Motivations of Students in the Open-Ended Use of Mobile Computing in Lecture-Based Classrooms

by

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We hereby certify that this dissertation, submitted by Jeffrey Kimball, conforms to acceptable standards and is fully adequate in scope and quality to fulfill the dissertation requirements for the degree of Doctor of Philosophy.

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While research supports the integration of mobile computing into instruction, there is disagreement concerning the unstructured use of mobile devices in lecture-based college classrooms. Research supports the argument that unstructured use creates distraction and decreased academic performance. Research also suggests that unstructured use actually supports lecture instruction through personalized learning situations. In either case, the motivations of students to use mobile device is often unclear. This study sought to investigate the motivations for students' acceptance of mobile devices. The Unified Theory of Acceptance and Use of Technology (UTAUT) was utilized to identify the factors leading to college students' adoption of mobile devices. A survey based on UTAUT was distributed to 254 college students in six distinct lecture-based general education courses. The results revealed that Performance Expectancy, Effort Expectancy, and Social Influence were positively correlated with Behavioral Intention for class-related behavior, with Performance Expectancy being the most significant. None of the constructs were significant for behavior unrelated to lecture. Analysis of the students' intention based on the UTAUT moderators of age, gender, and experience did not produce any significant difference, nor did an analysis of the classes by subject. The study concludes that the ability of a mobile device to complete specific tasks was the strongest motivating factor leading to intention.

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Chapter 1

Introduction

Background

At colleges and universities across the United States, students are attending classes, bringing with them mobile devices of varying kinds. For these students, the use of a mobile device is simply part of the classroom learning experience. Why is this the case? Consider the following scenarios.

In one class, Student A has used his laptop to log into the campus network, access the school's course management system, and open a Powerpoint presentation file made available by the instructor prior to class. The same presentation file is being projected onto a large screen in the classroom while the instructor discusses its content, proceeding through the presentation slide by slide. Student A is using the file he has opened to follow along with the instructor, even though he is seated only a few feet away from the screen.

Elsewhere, Student B uses her smartphone during her class to look up some information related to the class discussion. Her action is prompted by a question posed to the instructor by another student. Student B shares the information she has found with the instructor and the rest of class, for which she is thanked by the instructor for her contribution to the discussion.

Student C, attending a lecture with a large number of students, is using her laptop to take notes instead of using paper and pencil. While speaking, the instructor uses a term that is unfamiliar to Student C. The student pauses in her note-taking, accesses an Internet browser, and looks up the definition of the word with an online dictionary. After reading the definition, she closes the browser and redirects her attention back toward the lecture and resumes taking notes.

While listening to a lecture, Student D becomes interested in something mentioned by the instructor. He conducts an Internet search on the topic using his tablet. Student D finds material reinforcing what was already mentioned and discovers some information that was not presented by the instructor. He raises his hand to ask a question regarding the omitted material. The instructor briefly elaborates on the information, relating it back to the presentation content, and explains the reason for its omission, clarifying that it is beyond the scope of the current discussion.

The preceding descriptions of mobile device use are not hypothetical. Each of these situations is representative of the many actual open-ended uses of mobile devices in university classrooms witnessed by or recounted to the author of this study. None of the students' actions were anticipated by the instructors. Since the instructor in each situation did not foresee how the mobile devices might be used, the nature of the students' behavior, taken at face value at the moment of occurrence, might have been misinterpreted as disengagement from the class. The intention of the students was simply not known. Consequently, the benefit received by the students' actions was not readily apparent to the instructor. In that singular moment when intention to use a mobile device becomes action, an instructor can only guess at the reasons for the students' behavior and speculate about what the students are hoping to achieve. If the motivation of the student is clearly understood, then the instructor can intervene as necessary to guide appropriate behavior. The question of the appropriate use of mobile devices in class revolves around this intention.

In the earlier scenarios, what if the students had asked the instructor for permission to use the mobile devices without explaining how the devices were going to be used? The question "Why?" could be asked in each case to determine the purpose of the student. Why does Student A choose to access a presentation file on his laptop when it is already displayed in the classroom? Why does Student C wish to take notes on his device? Why do Students B, C, and D want to use their devices to perform Internet searches during class? Knowing the reason a student would want to use a mobile device can reveal insights into behaviors to be supported or avoided in the learning process.

In this context, the issue of why students engage in the open-ended use of mobile devices in class is a problem worthy of investigation. An overview of research literature reveals that college students embrace and even anticipate the use of mobile devices for learning (Young, 2006; Kulesza, DeHondt II, & Nezlek, 2010; Lindroth & Bergquist, 2010; Smith & Caruso, 2010; Chen, 2011; Donaldson, 2011; Baker, Lusk, & Neuhauser, 2012). The literature also notes that educators do not understand their students' expectations, desires, and motivations in adopting the use of mobile technology (Akour, 2009; Donaldson, 2011; Baker et al., 2012; Cheon, Lee, Crooks, & Song, 2012; Gu, Zhu, & Guo, 2013; Irby & Strong, 2013). The actions are observed but the intent is not understood. In an effort to contribute to the body of knowledge on the use of mobile devices in education, this study sought to answer the question "Why?" and discover what motivates college students to adopt mobile devices for use in lecture-based classes.

Problem Statement

A mobile computing device allows an individual to access information and computing technology infrastructure anywhere and anytime (Lawrence, Bachfischer, Dyson, & Litchfield, 2008; Moran, Hawkes, & El Gayar, 2010; Irby & Strong, 2013). These devices can include smartphones, e-readers, tablets, or laptop computers, all supporting the retrieval and analysis of data, the formation of knowledge from data, and the communication of knowledge in a variety of forms (Akour, 2009; Williams, 2009; Kulesza et al., 2010; Baker et al., 2012). The modern college student has been exposed to a world of ubiquitous computing through mobile technology in areas of communication, productivity, entertainment, and learning (Lawrence et al., 2008; Smith & Caruso, 2010; Robertson, 2011; Junco, 2012; Gu et al., 2013). Having incorporated mobile computing into their personal practices, college students have the expectation that mobile device use will be extended into the university classroom and play a significant role in their learning (Young, 2006; Kulesza et al., 2010; Smith & Caruso, 2010; Chen, 2011).

In examining the impact of mobile devices on learning, Fried (2008) notes that classroom activities purposefully integrating mobile computing have demonstrated some benefit. However, research in the open-ended, unstructured use of these devices in traditional, lecture-based classes has yielded mixed results (Baker et al., 2012). Studies show that students in a lecture-based classroom in which mobile devices are not restricted, but are not required, engage in actions dictated by the need and the will of the individual. The literature further indicates that some of these actions are unrelated to the immediate class session, serve as distractions to learning, and negatively affect academic performance (Fried, 2008; Kraushaar & Novak, 2010; Kulesza et al., 2010; Robertson, 2011; Sana, Weston, & Cepeda, 2013). Off-task behaviors include checking email, browsing the Internet, and playing games (Young, 2006; Fried, 2008; Kraushaar & Novak, 2010; Kulesza et al., 2010; Kay & Lauricella, 2011b; Gehlen-Baum & Weinburger, 2012; Kay, 2012).

Research also indicates that students' use of mobile devices may appear to be off-task but actually support classroom learning through the development of personalized learning situations (Lindroth & Bergquist, 2010). A dominant activity, such as listening to a lecture, is supported by subordinate behaviors that may appear to be unrelated to the dominant activity but develop as a student customizes an approach to learning during class (Lindroth & Bergquist, 2010; Kay & Lauricella, 2011b; Cheon et al., 2012). Examples of subordinate activities with mobile technology include searching the Internet for content related to the lecture topic; posing questions to fellow class members via instant messaging, email, or online discussion forums; and accessing course management software to view material associated with the class (Lindroth & Bergquist, 2010; Smith & Caruso, 2010; Kay & Lauricella, 2011b; Gehlen-Baum & Weinburger, 2012; Kay 2012). Lindroth and Bergquist (2010) assert that mobile devices, properly managed, can positively influence learning during a lecture.

Faced with contrasting views of mobile device use, educators must to choose to accept mobile technology and build instruction around them, ban mobile devices from the classroom altogether, or allow students to use mobile devices and figure out on their own how to best use them (Kay & Lauricella, 2011b; Gehlen-Baum & Weinburger, 2012). Instead of these three choices, the literature suggests that there is room for a balanced approach that would promote practices with mobile devices that support learning while satisfying the preferences and needs of students and preserving the traditional lecture favored by some instructors (Lawrence et al., 2008). This approach requires a common view of appropriate behavior with mobile devices, better information regarding their use, and an ongoing dialog between teachers and students concerning effective practices and expectations (Kraushaar & Novak, 2010; Kulesza et al., 2010; Lindroth & Bergquist, 2010; Chen, 2011; Baker et al., 2012; Cheon et al., 2012; Huffman & Huffman, 2012; Gu et al., 2013; Sana et al., 2013).

An important step toward establishing a common view would be an attempt to understand the motives of students in choosing to use a mobile device for learning. Some studies, such as those by Fried (2008) and Lindroth and Bergquist (2010), have been primarily focused on students' behavior with mobile devices, not on the reasons students seek to use them. Huffman and Huffman (2012) note that students are more likely to use a technological tool if they perceive it will contribute to a successful academic performance. Since student interest in using mobile computing for educational purposes does exist (Lindroth & Bergquist, 2010; Smith & Caruso, 2010; Donaldson, 2011; Baker et al., 2012), it is necessary for teachers to understand their students' needs, concerns, and motivations in adopting this form of technology in order to provide guidance in appropriate use (Akour, 2009; Donaldson, 2011; Baker et al., 2012; Cheon et al., 2012; Gu et al., 2013; Irby & Strong, 2013).

Technology acceptance theory lends itself to such an investigation since it provides insight into the reasons individuals adopt and utilize technological innovations (Straub, 2009; Huffman & Huffman, 2012). The main idea in technology acceptance theory is that a strong intention to use technology, based on individually-held beliefs, will lead to a greater likelihood of its actual use (Moran et al., 2010; Chen, 2011; Huffman & Huffman, 2012). Venkatesh, Morris, Davis, and Davis (2003) describe technology acceptance theory as a mature and growing area of information systems studies. Many theories and models exist in order to explain the influences and factors behind an individual's decision to adopt a technological innovation (Fishbein & Ajzen, 1975; Bandura, 1986; Davis, 1989; Ajzen, 1991; Moore & Benbasat, 1991; Thompson, Higgins, & Howell, 1991; Davis, Bagozzi & Warshaw, 1992; Compeau & Higgins, 1995; Rogers, 1995; Taylor & Todd, 1995; Venkatesh et al., 2003). These technology acceptance models have been applied beyond information systems research into other areas such as education and social sciences (Wang & Wang, 2010; Chen, 2011; Cheon et al., 2012; Huffman & Huffman, 2012; Lai, Wang & Lei, 2012; Park, Nam & Cha, 2012; Gu et al., 2013; Irby & Strong, 2013). This trend suggests that technology acceptance theory is applicable in examining the factors that lead students to use mobile devices during lecture classes.

Within technology acceptance theory, there exists a hybrid model which combines elements of eight prior models into a single entity. Venkatesh et al. (2003) conceived of the Unified Theory of Acceptance and Use of Technology (UTAUT) as a "best of the best" model containing the common features and factors of behavioral intention present in pre-existing models and theories. The UTAUT model has been validated in subsequent studies using a wide range of technological innovations and contexts, explaining the factors of technology acceptance at a level of accuracy beyond its predecessors (Venkatesh et al., 2003; Moran, 2006; Williams, 2009; Moran et al., 2010; Wang & Wang, 2010; Chen, 2011; Donaldson, 2011; Irby & Strong, 2013). Consequently, the literature identifies UTAUT as a definitive model for conveying a comprehensive and conclusive understanding of acceptance factors in numerous situations (Moran et al., 2010; Wang & Wang, 2010; Chen, 2011; Irby & Strong, 2013).

The unstructured use of mobile technology during lecture-based classes remains an issue that must be confronted by classroom instructors. To be addressed effectively, the reasons students choose to use mobile devices must be understood. As suggested by the literature (Moran, 2006; Akour, 2009; Moran et al., 2010; Donaldson, 2011; Cheon et al., 2012; Huffman & Huffman, 2012; Lai et al., 2012; Park et al., 2012; Irby & Strong, 2013), an investigation into the motivations of college students in accepting mobile technology can contribute to a solution to this problem.

Dissertation Goal

This study endeavored to discover the factors that motivate college students to adopt the use of mobile computing devices for open-ended use in traditional, lecture-based classes. Educators do not have a full and accurate picture of their students' intentions to use mobile devices during class. This lack of understanding restricts instructors in their ability to offer guidance to students in the appropriate use of mobile devices. It also prevents instructors and students from establishing mutually accepted forms of usage for mobile technology. By revealing the reasons students accept mobile devices, this study sought to ameliorate this situation by providing a basis for advancing the discussion on the best uses of mobile devices during lecture classrooms.

This study addressed the issue of student motivation by applying a specific model of technology acceptance, the Unified Theory of Acceptance and Use of Technology (UTAUT), as conceived by Venkatesh et al. (2003), to a technological innovation with a unique context: mobile devices in open-ended use by college students in a lecture-based classroom. By using the UTAUT model in this manner, this study contributed to the body of research literature in technology acceptance theory in general and the UTAUT specifically.

Research Questions and Hypotheses

This study's primary research question was "Why are college students choosing to use mobile devices in traditional, lecture-based classes?" The study examined whether a relationship exists between factors in the UTAUT model and students' behavioral intention to use mobile devices during class. Accordingly, this effort was a correlational study. In support of the primary question and in order to determine the existence of a relationship between UTAUT constructs and intention, several ancillary questions were chosen:

1. Which constructs of the UTAUT model have a significant positive relationship with students' behavioral intention to use mobile devices during lecture for activity related to the class?
2. Which constructs of the UTAUT model have a significant positive relationship with students' behavioral intention to use mobile devices during lecture for activity not related to the class?

3. What effect do the UTAUT moderators of age, gender, and experience have on students' behavioral intention to use mobile devices during lecture?
4. What effect do the defining characteristics of a class, such as subject area and size, have on students' behavioral intention to use mobile devices during lecture?

Question One, which addressed the motivation to use of mobile devices for learning, was assessed using survey items adapted from the original work by Venkatesh et al. (2003) establishing the UTAUT model. The constructs of Performance Expectancy, Effort Expectancy, and Social Influence act as independent variables in relationship to the dependent variable Behavioral Intention. Facilitating Conditions, normally included in the UTAUT model, was omitted from this study since it does not contribute to intention. The first question and hypotheses were as follows:

1. Which constructs of the UTAUT model have a significant positive relationship with students' behavioral intention to use mobile devices during lecture for activity related to the class?

   $H1_A$. The constructs of the UTAUT model will have a significant positive relationship with students' behavioral intention to use mobile devices during lecture for activity related to class.

   $H1_0$. The constructs of the UTAUT model will not have a significant positive relationship with students' behavioral intention to use mobile devices during lecture for activity related to class.

Question Two examined the intention to use mobile devices for off-task activities. As with Question One, survey items were adapted from Venkatesh et al. (2003). The relationships among the variables outlined for Question One remained the same for this question. The second question and hypotheses were as follows:

2. Which constructs of the UTAUT model have a significant positive relationship with students' behavioral intention to use mobile devices during lecture for activity not related to the class?

   $H2_A$. The constructs of the UTAUT model will have a significant positive relationship with students' behavioral intention to use mobile devices during lecture for activity unrelated to class.

   $H2_0$. The constructs of the UTAUT model will not have a significant positive relationship with students' behavioral intention to use mobile devices during lecture for activity unrelated to class.

Question Three examined the impact of some of the moderators included in UTAUT. The moderators included as part of this study were age, gender, and experience. Voluntariness of use, normally included in the UTAUT model, was excluded from examination in this study since unstructured mobile device use in class is already voluntary. This question was addressed by using the descriptive statistics of the student participants. The third question and hypotheses were as follows:

3. What effect do the UTAUT moderators of age, gender, and experience have on students' behavioral intention to use mobile devices during lecture?

   $H3_A$. The UTAUT moderators of age, gender, and experience will be significant with respect to students' behavioral intention to use mobile devices.

$H3_0$. The UTAUT moderators of age, gender, and experience will not be significant with respect to students' behavioral intention to use mobile devices.

Question Four aimed to discover if the characteristics of a class, namely its size and its subject matter area, have any relationship to students' behavioral intention. Descriptive statistics about each course participating in this study were used to answer this question. The fourth question and hypotheses were as follows:

4. What effect do the defining characteristics of a class, such as subject area and size, have on students' behavioral intention to use mobile devices during lecture?

$H4_A$. Course subject matter area and class size will be significant with respect to students' behavioral intention to use mobile devices.

$H4_0$. Course subject matter area and class size will not be significant with respect to students' behavioral intention to use mobile devices.

Relevance and Significance

A gulf exists between the perception and the reality of how and why mobile devices are used by students. Research, such as that of Fried (2008), Kraushaar and Novak (2010), and Sana et al. (2013), indicates mobile devices serve as distractions from the learning environment. Other studies, such as those by Lindroth and Bergquist (2010), Kay and Lauricella (2011b), and Cheon et al. (2012), note that mobile devices support personalized learning activities within the classroom. These contrasting views suggest the need for the establishment of a "middle ground" in which students are able to employ mobile devices in class appropriately and effectively with approval and guidance from instructors (Kraushaar & Novak, 2010; Kulesza et al., 2010; Lindroth & Bergquist, 2010; Chen, 2011; Baker et al., 2012; Cheon et al., 2012; Huffman & Huffman, 2012; Gu et al., 2013; Sana et al., 2013). Critical to the effort in building this common ground is the ability to understand students' intentions and motivations in adopting mobile devices for learning (Akour, 2009; Donaldson, 2011; Baker et al., 2012; Cheon et al., 2012; Gu et al., 2013; Irby & Strong, 2013). Buche, Davis, and Vician (2012) note that the literature is sparse concerning the reactions to technology in courses that lack a technology focus but where technology can assist learning. Buche et al. (2012) further note that reaction influences intention, which influences behavior. Straub (2009) suggests that research in technology adoption should examine how informal technologies influence the use of technology in formal surroundings. One way to determine the intention to use a technological innovation such as a mobile device is to utilize the UTAUT model (Venkatesh et al., 2003, Moran et al., 2010; Wang & Wang, 2010; Irby & Strong, 2013). The literature concerning mobile technology acceptance by students suggests further investigation (Moran, 2006; Akour, 2009; Moran et al., 2010; Donaldson, 2011; Cheon et al., 2012; Huffman & Huffman, 2012; Lai et al., 2012; Park et al., 2012; Irby & Strong, 2013).

This study was significant in that it attempted to address the question of why a college student chooses to use a mobile device in support of classroom learning. The identification of the UTAUT factors most likely to explain students' motivations contribute to an overall understanding of how and why mobile devices are being used. In turn, this effort added to the dialog about best practices with mobile computing in the classroom, contributing to the balanced approach advocated by educational research. It is hoped that this study would increase instructors' understanding of the utility of mobile devices for learning so that they can provide appropriate guidance to their students.

This study also added to the body of information systems literature by providing an avenue for exploring the UTAUT model. Since its introduction by Venkatesh et al. (2003), UTAUT has been evaluated for validity and effectiveness as a model for assessing the current use and predicting the future use of technology. While UTAUT primarily serves as a means to an end in this study by revealing the factors leading to the intention to use mobile devices, the study also provided a unique context for examining the utility of the model. The results of this study contributed to a growing understanding of the UTAUT model's effectiveness.

Barriers and Issues

The essence of the problem requires gaining insight into the reasons why college students adopt mobile devices for use during class. This means that the study investigated internal motivation rather than observable behavior. Therefore, the required data was needed to be self-reported by the student population. The gathering of data was done via a survey using questions corresponding to the constructs of the UTAUT model. Since this approach is common for research performed with UTAUT, this was a replicative study. However, some obstacles were anticipated.

1. Creating a relevant survey. The work by Venkatesh et al. (2003) that established the UTAUT model included questionnaire items that could be adapted for follow-up studies. The survey for this study attempted to elicit student responses regarding intention to use mobile devices for activity

related and unrelated to class. For this study, it was crucial to adapt each question carefully for this unique context.

2. Choosing an appropriate population for the survey. This population was identified as coming from several sections of general education courses, such as General Psychology and Intro to Computing, which tend to have large and diverse enrollments representing a cross-section of the overall student population. However, the number of students who have actually used mobile devices in these classes could be small and thus affect the survey outcome. Gay, Mills and Airasian (2009) state that the minimally accepted sample size for a correlational study, like this one, is 30 participants, but that a larger sample size may be necessary if validity and reliability are low. Administering the survey also required the cooperation of classroom instructors. An effort was needed to inform and recruit instructors amenable to allowing their students to participate in this study.
3. Retrieving an appropriate number of responses to the survey. Any time surveying is attempted, getting a sufficient number of responses to validate the survey is a concern. This study was no different.
4. Eliciting honest responses from students. Depending on the manner in which any survey is delivered, whether face-to-face or using an online tool, participants may or may not respond honestly and tell only what they believe is an expected response. This possibility could have skewed the results of the study.

5. Survey outcomes may not be generalizable. This study was conducted on the campus of Southwest Baptist University, a small private Christian university in the mid-western United States. Compared to some larger institutions, this university does not have a diverse student population.

Assumptions, Limitations and Delimitations

Assumptions are assertions that are accepted as true but not actually verified (Gay et al., 2009). For this study, there were several assumptions that were made.

1. The students participating in the survey were indeed using mobile devices during class and for class-related reasons.
2. The students participating in the survey were also using mobile devices during class for actions not related to the lecture.
3. The students participating in the survey responded honestly to the questions rather than giving answers they think are anticipated.
4. The students participating in the survey were familiar in answering Likert-type questions that require a response from a range of values indicating agreement with a statement.
5. The survey instrument, being derived from a recognized and validated source, was successfully adapted for this context.
6. The criteria for gauging Facilitating Conditions as a factor of Use Behavior were already met or mitigated. This assumption is explained in further detail in Chapter 3.

Limitations are aspects of the study that are beyond the control of the researcher. They have the potential to negatively impact the results of the study (Gay et al., 2009).

This study was quantitative in its approach and involved correlational research. The questions posed by the study sought to determine if there is a significant positive influence from the components of the UTAUT model on the behavioral intention to use mobile computing devices in class. Keeping this in mind, the study had a few limitations:

1. The study was not be able to draw any conclusions about causality. For example, it was not able to claim that Social Influence is a significant cause of the use of mobile devices for on-task or off-task behavior in the classroom.
2. Use of the UTAUT model without additional variables excluded other factors that could have been considered as influences on intention or other moderators that could have affected the relationships among UTAUT constructs.
3. Opting for a quantitative approach eliminated the possibility of delving further into student motivations. A qualitative approach, such as a case study, might reveal insights not possibly derived using the UTAUT model.

Delimitations are factors that are intentionally imposed on a study to constrain its scope. They have the potential to impact the generalizability of a study. For this investigation, there were a few delimitations.

1. The scope of this study was limited to surveying general education courses with large enrollments. This was done in order to establish a population representing the broadest possible group of students. It may be that studies with a more narrow focus in terms of class size and curriculum will produce different results.

2. The scope of this study was limited to courses that were predominantly lecture-based. Outcomes may vary for studies conducted in classes that incorporate other instructional styles.
3. The scope of this study was limited to Southwest Baptist University, an institution that is small in population, private and Evangelical Christian in its identity, and centered on a liberal arts education as its mission. The student population is minimally diverse. The university itself is situated in a rural setting in the mid-western United States. Studies conducted at other institutions with different defining characteristics, curriculum and locales may produce different outcomes.

Definitions of Terms

Following is a list of terms and definitions used throughout this study.

Mobile Computing Device – A mobile computing device is a technological object that allows an individual to access information anywhere and anytime (Lawrence et al., 2008; Moran et al., 2010; Irby & Strong, 2013). This category of computing devices includes laptop computers, smartphones, tablets and e-readers (Akour, 2009; Williams, 2009; Kulesza et al., 2010; Baker et al., 2012).

Lecture-Based Classroom – A lecture-based classroom is a course in which the primary means of instruction is the traditional lecture conducted by a teacher or professor.

Structured Activity – Structured activity with mobile computing devices involves building instruction and learning around the use of the devices. In this context, the devices are a critical form of content delivery for the teacher or a necessary tool for all students to learn. The class presentation or lesson is reliant on the presence of a mobile device for all students.

Unstructured Activity – Unstructured activity are actions with a mobile computing device that take place during class but are not required by the lesson or presentation at hand. These actions are driven by the desires of an individual student, not directed by a teacher and not performed by all students. An example of unstructured activity would be a student using an Internet search engine to find information related to a teacher's lecture content.

On-Task Behaviors – On-task behaviors are actions taken by a student using a mobile device that are related to the class in session. Types of on-task behaviors with mobile devices include searching the Internet for content related to a presentation; asking questions of classmates via instant messaging, email or social media; or accessing course management software to make use of digital resources for the class (Lindroth & Bergquist, 2010; Smith & Caruso, 2010; Kay & Lauricella, 2011b; Gehlen-Baum & Weinburger, 2012; Kay, 2012).

Off-Task Behaviors – Off-task behaviors are actions taken by a student using a mobile computing device for the purpose of disengaging from a class session. Examples of this type of behavior includes checking personal email, browsing the Internet for content not related to class and playing video games (DeGagne & Wolk, 2006; Young, 2006; Fried, 2008; Nworie & Haughton, 2008; Hammer et al., 2010; Kraushaar & Novak, 2010; Kulesza et al., 2010; Kay & Lauricella, 2011b; Gehlen-Baum & Weinburger, 2012; Kay, 2012).

Technology Acceptance – Technology acceptance is a complex development process in which an individual chooses to adopt a technological innovation (Staub, 2009; Huffman & Huffman, 2012). Technology acceptance theory seeks to understand the factors that influence the behavioral outcome of an individual's choice to accept or reject a form of technology (Buche et al., 2012).

UTAUT – The Unified Theory of Acceptance and Use of Technology, or UTAUT for short, is a theory of technology acceptance developed by Venkatesh et al. (2003). It is derived from several other technology acceptance models as a "best of the best" hybrid. The theoretical model is composed of several factors or constructs that represent the motivating influences behind an individual's choice to adopt a technological innovation.

The models of technology acceptance that contribute to the design of UTAUT are fully described in the review of the literature in Chapter 2. The discussion presented in Chapter 2 describes the models in the context of how each model contributes to the theoretical foundations of UTAUT. For completeness, the names and acronyms for these models are listed below:

- *TRA* – Theory of Reasoned Action
- *TAM* – Technology Acceptance Model
- *MM* – Motivational Model
- *TPB* – Theory of Planned Behavior
- *C-TAM-TPB* – A model combining TAM and TPB
- *MPCU* – Model of Personal Computer Utilization
- *IDT* – Innovation Diffusion Theory
- *SCT* – Social Cognitive Theory

The UTAUT model contains several constructs that act as variables or moderators in determining the acceptance of a specific form of technology. These entities demonstrate and describe the degree of influence certain factors exert on the likelihood of acceptance. While a more detailed explanation of the model is given in Chapter 2, a brief definition of the factors and moderators is offered here. The components of UTAUT are:

- *Performance Expectancy* – One of the core constructs in UTAUT, performance expectancy indicates the degree to which a user believes that using a form of technology will be advantageous in the completion of desired tasks (Venkatesh et al., 2003).
- *Effort Expectancy* – A second construct, effort expectancy describes the degree of ease that a person anticipates when using a form of technology (Venkatesh et al., 2003).
- *Social Influence* – The third major construct, social influence measures the degree to which an individual perceives that significant or important persons endorse or encourage the individual to use a form of technology (Venkatesh et al., 2003).
- *Facilitating Conditions* – Another of the main constructs, facilitating conditions is interpreted as the degree to which a user believes that an organizational and technical infrastructure exists to support the use of a form of technology (Venkatesh et al., 2003).
- *Behavioral Intention* – A significant construct in UTAUT, behavioral intention is the willingness shown by an individual in using a form of technology (Venkatesh et al., 2003).

- *Use Behavior* – A component in UTAUT, use behavior describes actions taken by an individual in using a form of technology (Venkatesh et al., 2003).
- *Gender* – The gender of an individual is listed as a moderator in UTAUT.
- *Age* – The age of an individual is included in the model as a moderator.
- *Experience* – Experience, which is the familiarity or expertise that an individual has with a form of technology, serves as a moderator in UTAUT.
- *Voluntariness of Use* – A moderator in the model, voluntariness of use is the willingness of an individual to adopt or use a form of technology.

Summary

The ubiquitous nature of mobile computing devices has permitted college students in engage in behavior during lecture-based classes that is both on-task and off-task. The body of literature indicates that some mobile device use is distracting and detrimental to learning. Additional research shows that some mobile device use constitutes a form of personal learning. The divided opinion among educators reveals the need to understand the reasons college students seek to use this form of technology in class. This study investigated those motivations through the application of technology acceptance theory, specifically a model of intention called UTAUT. The study examined students' behavioral intention to use mobile devices during class for activities both related and not related to class.

Chapter 2

Review of the Literature

Mobile Devices and College Students

Mobile devices are a category of computers that can include laptop computers, netbooks, e-readers, smartphones, and tablets (Akour, 2009; Williams, 2009; Kulesza et al., 2010; Baker et al., 2012; Khalid, Chin, & Nuhfer-Halten, 2012; Sarrab, Elgamel, & Aldabbas, 2012). A mobile device gives an individual the ability to access information and computing technology infrastructure anywhere and anytime (Lawrence et al., 2008; Moran et al., 2010; Sarrab et al., 2012; Irby & Strong, 2013). Nearly ubiquitous in modern society, a mobile device facilitates access to information and multiple forms of communication (Kulesza et al., 2010). The current generation of college students has grown up in a world of ubiquitous computing, supported by the widespread availability and use of mobile technology (Lawrence et al., 2008; Murphy, 2010; Junco, 2012; Wood et al., 2012; Gu et al., 2013). By incorporating mobile computing devices into their personal practices, college students have developed and have adapted to new avenues for communication, productivity, entertainment, and learning (Plymale, 2007; Smith & Caruso, 2010; Fulton et al., 2011; Robertson, 2011). These students have also experienced an increased use of computing technology throughout their K-12 education (Wood et al., 2012; Gu et al., 2013) and a blending of information and entertainment in various forms of media (Adams, 2006). It is the expectation of college students that personal mobile computing practices can be extended into the university classroom to augment their learning experience (Young, 2006; Hammer et al., 2010; Kulesza et al., 2010; Murphy, 2010; Smith & Caruso, 2010; Chen, 2011).

Mobile Devices in the University Classroom

A distinction can be made in how mobile devices are used in a classroom. The term "structured use" describes a paradigm in which computers are meaningfully and deliberately integrated into instructional activities (Mohammadi-Aragh & Williams, 2013). An "unstructured use" paradigm describes a classroom that involves a traditional lecture format with some computer use by an instructor for the delivery of content but no directed or required computer use by students (Mohammadi-Aragh & Williams, 2013).

The research literature in the structured use of mobile devices notes a positive effect on students' learning performance (Barak, Lipson, & Lerman, 2006; Fried, 2008), where the literature in unstructured use reveals mixed findings regarding student academic performance (Wurst, Smarkola, & Gaffney, 2008; Kay & Lauricella, 2011a; Baker et al., 2012; Khalid et al., 2012; Gaudreau, Miranda, & Gareau, 2014). These environments allow open-ended use of mobile devices, giving students the latitude to determine when and how to use them. Because the use is not structured around a meaningful activity, students engage in a variety of behaviors, some of which are unrelated to the class in session and serve as distractions, creating a negative impact on learning (Hembrooke & Gay, 2003; DeGagne & Wolk, 2006; Fried, 2008; Kraushaar & Novak, 2010; Kulesza et al. 2010; Fulton et al., 2011; Kay & Lauricella, 2011a; Robertson, 2011; Zivcakova, 2011; Mueller, Wood, De Pasquale, & Cruikshank, 2012; Wood et al., 2012; Sana et al., 2013; Gaudreau et al., 2014). These unrelated, off-task behaviors include actions such as checking email, browsing the Internet, and playing video games (Hembrooke & Gay, 2003; Golub, 2005; DeGagne & Wolk, 2006; Young, 2006; Fried, 2008; Nworie & Haughton, 2008; Hammer et al., 2010; Kraushaar & Novak, 2010; Kulesza et al., 2010; Murphy, 2010; eun Oh & Gwizdka, 2011; Fulton et al., 2011; Kay & Lauricella, 2011b; Zivcakova, 2011; Annan-Coultas, 2012; Gehlen-Baum & Weinburger, 2012; Kay, 2012; Gaudreau et al., 2014). Kay and Lauricella (2011a) report that students cited the use of laptops by other students as the most frequent source of distraction, followed by personal communication and activities directed toward entertainment.

However, research notes that some unstructured use actually supports learning during the lecture (Lindroth & Bergquist, 2010; Murphy, 2010; Kay & Lauricella, 2011a; Kay & Lauricella, 2011b; Annan-Coultas, 2012; Khalid et al., 2012; Mueller et al., 2012). These actions may appear to be off-task but serve to develop personalized learning situations comprised of a dominant activity and subordinate behaviors (Lindroth & Bergquist, 2010; Murphy, 2010; Kay & Lauricella, 2011b; Cheon et al., 2012). For example, listening to a lecture would be considered a dominant activity. As the student engages in the dominant activity, subordinate behaviors develop according to the need of the student. In a classroom lecture, a student may choose to use a mobile device to follow and modify lecture notes provided in advance by the instructor; search the Internet for content related to the lecture topic when prompted by something mentioned during the presentation; ask questions of classmates via instant messaging, email, or social media; or access course management software to view material associated with the class (Hembrooke & Gay, 2003; Golub, 2005; Lindroth & Bergquist, 2010; Murphy, 2010;

Smith & Caruso, 2010; eun Oh & Gwizdka, 2011; Fulton et al., 2011; Kay & Lauricella, 2011a; Kay & Lauricella, 2011b; Annan-Coultas, 2012; Gehlen-Baum & Weinburger, 2012; Kay, 2012, Mueller et al., 2012; Gaudreau et al., 2014). These actions, while appearing to be disconnected from class, would be subordinate to the main activity of the lecture and would allow the student to derive additional meaning or learning in response to the lecture itself. Kay and Lauricella (2011a) identify multiple beneficial behaviors with mobile devices in the areas of note-taking, completion of academic activities, access to academic-based resources, improvement in academic success, and communication with instructors and students. Because of their ability to provide "on the spot" access to information (Khalid et al., 2012; Jambulingham, 2013), laptops and other mobile devices can assist in the development of a blended learning environment, composed of interactions, collaborations, conversations, and problem-solving, that increases learner interaction and engagement (McLaren, 2011; Sarrab et al., 2012). Students using mobile devices report increased focus, self-organization, and efficiency in completing academic and administrative tasks as well as assistance for students with special needs and opportunities for exploring new technology (Kay & Lauricella, 2011a). Kay (2012) suggests that the lecture itself influences the usage of mobile devices, noting that students cite the benefits of mobile device usage twice as frequently as issuing complaints about distractions. The literature states that it is not the nature of mobile devices that is inherently distracting but the manner in which they are used, contending that the properly managed use of mobile devices can exert a positive influence on learning during a lecture (Lindroth & Bergquist, 2010; Khalid et al., 2012).

The Need for Common Ground

Educators are presented with two contrasting views: mobile devices as distractions and mobile devices as support tools. Given these two divergent opinions, educators must either choose to accept, reject, or allow mobile devices (Kay & Lauricella, 2011b; Gehlen-Baum & Weinburger, 2012). By accepting mobile technology during class, instructors must reconfigure lessons around the purposeful, integrated use of the devices. The literature notes that this approach has proven effective (Barak et al., 2006; Fried, 2008). However, it may not be a strategy that can be reasonably applied for all classrooms, sessions, formats or subjects and does not address the possibility of unstructured use as a means for assisting personalized learning (Lindroth & Bergquist, 2010). Rejecting mobile devices by banning their use during class does eliminate a source of potential distraction. This strategy may not be suitable for subject areas, such as computer science and engineering, which make use of computing devices as tools for academic study (Fulton et al., 2011). A ban may also backfire by alienating students who have grown accustomed to ubiquitous mobile computing in a variety of contexts both in and out of the classroom (Hammer et al., 2010; McDonald, 2012). Students may be conditioned to a fast-paced shifting of attention from one form of information to another (Adams, 2006). Learning processes that students have already developed through the unstructured use of mobile technology may be potentially disrupted or hindered as an unintended consequence (Kulesza et al., 2010; Lindroth & Bergquist, 2010; Kay, 2012; Khalid et al., 2012). In allowing mobile devices, teachers leave to the individual student the responsibility for determining the best way to use mobile technology during class. A "laissez-faire" approach like this could certainly appeal to some students but does not provide an environment for nurturing good learning practices and diminishing behavior detrimental to learning.

Compounding the problem is the view of mobile computing held by students. Current students are more knowledgeable about information technology devices than their instructors (Gu et al., 2013) and have been raised in a culture of fast-paced presentation blurring the line between relevant information and entertaining content (Adams, 2006). Gu et al. (2013) assert that early and frequent exposure to technology experienced by college students has shaped their patterns of thinking, behaving, and communicating, which is reflected in notions of learning. Students are using technology in support of multiple aspects of academic study, personalized for their needs, adapted to their individual learning approaches, and capable of allowing them to be productive in a constantly changing environment (Conole, de Laat, Dillon, & Darby, 2008). College students believe in the legitimacy of using mobile technology for class, that they are effective in multi-tasking behaviors, and that engaging in multi-tasking efforts during class is less intrusive than talking or reading (Hammer et al., 2010). Multitasking is viewed by digital natives as a normal social practice, performed routinely and often with multiple forms of media (eun Oh & Gwizdka, 2011; Fulton et al., 2011; Gu et al., 2013). Research shows that students are not actually multitasking but engaging in continuous partial attention, shifting their focus from thing to another (Adams, 2006; Salter & Purgathofer, 2010). In a practical manner, students suffer from a type of cognitive dissonance in this case: they know that unstructured mobile device use during class could be disruptive but would prefer to see the use perpetuated rather than discontinued (Hammer et al., 2010; Murphy, 2010). In many cases, students allow themselves to become distracted, believing that they can teach themselves later using a variety of class-related materials (Annan-Coultas, 2012).

The literature calls for a balanced approach between the views of mobile devices as sources of distraction on one hand and sources of supported learning on the other. According to eun Oh and Gwizdka (2011), optimizing the educational utility of technology requires an understanding of how it might be used and how it can support or hinder learning. Salter and Purgathofer (2010) assert that the ubiquitous nature of technology for use both personally and professionally suggests that effective strategies for using technology in education should be explored. Straub (2009) suggests that research should examine how informal technologies influence the use of technologies in more formal environments. Kulesza et al. (2010) describe this as an "enlightened compromise" that would allow students and teachers to promote strategies of unstructured use with mobile devices that support learning during a lecture. Forging such a compromise would retain elements of ubiquitous mobile technology preferred by college students while preserving the traditional lecture format favored by many instructors (Lawrence et al., 2008; Hammer et al., 2010). The effort to establish a set of best practices out of this "enlightened compromise" requires teachers and students to maintain an ongoing dialog about mobile computing strategies and expectations, coupled with better information regarding the use of mobile technology and a common view of acceptable behavior in the classroom (Hembrooke & Gay, 2003; Hammer et al., 2010; Kraushaar & Novak, 2010; Kulesza et al., 2010; Lindroth & Bergquist, 2010; Chen, 2011; Annan-Coultas, 2012; Baker et al., 2012; Cheon et al., 2012; Huffman & Huffman, 2012; Gu et al., 2013; Sana et al., 2013; Gaudreau et al., 2014). Fulton et al. (2011)

discovered that students are amenable to modifying behavior with mobile devices when engaged by instructors in a discussion of classroom expectations, student responsibilities, and the impact of multitasking on learning and academic performance. As a reinforcement of this idea, Annan-Coultas (2012) reports that many students believe it is their personal responsibility to avoid distraction when using mobile technology. The literature suggests that the potential benefits of any form of technology in education can only be fully realized when stakeholders like students and teachers accept technology and find value in its appropriate use (Kulesza et al., 2010; Donaldson, 2011; Gehlen-Baum & Weinburger, 2012).

One important step in establishing a common view of mobile computing is the attempt to understand the intentions students have in using the devices in the first place. Research, such as that by Fried (2008) and Lindroth and Bergquist (2010), has been primarily focused on student behavior rather than on student motivation. Moran et al. (2010) assert that the acceptance of technology begins with beliefs held by individuals, followed by the intention to use the technology in question, and finally leading to behavior with the technology. Students are likely to adopt forms of technology if doing so enables them to experience improved academic performance (Huffman & Huffman, 2012). Students develop a more positive attitude toward electronic educational interaction and develop new avenues for communication and interaction with peers and instructors when using mobile devices, such as laptops, in class (McLaren, 2011). The literature demonstrates the existence of a firm interest on the part of students in the use of mobile devices for educational reasons (Demb, Erickson, & Hawkins-Wilding, 2004; Lindroth & Bergquist, 2010; Smith & Caruso, 2010; Murphy, 2010; Donaldson, 2011;

Baker et al., 2012; Khalid et al., 2012). This student interest is spurred by belief in the utility of mobile devices, which allows intention to develop, yielding ultimately to action, as described in the research literature (Fried, 2008, Kraushaar & Novak, 2010; Kulesza et al., 2010; Lindroth & Bergquist, 2010; Smith & Caruso, 2010; Kay & Lauricella, 2011b; Gehlen-Baum & Weinburger, 2012; Kay, 2012). Since this dynamic of interest, belief, and intention about mobile computing persists, it is necessary for educators to understand their students' perspective on this form of technology (DeGagne & Wolk, 2006; Akour, 2009; Donaldson, 2011; Baker et al., 2012; Cheon et al., 2012; Gu et al., 2013; Irby & Strong, 2013). It follows that a full and complete picture of students' intentions would allow teachers to better address the presence of mobile devices in the classroom.

Technology Acceptance Theory

Part of information systems research, technology acceptance theory provides insight into the reasons individuals choose to adopt technological innovations (Straub, 2009; Huffman & Huffman, 2012). Ideas and objects, such as a new form of technology or a new use for an existing product, are accepted by society at large because of the cumulative decisions made by individuals to adopt them (Moore & Benbasat, 1991). Buche et al. (2012) describe the goal of technology acceptance research as understanding the factors that influence the behavioral outcome of a person's choice to use or not use a form of technology.

Technology adoption is regarded as a complex developmental process that requires an examination of individuals and the choices individuals make in accepting or rejecting forms of technological innovations (Straub, 2009). The process of adoption originates with beliefs held by individuals concerning technology (Moran et al., 2010).

Beliefs yield to an intention to use a specific form of technology (Moran et al., 2010). Intention culminates in specific behavior with the chosen technological innovation (Moran et al., 2010).

Due to the technological advances in our society, research within the area of technology acceptance theory continues to develop in order to fully understand the unique and complex dynamic between acceptance, intention, and behavior. Technology acceptance theory is a mature and growing area of study within the broader discipline of information systems research, according to Venkatesh et al. (2003). The expansion of this area of study is observed in the application of many different theories of technology acceptance using multiple types of technological innovations in a wide range of contexts, such as education and social sciences (Carlsson, Carlsson, Hyvönen, Puhakainen, & Walden, 2006; Marchewka, Liu, & Kostiwa, 2007; Wang & Shih, 2009; Wang & Wang, 2010; Chen, 2011; Marques, Villate, & Carvalho, 2011; Cheon et al., 2012; Huffman & Huffman, 2012; Lai, Wang, & Lei, 2012; Park, Nam, & Cha, 2012; Gu et al., 2013; Irby & Strong, 2013). In the attempt to explain and predict the adoption of technology, each of these theoretical models has a set of determinants to identify the causes of technology acceptance.

While not an exhaustive list of technology acceptance models, the models relevant to this study are the Theory of Reasoned Action (TRA); the Technology Acceptance Model (TAM); the Motivational Model (MM); the Theory of Planned Behavior (TPB); a model combining TAM and TPB (C-TAM-TPB); the Model of PC Utilization (MPCU); Innovation Diffusion Theory (IDT); and the Social Cognitive Theory (SCT). Individually, each of these models contributes to the overall body of literature pertaining to technology acceptance theory. Collectively, many of their components have been combined by Venkatesh et al. (2003) into a single unified model called the Unified Theory of Acceptance and Use of Technology (UTAUT). A brief examination of each of the eight models is provided with a detailed explanation of UTAUT to follow.

Theory of Reasoned Action

The Theory of Reasoned Action (TRA) is considered to be one of the most fundamental and influential theories of human behavior (Venkatesh et al., 2003). As presented by Fishbein and Ajzen (1975), TRA is frequently used to predict a wide range of behaviors of individuals in a given situation (Venkatesh et al., 2003; Marques et al., 2011). At the core of TRA is the idea that a person's intent to perform a specific behavior is a function of certain beliefs (Fishbein & Ajzen, 1975). The beliefs are not centered on the object of the behavior but concern the behavior itself (Fishbein & Ajzen, 1975). Some beliefs influence attitude toward the behavior (Fishbein & Ajzen, 1975). Other beliefs are rooted in a subjective norm, the valuation given to behavior by persons held to be important to the individual (Fishbein & Ajzen, 1975). This arrangement about beliefs lead Fishbein and Ajzen (1975) to suggest that behavioral intention is a factor of attitude toward behavior and subjective norm.

Fishbein and Ajzen (1975) define attitude as a learned predisposition to respond in a consistently favorable or unfavorable manner toward an object. Attitude can be learned, suggests action, and influences a general positive or negative feeling toward something, such as specific behavior (Fishbein & Ajzen, 1975). An individual's attitude toward performing a particular behavior will be related to beliefs about the behavior and an evaluation of the resulting consequences (Fishbein & Ajzen, 1975). According to TRA, a person will adopt specific behavior if it is perceived to lead to a positive outcome (Marques et al., 2011).

Subjective norm is defined by Fishbein and Ajzen (1975) as beliefs that certain people think an individual should or should not perform a behavior. An individual may or may not conform to a standard of behavior held by other people deemed to be important or significant to the individual (Fishbein & Ajzen, 1975). The cumulative effect of these normative pressures exerts a powerful influence on whether an individual chooses to engage in a specific behavior (Fishbein & Ajzen, 1975).

Technology Acceptance Model

The Technology Acceptance Model (TAM) is a highly regarded and widely-used adaptation of the Theory of Reasoned Action (TRA) designed specifically to explain computer usage behavior and acceptance (Davis, Bagozzi, & Warshaw, 1989). TAM has the benefit of being generally applicable to a variety of information systems contexts, explaining end user behavior across a broad range of computer technologies and user populations (Davis et al., 1989). The key purpose of TAM is to provide a basis for tracing the impact of external factors on internal beliefs, attitudes, and intentions (Davis et al., 1989). TAM adopts the theoretical basis from TRA that behavioral intention leads to action, but specifics a causal link between attitude, intention, and behavior and two new constructs of perceived usefulness and perceived ease of use (Davis et al., 1989).

Perceived usefulness is defined as the notion held by an individual that the use of a technological device will increase job performance in an organizational context (Davis et al., 1989). Perceived ease of use indicates the degree to which an individual expects the use of a technological device to be free from effort (Davis et al., 1989). According to TAM, and in contrast with TRA, perceived usefulness and perceived ease of use are the two factors that are primarily relevant for technology acceptance (Davis et al., 1989).

Motivational Model

General motivation theory as an explanation for behavior is supported by a significant body of research (Venkatesh et al., 2003). According to the theory of motivation, there are two broad classes of motivation: extrinsic motivation and intrinsic motivation (Davis, Bagozzi, & Warshaw, 1992; Vallerand, 1997). Extrinsic motivation suggests that the performance of an activity is perceived to be instrumental in achieving a desired or important outcome which remains distinct and separate from the nature of the activity itself (Davis et al., 1992). The behavior being performed could involve the goal of receiving rewards or avoiding punishment (Vallerand, 1997). Davis et al. (1992) considered that the desired outcome, in the context of using computers in the workplace, could be related to improved job performance, increased pay, or even promotions. Regardless of its precise focus, extrinsic motivation influences behavior based on the reinforcement value of sought-after outcomes (Davis et al., 1992). Perceived usefulness is an example of extrinsic motivation when considering the adoption of a technological innovation (Davis et al., 1992).

Intrinsic motivation influences behavior for no apparent reason other than the pleasure or satisfaction derived from engaging in the behavior itself (Vallerand, 1997). Since there are no outside influences, the process of performing an activity is the sole reinforcement (Davis et al., 1992). An example of intrinsic motivation is enjoyment, defined as the extent to which an activity is perceived to be satisfying in its own right, apart from any performance consequences (Davis et al., 1992).

Theory of Planned Behavior

The Theory of Planned Behavior (TPB) is an extension of the Theory of Reasoned Action (TRA) (Ajzen, 1991; Venkatesh et al., 2003). TRA establishes the relationship between attitude toward behavior and subjective norm as key determinants influencing behavioral intention (Fishbein & Ajzen, 1975). Ajzen (1991) noted that attitude is influenced by other factors and suggested that an additional construct of perceived behavioral control would be a better predictor of behavioral intention. In developing TPB, the constructs of attitude toward behavior and subjective norm from TRA were combined with an additional component demonstrating the influence of perceived behavioral control (Ajzen, 1991). TPB demonstrates that the more favorable attitude and subjective norm, and the greater the perceived behavioral control, the stronger the behavioral intention (Ajzen, 1991).

Perceived behavioral control suggests that a person can decide at will to perform or not perform a behavior (Ajzen, 1991). To the extent that a person has the opportunity and resources supporting a desired action, the person will engage in that action (Ajzen, 1991). The perception of controlling a behavior is critical to intention since it indicates a degree of ease or difficulty in performing that behavior (Ajzen, 1991). A person's view of the level of difficulty in performing actions in pursuit of outcomes will mitigate the person's belief that the outcomes are indeed determined by those actions, thus influencing intention (Ajzen, 1991).

Combined TAM and TPB

Taylor and Todd (1995) devised an "augmented TAM" that combined elements from TAM and TPB into a complete model. The combined TAM/TPB model (C-TAM-TPB) incorporates the relationship established in TAM between behavioral intention and attitude and the factors of perceived ease of use and perceived usefulness (Taylor & Todd, 1995). Taylor and Todd (1995) found TAM to be lacking components to indicate the influence of social factors and control factors on behavior. Since subjective norm and perceived behavioral control in TPB address social factors and control factors, respectively, they are included as variables in the C-TAM-TPB model (Taylor & Todd, 1995).

The study conducted by Taylor and Todd (1995) utilized the C-TAM-TPB to examine the possible differences between experienced and inexperienced users of technology. The researchers concluded that all direct determinants of intention, except attitude, were significant (Taylor & Todd, 1995). This meant that perceived behavioral control and subjective norm from TPB and perceived usefulness and perceived ease of use from TAM could be used in C-TAM-TPB to predict subsequent usage behavior (Taylor & Todd, 1995).

Model of PC Utilization

Drawing from psychology, Thompson, Higgins and Howell (1991) developed a model tailored for use in information systems research and focused on the use of personal computers (PCs). The model implies that the use of a computer by an individual in an optimal use environment would be influenced by the individual's feelings toward using a computer; social norms concerning the use of a computer; the expected consequences in using a computer; and conditions conducive for using a computer (Thompson et al., 1991).

The Model of PC Utilization consists of six core constructs: social factors, complexity, job fit, long-term consequences, affect, and facilitating conditions (Thompson et al., 1991). Social factors account for an individual's internalization of a surrounding subjective culture, consisting of norms, roles, and values as applied to the use of computing devices (Thompson et al., 1991). Complexity describes the degree of difficulty in understanding and using a computer (Thompson et al., 1991). Job fit relates to the ability of a computer to enhance an individual's performance of tasks (Thompson et al., 1991). Long-term consequences describe the future benefits anticipated from computer use, rather than the immediate resolution of needs in the present (Thompson et al., 1991). Affect toward computer use attempts to gauge the feelings associated with a particular action (Thompson et al., 1991). Facilitating conditions are the objective factors inherent to an environment that support the use of computers and make actions with them easy to perform (Thompson et al., 1991).

Innovation Diffusion Theory

With its roots in sociology, Innovation Diffusion Theory (IDT) is presented by Rogers (1995) as a means for explaining how an innovation is adopted by a population. Rogers (1995) describes an innovation as an idea, practice, or object that is perceived as new by an individual or group. Diffusion is defined as a social change process by which an innovation is conveyed over a period of time through means of communication among members of a societal group (Rogers, 1995).

Rogers (1995) lists five characteristics that describe an innovation, noting that the perceptions of these characteristics predict the rate of adoption of the innovation. Relative advantage is the degree to which an innovation is thought to be better or more advantageous to use than previous products (Rogers, 1995). Compatibility is the degree to which an innovation is believed to be consistent with the accepted values and norms of a social system (Rogers, 1995). Complexity is the degree to which an innovation is readily understood by members of a population (Rogers, 1995). Trialability describes the degree of experimentation that is permitted by an innovation (Rogers, 1995). Observability is the degree to which the results of an innovation are readily apparent and visible to other members of a social system (Rogers, 1995). Rogers (1995) notes that new ideas or objects that give the perception of having greater relative advantage, compatibility, trialability, observability, and less complexity will be accepted more rapidly than other concepts.

In discussing the specific diffusion of information technology innovations, Moore and Benbasat (1991) stress the importance of perceptions of innovations, particularly the use of an innovation rather than the innovation itself. Moore and Benbasat (1991) assert that differing perceptions of innovations may result in different behaviors. The construct of ease of use, as seen in TAM, was examined with other constructs of diffusion (Moore & Benbasat, 1991). Ease of use is the degree to which using an innovation is perceived to be free of effort (Moore & Benbasat, 1991). Image is the degree to which an innovation can enhance the status of an individual within a social system (Moore & Benbasat, 1991). Voluntariness of use is the degree to which individuals are free to implement an adoption or rejection decision of an innovation (Moore & Benbasat, 1991).

The characteristic of observability was split into two separate constructs: visibility, which indicates the degree to which an individual can see an innovation, the more likely it is to be adopted; and result demonstrability, which gauges the tangible outcomes of the use of an innovation (Moore & Benbasat, 1991). The construct of trialability was deemed to be less significant as a factor for adoption when placed in an organizational context than when assessing acceptance by individuals, so it was omitted from consideration by Moore and Benbasat (1991).

Social Cognitive Theory

According to Bandura (1986), Social Cognitive Theory (SCT) emphasizes an interactional model in which environmental influences, cognitive and personal factors, and behavior operate as determinants of each other. Critical to SCT are the concepts of self-efficacy and outcome expectations (Bandura, 1986). Self-efficacy is the judgment or belief an individual has regarding one's own capabilities to organize and execute actions in pursuit of a desired level of performance (Bandura, 1986). It is not based upon the skills one possesses but the belief in what one can do with those skills (Bandura, 1986). The perception on one's capabilities can influence which behaviors should be attempted as well as the effort and persistence required to attain an expected outcome (Compeau & Higgins, 1995). Bandura (1986) defines an outcome as a consequence of an act rather than the act itself. An individual with high self-efficacy will expect favorable outcomes while someone with low self-efficacy will anticipate a mediocre performance or even negative results (Bandura, 1986). Compeau and Higgins (1995) stated that individuals are more likely to undertake certain behaviors if those actions result in valued outcomes rather than engaging in behaviors with less favorable consequences. Bandura (1986) asserts that self-efficacy and outcome expectancy cannot be separated as factors influencing behavior.

Applying the work of Bandura (1986), Compeau and Higgins (1995) extended SCT specifically to computer use and identified several factors that influence behavior with computing technology. Affect is an individual's liking of, or preference for, a particular behavior (Compeau & Higgins, 1995). Anxiety is a generalized negative emotional reaction toward computing use (Compeau & Higgins, 1995). Self-efficacy is the belief in one's own ability for using computing technology with a high self-efficacy resulting in a high effect of computer use (Compeau & Higgins, 1995). Compeau and Higgins (1995) divided outcome expectations into two categories, one for performance-based consequences and one for personal consequences. Performance outcome expectations tend to be job-related, such as increasing the quality of work produced (Compeau & Higgins, 1995). Personal outcome expectations deal with results like an increased sense of accomplishment (Compeau & Higgins, 1995).

The Unified Theory of Acceptance and Use of Technology

Venkatesh et al. (2003) note that many of the existing technology acceptance models contain similar features. It was decided to identify the common aspects of eight significant models and combine these components into a single, useful entity to be applied in further research. The models used for this composite were the Theory of Reasoned Action (TRA); the Technology Acceptance Model (TAM); the Motivational Model (MM); the Theory of Planned Behavior (TPB); a model combining TAM and TPB (C-TAM-TPB); the Model of PC Utilization (MPCU); Innovation Diffusion Theory (IDT); and the Social Cognitive Theory (SCT) (Venkatesh et al., 2003).

The resulting hybrid, a sort of "best of the best" model, is the Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh et al., 2003). It has core components derived from the eight foundational theories and models, focused on intention, behavior, and mitigating factors (Venkatesh et al., 2003; Williams, 2009; Wang & Wang, 2010; Irby & Strong, 2013). The main components are Performance Expectancy, Effort Expectancy, Social Influence, and Facilitating Conditions (Venkatesh et al., 2003). A fuller explanation of these four core constructs follows an examination of how each model contributed to the development of UTAUT.

The Foundations of UTAUT

Venkatesh et al. (2003) include the Theory of Reasoned Action (TRA) as part of the effort to develop UTAUT as an all-encompassing model of technology acceptance. Attitude toward behavior is excluded from the model since it has been decomposed into other factors in many other models that build upon TRA. Subjective norm is included in UTAUT as part of the Social Influence construct in order to describe how behavioral intention to use technology is influenced by the perception of others' beliefs about the use of technology.

The Technology Acceptance Model (TAM) features two core constructs, perceived usefulness and perceived ease of use (Davis et al., 1989). Since perceived usefulness gauges an individual's assumption that the use of a computing device will improve job performance, it is included as part of the Performance Expectancy construct (Venkatesh et al., 2003). Given that perceived ease of use examines the degree to which an individual expects using a computing device to be free from effort, it is assimilated it into the Effort Expectancy construct (Venkatesh et al., 2003).

Drawing from the Motivational Model, Venkatesh et al. (2003) include extrinsic motivation in UTAUT since it indicates the perception that users will engage in an activity that is perceived to be instrumental in achieving an important outcome. Extrinsic motivation, as a measurable factor of intention, is part of the Performance Expectancy construct. The second factor in the Motivational Model, intrinsic motivation, is interpreted to be part of attitude, which is not included in UTAUT as a significant factor leading to behavioral intention (Venkatesh et al., 2003). The role of attitude in intention is minimized by the influence of the factors of Performance Expectancy and Effort Expectancy (Venkatesh et al., 2003). Since attitude was omitted from UTAUT, intrinsic motivation is also absent.

Since the Theory of Planned Behavior (TPB) is derived from the Theory of Reasoned Action (TRA), as described by Ajzen (1991), the two core components of TPB are shared with TRA and are similarly addressed in UTAUT. Since TPB and TRA have common constructs of subjective norm and attitude toward behavior, Venkatesh et al. (2003) include them in UTAUT. Subjective norm from TPB is assimilated in the Social Influence construct (Venkatesh et al., 2003). Attitude toward behavior from TPB is omitted from UTAUT, as was done with the attitude component of TRA (Venkatesh et al., 2003). The third construct in TPB is perceived behavioral control (Ajzen, 1991). Since perceived behavioral control relates to an individual's assessment of level of difficulty in performing an action, Venkatesh et al. (2003) include it as part of the Facilitating Conditions construct in UTAUT.

Taylor and Todd (1995) created the C-TAM-TPB model as a combination of constructs from TAM and TPB. From TAM, the model includes the constructs of perceived usefulness and perceived ease of use (Taylor & Todd, 1995). From TPB, the model includes subjective norm and perceived behavioral control as factors (Taylor & Todd, 1995). Attitude, as a factor leading to intention, was not found to be significant after initially being included in the hybrid model (Taylor & Todd, 1995). For UTAUT, Venkatesh et al. (2003) count perceived usefulness from C-TAM-TPB as part of Performance Expectancy. Subjective norm is included in UTAUT as part of Social Influence (Venkatesh et al., 2003). Perceived behavioral control is noted as contributing to the Facilitating Conditions construct (Venkatesh et al., 2003).

From the Model of PC Utilization (MPCU), Venkatesh et al. (2003) adapt the facilitating conditions component directly into UTAUT as Facilitating Conditions. Job fit is included as part of Performance Expectancy (Venkatesh et al., 2003). Complexity is featured in the broader construct of Effort Expectancy (Venkatesh et al., 2003). The Social Influence construct in UTAUT accounts for the social factors variable in MPCU (Venkatesh et al., 2003). The long-term consequences construct is omitted while affect is considered part of attitude, which was rejected as having significance in UTAUT (Venkatesh et al., 2003).

UTAUT borrows concepts from the Innovation Diffusion Theory (IDT) characteristics defined by Rogers (1995) and refined by Moore and Benbasat (1991) for an IT context (Venkatesh et al., 2003). The relative advantage attribute is incorporated into the Performance Expectancy construct (Venkatesh et al., 2003). The ease of use characteristic is included in the Effort Expectancy construct (Venkatesh et al., 2003). The image attribute appears in UTAUT as part of Social Influence (Venkatesh et al., 2003). Compatibility is combined as part of the Facilitating Conditions (Venkatesh et al., 2003). Voluntariness of use is included in UTAUT, but as a moderator of Social Influence, not as a direct factor leading to intention (Venkatesh et al., 2003).

Venkatesh et al. (2003) only include a single attribute from the Social Cognitive Theory (SCT) factors outlined by Bandura (1986) which were applied and modified by Compeau and Higgins (1995) in the context of computing technology. The factor that is included in UTAUT is outcome expectation, adapted by Venkatesh et al. (2003) as part of Performance Expectancy.

Table 1 summarizes the contributions of the existing technology acceptance models and theories to the development of UTAUT. A detailed explanation of each UTAUT construct follows.

Performance Expectancy Construct	Effort Expectancy Construct
• Perceived usefulness (from TAM and C-TAM-TPB) • Extrinsic motivation (from MM) • Job fit (from MPCU) • Relative advantage (from IDT) • Outcome expectation (from SCT)	• Perceived ease of use (from TAM and C-TAM-TPB) • Complexity (from MPCU) • Ease of use (from IDT)
Social Influence Construct	Facilitating Conditions Construct
• Subjective norm (from TRA, TPB, and C-TAM-TPB) • Social factors (from MPCU) • Image (from IDT)	• Perceived behavioral control (from TPB and C-TAM-TPB) • Facilitating conditions (from MPCU) • Compatibility (from IDT)

Table 1 – UTAUT Constructs and Related Theories

The Components of UTAUT

The main constructs of UTAUT are Performance Expectancy, Effort Expectancy, Social Influence, and Facilitating Conditions (Venkatesh et al., 2003). These four constructs act as independent variables on two other constructs, Behavioral Intention and

Use Behavior. The model also considers four variables that serve as moderators of the four main factors. These variables are gender, age, experience, and voluntariness of use (Venkatesh et al., 2003). Figure 1 depicts the UTAUT model and the relationships connecting its core components and moderators.

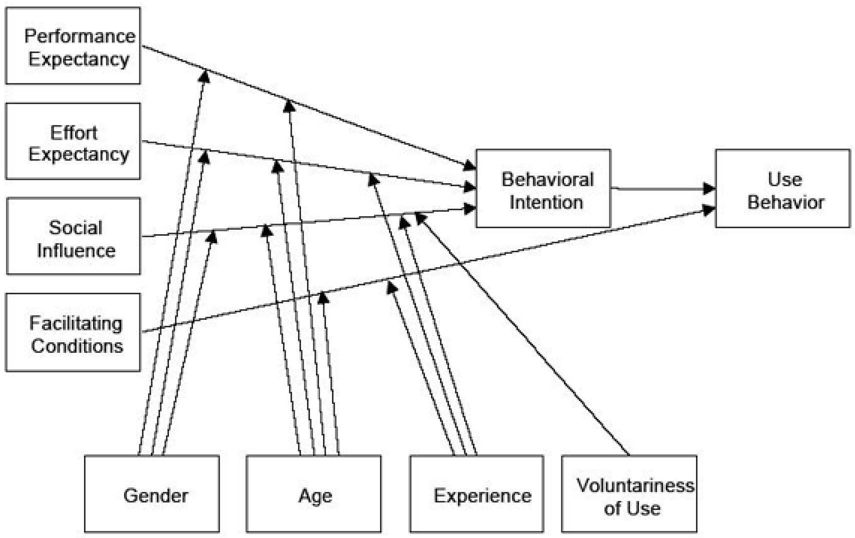

Figure 1 – The UTAUT Model

Performance Expectancy is defined as the degree to which a user believes using a form of technology will be advantageous in the performance of tasks (Venkatesh et al., 2003). It is the construct that is the strongest predictor of intention and is moderated by gender and age (Venkatesh et al., 2003). Performance Expectancy accounts for these factors from previous models: perceived usefulness, extrinsic motivation, job fit, relative advantage, and outcome expectations (Venkatesh et al., 2003; Lai & Lai, 2010; Pardamean & Susanto, 2012).

Effort Expectancy is the degree of ease a person anticipates experiencing when using a form of technology (Venkatesh et al., 2003). This construct is a significant variable in examining both voluntary and mandatory use of a system (Marques et al., 2011). Effort Expectancy is initially significant but diminishes over time through extended and sustained use of technology and is considered to be more important to intention during the early stages of a new behavior (Venkatesh et al., 2003). This construct predicts Behavioral Intention and is moderated by gender, age, and experience (Venkatesh et al., 2003). Effort Expectancy accounts for the measures perceived ease of use, complexity, and ease of use from previous models (Venkatesh et al., 2003; Lai & Lai, 2010; Pardamean & Susanto, 2012).

Social Influence is interpreted as the degree to which an individual perceives that other influential or valued people encourage the use of a form of technology (Venkatesh et al., 2003). This construct affects intention and represents an explicit or implicit notion that behavior is influenced by how an individual will be viewed by other persons of importance or significance (Venkatesh et al., 2003). It is moderated by age, gender, experience, and voluntariness (Venkatesh et al., 2003). Social Influence consists of subjective norm, social factors, and image, all indicators from previous models upon which UTAUT is based (Venkatesh et al., 2003; Lai & Lai, 2010; Pardamean & Susanto, 2012).

Facilitating Conditions is defined to be the degree to which a user believes that an organizational and technical infrastructure exists to support the use of a form of technology (Venkatesh et al., 2003). It is noted that when Facilitating Conditions is present with Effort Expectancy, Facilitating Conditions does not have a significant influence on intention, but will be a significant influence on behavior (Venkatesh et al., 2003). Accordingly, the model demonstrates that Facilitating Conditions influences Use

Behavior not Behavioral Intention. This construct is moderated by age and experience (Venkatesh et al., 2003).

Behavioral Intention is described as the willingness shown by a user in using a system or form of technology in the future (Marques et al., 2011). Use Behavior concerns the effective use of a system (Marques et al., 2011). According to Venkatesh et al. (2003), the constructs of Performance Expectancy, Effort Expectancy, and Social Influence affect Behavioral Intention. In turn, Behavioral Intention was demonstrated as having a significant positive influence on Use Behavior (Venkatesh et al., 2003). In the UTAUT model, there are no moderating variables for the constructs of intention or use (Venkatesh et al., 2003).

The Application of UTAUT

In validation testing, UTAUT was proven to explain up to 70% of variance of intention, a significant improvement over its predecessors' average of 40% (Venkatesh et al., 2003; Moran, 2006; Marchewka et al., 2007; Moran et al., 2010; Donaldson, 2011; Marques et al., 2011). Chen (2011) states that UTAUT should be considered a definitive model of information systems acceptance since it conveys a more comprehensive and conclusive understanding of the factors leading to the adoption of technology. While Straub (2009) notes the body of literature in information systems suggests that an expanded use of UTAUT across different contexts can further validate its effectiveness, Al Awadhi and Morris (2008) affirm that the suitability, reliability and validity of UTAUT in technology acceptance studies has been proven. The model continues to be applied in numerous studies in order to examine the factors leading to the acceptance of a technological innovation (Carlsson et al., 2006; Marchewka et al., 2007; Al Awadhi &

Morris, 2008; Zhou, 2008; Wang & Shih, 2009; Lai & Lai, 2010; Moran et al., 2010; Wang & Wang, 2010; Gao & Deng, 2012; Pardamean & Susanto, 2012; Yu, 2012; Chu, 2013; Irby & Strong, 2013; Jambulingham, 2013). Research supports the continued application of UTAUT specifically toward mobile technology acceptance by students (Moran, 2006; Akour, 2009; Wang, Wu, & Wang, 2009; Moran et al., 2010; Donaldson, 2011; Cheon et al., 2012; Huffman & Huffman, 2012; Lai et al., 2012; Park et al., 2012; Irby & Strong, 2013).

Chapter 3

Methodology

Overview of the Research Methodology

This section contains a broad view of the research methodology. A fuller description of the process is provided in subsequent sections of this chapter.

The aim of this study was discover the motivations for the unstructured use of mobile devices by college students in lecture-based classes by applying the Unified Theory of Acceptance and Use of Technology (UTAUT) to examine behavioral intention. Since the UTAUT model effectively demonstrates multiple factors that influence intention, the study involved correlational research. Four questions were asked in this study.

1. Which constructs of the UTAUT model have a significant positive relationship with students' behavioral intention to use mobile devices during lecture for activity related to the class?
2. Which constructs of the UTAUT model have a significant positive relationship with students' behavioral intention to use mobile devices during lecture for activity not related to the class?
3. What effect do the UTAUT moderators of age, gender, and experience have on students' behavioral intention to use mobile devices during lecture?

4. What effect do the defining characteristics of a class, such as subject area and size, have on students' behavioral intention to use mobile devices during lecture?

Venkatesh et al. (2003) included questionnaire items be adapted in creating surveys for different population groups and forms of technology. The template of questions is found in Appendix A. The literature notes this approach has been employed in many studies using UTAUT (Moran, 2006; Al Awadhi & Morris, 2008; Zhou, 2008; Williams, 2009; Lai & Lai, 2010; Moran et al., 2010; Wang & Wang, 2010; Donaldson, 2011; Gao & Deng, 2012; Pardamean & Susanto, 2012; Yu, 2012; Chu, 2013; Irby & Strong, 2013; Jambulingham, 2013). This research effort followed a similar approach consistent with the literature.

The original survey questions are Likert-item statements requiring responses from participants indicating their degree of agreement. These statements were reworded to question college students about their intention to use mobile devices during class. A five-point range of possible answers, numbered 1 through 5, was designated as a continuum from strong disagreement to strong agreement. A preliminary version of the survey is available in Appendix B. The version final version is provided in Appendix C.

A dual questioning technique was employed to gauge whether student intention is directed toward meaningful, lecture-based behavior or diversionary, non-lecture-based behavior. One version of a question was worded to assess intention toward class-related activity while a slightly altered question evaluated intention related to off-task behavior.

Demographic questions were added to capture data used to examine the modifiers of age, gender, and experience found in the UTAUT model as well as educational level (senior, junior, etc.) and academic major. None of the questions required any personal information that could have been used to identify individual students.

While the UTAUT model has been found to be valid and reliable in previous studies, the instrument was examined for both as a precaution. Reliability analysis was conducted during pilot testing. To ensure content validity, initial drafts of the survey were submitted to research peers. These individuals were asked to provide feedback on the form, structure, substance, and readability of the survey. The reviewers were college-level educators holding earned doctorate degrees with experience in survey-based research. Two reviewers held teaching positions in teaching undergraduate and graduate research. Assistance was also provided by the dissertation chair for this study. A more in-depth discussion of reliability and validity is found elsewhere in this chapter.

Approval to conduct the study was sought and obtained from the Institutional Research Board at Nova Southeastern University and the Research Review Board at Southwest Baptist University. Both boards determined that the research proposal met the criteria for exempt status.

Pilot testing was conducted with three groups. The first pilot group was a senior-level course for computer science majors. The students in this group provided sample data for reliability analysis and offered constructive criticism on the wording and format of the survey. The group evaluated multiple versions of the survey as it was being refined, meeting with the researcher a total of four times. The modifications that were made to the survey in response to this group prompted the inclusion of the second and third groups as a means of verifying the effectiveness of the changes. The additional groups each met once with the researcher and provided an opportunity to test the instrument with different demographic groups. The second pilot group consisted of sophomores, juniors, and seniors in two sections of a business communications course. The third pilot group was comprised on seniors in a business management capstone course.

With validity and reliability established, an appropriate population of college students was identified. While it is recommended that a correlational study have a minimally acceptable sample size of 30 participants (Gay et al., 2009), a much larger group of participants was preferred. General education courses were targeted as having an ideal population for four reasons. One, the courses had a face-to-face lecture component with the permitted unstructured use of mobile devices. Two, the courses contained students at varying stages of their academic careers and representing multiple majors. Three, the courses had enrollments that provided a large number of participants. Four, the courses represented a range of academic subjects.

Deployment of the survey was conducted on paper and face-to-face. This strategy allowed for maximum return from participants rather than a passive solicitation via an Internet-based delivery mechanism, which could be easily ignored by recipients. Students were notified that the collected data would be anonymous and would not have any bearing on their academic performance.

After administration of the survey, statistical analysis was conducted on the collected data. The results are of the data analysis are presented in Chapter 4.

The following milestones were completed for this study:

1. Development of the survey based on the work of Venkatesh et al. (2003).

2. Institutional Research Board approval from Nova Southeastern University and Southwest Baptist University to conduct the study.
3. Pilot testing of the survey.
4. Identification of general education courses at Southwest Baptist University for distribution of the survey. This involved speaking with instructors of courses regarding permissions they grant students for using mobile devices.
5. Deployment of the survey and data gathering.
6. Data analysis and reflection on outcomes.
7. Completion of the dissertation report.

Rationale for Methodology

The study began with a very broad view of the use of mobile technology by students in classrooms, specifically those with lectured-based formats. During the effort to narrow the scope of the problem, the Unified Theory of Acceptance and Use of Technology (UTAUT) was found while investigating technology acceptance as a way to discover the reasons for student behavior with mobile devices.

The premise of UTAUT is based on the idea that behavior is precipitated by intention (Venkatesh et al., 2003). Intention is influenced by four core constructs in UTAUT (Venkatesh et al., 2003). The model suggests that a relationship can exist between the four core factors, intention, and behavior (Venkatesh et al., 2003). Studies employing the model have demonstrated it to be a valid and reliable tool for identifying the factors that lead to behavioral intention (Carlsson et al., 2006; Marchewka et al., 2007; Al Awadhi & Morris, 2008; Zhou, 2008; Wang & Shih, 2009; Lai & Lai, 2010;

Moran et al., 2010; Wang & Wang, 2010; Chen, 2011; McLaren, 2011; Gao & Deng, 2012; Pardamean & Susanto, 2012; Yu, 2012; Chu, 2013; Irby & Strong, 2013; Jambulingham, 2013). Consistent use throughout the literature shows the UTAUT model applied in a variety of contexts with different forms of technology, all in an effort to identify the relationship between the intention to use technology and the factors influencing that intention (Carlsson et al., 2006; Marchewka et al., 2007; Al Awadhi & Morris, 2008; Zhou, 2008; Wang & Shih, 2009; Lai & Lai, 2010; Moran et al., 2010; Wang & Wang, 2010; Chen, 2011; McLaren, 2011; Gao & Deng, 2012; Pardamean & Susanto, 2012; Yu, 2012; Chu, 2013; Irby & Strong, 2013; Jambulingham, 2013).

As a result of finding the UTAUT model, the problem was focused on a gap in the research on mobile device use. Educators do not understand the factors leading to students' intent to use mobile devices (Moran, 2006; Akour, 2009; Moran et al., 2010; Donaldson, 2011; Cheon, Lee, Crooks & Song, 2012; Huffman & Huffman, 2012; Lai, Wang & Lei, 2012; Park, Nam & Cha, 2012; Irby & Strong, 2013). This study proposed to use UTAUT to reveal any significant positive relationships between the four factors in the model and intention. Since the study was attempting to identify the existence of a relationship between variables in a model, it was a correlational study and quantitative in nature.

The following considerations were made in the decision to adopt a quantitative approach:

1. This approach, using UTAUT in a quantitative study, was consistent with the use of UTAUT in the literature (Carlsson et al., 2006; Marchewka et al., 2007; Al Awadhi & Morris, 2008; Zhou, 2008; Wang & Shih, 2009;

Lai & Lai, 2010; Moran et al., 2010; Wang & Wang, 2010; Chen, 2011; McLaren, 2011; Gao & Deng, 2012; Pardamean & Susanto, 2012; Yu, 2012; Chu, 2013; Irby & Strong, 2013; Jambulingham, 2013). Rather than deviate from accepted use, it was decided to apply it as designed by its authors in order to maintain reliability and validity as well as conforming to the use demonstrated in literature.

2. In the examination of the literature, only two studies were found in which UTAUT was used in a qualitative manner (Garfield, 2005; Gruzd, Staves & Wilk, 2012). The studies did not apply the model in a manner consistent with the literature, choosing to map the UTAUT constructs onto interview data rather than the accepted survey-based methodology found in the literature. In their study, Gruzd et al. (2012) note this deviation, acknowledging that "UTAUT is usually applied to analyze and explain quantitative data collected through a survey instrument" (p. 2342). This tactic raised some concern about the validity of the studies as related to the accepted application of UTAUT. Because of this reservation, these studies were not included in the literature review.
3. A qualitative approach in order to discover aspects related to students' intention would be excellent future research. Since the UTAUT model is quantitative in nature, it would be difficult to explore facets of intention without first establishing a correlation between the factors and intention. The quantitative approach chosen in this study was the necessary first step

in identifying whether a correlation exists. Future research could develop based on any correlation found through quantitative analysis.

It is worthy of note that studies with UTAUT advocate further research with the model, particularly using different contexts or populations and with a variety of technological innovations (Marchewka et al., 2007; Wang & Shih, 2009; Lai & Lai, 2010; Donaldson, 2011; Pardamean & Susanto, 2012; Yu, 2012; Irby & Strong, 2013). Especially relevant to this research effort were the studies that support the application of UTAUT toward mobile technology acceptance by students (Moran, 2006; Wang, Wu, & Wang, 2009; Moran et al., 2010; Donaldson, 2011; Cheon et al., 2012; Huffman & Huffman, 2012; Lai et al., 2012; Park et al., 2012; Irby & Strong, 2013).

Instrument Development and Validation

Adapting the UTAUT Model

The UTAUT model is composed of constructs for Performance Expectancy, Effort Expectancy, and Social Influence which serve as independent variables to the dependent variable Behavioral Intention. Consequently, Behavioral Intention serves as an independent variable along with Facilitating Conditions to the dependent variable Use Behavior. This study was not focused on students' actual behavior, choosing instead to examine their motivations, evidenced in the Behavioral Intention construct. Because actual use was not the focus of this study, Use Behavior was not needed as a dependent variable and was excluded from consideration. Since Facilitating Conditions influences only behavior and not intention, it was not relevant to a study dealing with intention and was not retained.

Such exemptions and inclusions to the UTAUT model are common in the literature (Al Awadhi & Morris, 2008; Zhou, 2008; Lai & Lai, 2010; Wang & Wang, 2010; Chen, 2011; Gao & Deng, 2012; Pardamean & Susanto, 2012; Yu, 2012; Irby & Strong, 2013). One alternative considered for this study was reorienting Facilitating Conditions away from its place as an independent variable influencing Use Behavior to an independent variable affecting Behavioral Intention. However, the relationship between Facilitating Conditions and Behavioral Intention was demonstrated by Venkatesh et al. (2003) as not significant. A study treating Facilitating Conditions as a variable affecting Behavioral Intention would be redundant. Moreover, it was deemed important for the sake of reliability and validity to retain the relationship established by the original UTAUT study. The option of examining Behavioral Intention as influenced by Facilitating Conditions was rejected, meaning Facilitating Conditions was disregarded as a factor in this study.

It was further concluded that Facilitating Conditions could be ignored in this study for several reasons, all of which are addressed in the original Likert-item questions developed by Venkatesh et al. (2003). Those questions are as follows:

1. I have the resources necessary to use the system.
2. I have the knowledge necessary to use the system.
3. The system is not compatible with other systems I use.
4. A specific person (or group) is available for assistance with system difficulties.

The context of the use of a mobile device in class replaced the generic phrase "system" in each question. For the first item, it was a reasonable assumption that the university's wireless campus sufficiently dealt with the requirement that students have the resources necessary to use a mobile device in class. To address item two, it was noted that the university has instructional technology staff and resources that are available to students, meeting the requirement of the existence of a specific group or person able to provide assistance with difficulties in the use of mobile devices on campus. The third item dealing with the incompatibility of a system with other systems was difficult to adapt to the context of the use of mobile devices in class and was a strong candidate for omission from the survey instrument for this study. It was also assumed that the conditions satisfying the first item, namely the existence of wireless connectivity supporting a wide variety of mobile devices, rendered the third question as invalid and provided further justification for omitting this question. The fourth item was addressed by the literature on the use of mobile devices which establishes that the current population of college students has demonstrated sufficient knowledge in the use of mobile devices. This satisfied the requirement that students have the knowledge to use a mobile device in class. For these reasons, the items meant to address Facilitating Conditions were assumed to be satisfied, meaning the construct could be ignored for this study. With Facilitating Conditions omitted, the study continued with the remaining UTAUT constructs acting as factors of Behavioral Intention to be examined for the significance of their influence.

Other non-substantive changes involved the context of the problem. References to a generic "system" in the original UTAUT questions were replaced with references to mobile devices used during class. Mentions of an "organization" were changed to reflect a classroom setting. Statements about productivity or work-related benefits were rewritten to indicate academic progress or improvement in learning. Identification of "senior management" was changed to "instructors". In summary, any reference in the UTAUT template was modified to reflect an educational environment.

Two of the questions in this study required demographic data to be. Question Three asked, "What effect do the UTAUT moderators of age, gender, and experience have on students' behavioral intention to use mobile devices during lecture?" The data necessary for answering this question was gathered from the student population anonymously through the inclusion of demographic items on the survey. Question Four asked, "What effect do the defining characteristics of a class, such as subject area and size, have on students' behavioral intention to use mobile devices during lecture?" Subject area was identified by the name of the class and the college from which the class originated. Class size indicated the number of students enrolled in a course. These data values were easily identified or retrieved from either the classroom instructor or the University's enrollment database. None of these questions constituted a change in the original UTAUT model statements.

Creating the Survey Instrument

The UTAUT model presented in the original work by Venkatesh et al. (2003) was developed by analyzing and combining survey items from eight existing acceptance models. The sources, as noted in the literature review, include known and validated models such as TAM and TPB. From the synthesis of these eight models, Venkatesh et al. (2003) identified several common constructs upon which the UTAUT model was based. Survey questions corresponding to these constructs are provided in the original work by Venkatesh et al. (2003) and exist as a framework for technology acceptance research with UTAUT. The questions are designed to be customizable for different forms of technology and a variety of contexts.

For this research effort, the first question and hypotheses were as follows:

2. Which constructs of the UTAUT model have a significant positive relationship with students' behavioral intention to use mobile devices during lecture for activity related to the class?

   $H1_A$. The constructs of the UTAUT model will have a significant positive relationship with students' behavioral intention to use mobile devices during lecture for activity related to class.

   $H1_0$. The constructs of the UTAUT model will not have a significant positive relationship with students' behavioral intention to use mobile devices during lecture for activity related to class.

This question invited investigation into the motivations of students to use mobile devices during a lecture for class-related activities. It was necessary to rewrite the survey items from the UTAUT model specifically for this context. Table 2 shows the original generic items concerning Performance Expectancy and the adapted questions that appeared in the survey instrument.

Original UTAUT Items for Performance Expectancy	Adapted Survey Questions
1. I would find the system useful in my job.	1. I would find using a mobile device during class useful for doing things related to the lecture.
2. Using the system enables me to accomplish tasks more quickly.	2. Using a mobile device during class enables me to do things related to the lecture more quickly.
3. Using the system increases my productivity.	3. Using a mobile device during class for doing things related to the lecture increases my productivity for the class.
4. If I use the system, I will increase my chances of getting a raise.	4. If I use a mobile device during class for doing things related to the lecture, I will increase my chances of improving my grade for the class.

Table 2 – Questions for Performance Expectancy, Related to Class

The modifications for questions related to Effort Expectancy are displayed in Table 3. All of the questions were modified to reflect the use of a mobile device for class-related behavior. Reviewers were concerned about the first question's use of the phrase, "clear and understandable". The concerns were reinforced during pilot testing when a reliability analysis of the survey data revealed inconsistencies in the responses to that question.

In an effort to clarify the problem and arrive at a solution, a subsequent round of testing asked the participants to define how the statement should be interpreted. For comparison, an alternative statement using the phrase "done with relative ease" was also presented for interpretation. In addition to providing answers to both questions, students wrote what they believed each question was asking. The results of this side-by-side examination revealed that nearly half of the participants believed the question with the phrase “clear and understandable” was related to “ease of use”, the correct interpretation of the Effort Expectancy construct. The other half of the respondents indicated that “clear and understandable” meant that the reasons for any interactions with a mobile device would be self-evident or immediately apparent to other people. Misinterpreting the statement in this manner meant the question was not measuring the effort required to use a mobile device. Since a significant portion of the pilot group held to this misreading of the question, it was decided to replace the phrase “clear and understandable” with the phrase “done with relative ease”. Remarks from participants indicated the latter phrase was less ambiguous than the former and led to a more precise comprehension of the intent of the question. A subsequent pilot test with another group of students demonstrated marked improvement in reliability after this rephrasing. With this evidence, the change to the first question was made.

Original UTAUT Items for Effort Expectancy	Adapted Survey Questions
1. My interaction with the system would be clear and understandable.	1. My interaction with a mobile device during class for doing things related to the lecture would be done with relative ease.
2. It would be easy for me to become skillful at using the system.	2. It would be easy for me to become skillful at using a mobile device during class for doing things related to the lecture.
3. I would find the system easy to use.	3. I would find a mobile device easy to use for doing things related to the lecture.
4. Learning to operate the system is easy for me.	4. Learning to operate a mobile device for doing things related to lecture is easy for me.

Table 3 – Questions for Effort Expectancy, Related to Class

Questions pertaining to Social Influence are provided in Table 4. All of the questions were edited to assess the factor's role in the intention to use a mobile device for activity related to the lecture session. In the third question, "senior management" identifies the influence exerted by authority figures or superiors in an organizational structure. It was decided that role of "senior management" for this study was best filled by classroom instructors. Decisions made by an instructor, whether on a day-to-day basis or prior to the start of an academic term, could have a powerful influence on the intention of students to use a mobile device. The modification of question three reflected this reality by replacing "senior management" with "instructors".

Original UTAUT Items for Social Influence	Adapted Survey Questions
1. People who influence my behavior think that I should use the system.	1. People who influence my behavior think that I should use a mobile device during class for doing things related to the lecture.
2. People who are important to me think that I should use the system.	2. People who are important to me think that I should use a mobile device during class for doing things related to the lecture.
3. The senior management of this business has been helpful in the use of the system.	3. The instructors at this university have been helpful in the use of a mobile device during class for doing things related to the lecture.
4. In general, the organization has supported the use of the system.	4. In general, the university has supported the use of a mobile device for doing things related to lecture.

Table 4 – Questions for Social Influence, Related to Class

The items concerning Behavioral Intention are listed in Table 5. The time frame specified in these questions was the duration of the semester. This allowed the survey to be deployed throughout the semester without the constraints of a specific number of weeks or months.

Original UTAUT Items for Behavioral Intention	Adapted Survey Questions
1. I intend to use the system in the next <n> months.	1. I intend to use a mobile device during class for doing things related to the lecture this semester.
2. I predict that I would use the system in the next <n> months.	2. I predict that I would use a mobile device during class for doing things related to the lecture this semester.
3. I plan to use the system in the next <n> months.	3. I plan to use a mobile device during class for doing things related to the lecture this semester.

Table 5 – Questions for Behavioral Intention, Related to Class

The second question and hypotheses were as follows:

5. Which constructs of the UTAUT model have a significant positive relationship with students' behavioral intention to use mobile devices during lecture for activity not related to the class?

   $H2_A$. The constructs of the UTAUT model will have a significant positive relationship with students' behavioral intention to use mobile devices during lecture for activity unrelated to class.

   $H2_0$. The constructs of the UTAUT model will not have a significant positive relationship with students' behavioral intention to use mobile devices during lecture for activity unrelated to class.

Here, the emphasis was altered from the first question. The focus was set on unstructured activities unrelated to class in order to discover the motivations of students to use a mobile device for these purposes. Items from UTAUT were modified accordingly to fit this setting. Table 6 presents the items for Performance Expectancy.

The bolded, italicized, and underscored words were included in the survey for emphasis so that participants would clearly see that the wording was not exactly the same as previous questions. The formatting was used for all questions on activities unrelated to class. Pilot test participants noted the formatting was especially helpful in bringing attention to the distinctiveness of the questions.

Original UTAUT Items for Performance Expectancy	Adapted Survey Questions
1. I would find the system useful in my job.	1. I would find using a mobile device during class useful for doing things ***not*** related to the lecture.
2. Using the system enables me to accomplish tasks more quickly.	2. Using a mobile device during class enables me to do things ***not*** related to the lecture more quickly.
3. Using the system increases my productivity.	3. Using a mobile device during class for doing things ***not*** related to the lecture increases my productivity for the class.
4. If I use the system, I will increase my chances of getting a raise.	4. If I use a mobile device during class for doing things ***not*** related to the lecture, I will increase my chances of improving my grade for the class.

Table 6 – Questions for Performance Expectancy, Not Related to Class

The questions for Effort Expectancy were changed to address use of mobile devices in class for off-task activities. The modifications are presented in Table 7. The rewording of the first question was the same as the rewording used for Effort Expectancy and activities related to class, seen previously in Table 3.

Original UTAUT Items for Effort Expectancy	Adapted Survey Questions
1. My interaction with the system would be clear and understandable.	1. My interaction with a mobile device during class for doing things ***not*** related to the lecture would be done with relative ease.
2. It would be easy for me to become skillful at using the system.	2. It would be easy for me to become skillful at using a mobile device during class for doing things ***not*** related to the lecture.
3. I would find the system easy to use.	3. I would find a mobile device easy to use for doing things ***not*** related to the lecture.
4. Learning to operate the system is easy for me.	4. Learning to operate a mobile device for doing things ***not*** related to lecture is easy for me.

Table 7 – Questions for Effort Expectancy, Not Related to Class

The questions associated with Social Influence were also adapted for addressing the use of a mobile device for activity not related to the lecture session. These questions are found in Table 8. In the early stages of testing the survey, the original wording was retained but with an emphasis placed on an educational setting. Results from reliability testing revealed that the questions were not performing as anticipated. It was theorized that students were struggling with the interpretation of the UTAUT statements when applied to unstructured mobile device use not related to class. The students seemed to struggle with the notion that individuals were suggesting to them that they should use a mobile device in an unacceptable manner or that the university supported such use. The cognitive dissonance mentioned in the literature review appeared to be in play at this point, as students seemed to suggest in their responses that there were no Social Influence factors contributing to their behavior. One possible cause of this could be that students were considering explicit influences rather than implicit influences. Another possible cause is that students were not acknowledging that there could be subtle social factors influencing intention. Because of this, effort was taken to reword the questions in order to retain the original meaning but clarify the intent at the same time. Subsequent use of the revised questions demonstrated vastly improved reliability measures.

Original UTAUT Items for Social Influence	Adapted Survey Questions
1. People who influence my behavior think that I should use the system.	1. People who influence my behavior believe that it is acceptable to use a mobile device during class for doing things ***not*** related to the lecture.
2. People who are important to me think that I should use the system.	2. People whose opinions I value believe that it is acceptable to use a mobile device during class for doing things ***not*** related to the lecture.
3. The senior management of this business has been helpful in the use of the system.	3. The instructors at this university have allowed the use of a mobile device during class for doing things ***not*** related to the lecture.
4. In general, the organization has supported the use of the system.	4. In general, the culture of the university has accepted the use of a mobile device during class for doing things ***not*** related to the lecture.

Table 8 – Questions for Social Influence, Not Related to Class

The items concerning Behavioral Intention in the context of mobile device use are unrelated to class are listed in Table 9.

Original UTAUT Items for Behavioral Intention	Adapted Survey Questions
1. I intend to use the system in the next <n> months. 2. I predict that I would use the system in the next <n> months. 3. I plan to use the system in the next <n> months.	1. I intend to use a mobile device during class for doing things ***not*** related to the lecture this semester. 2. I predict that I would use a mobile device during class for doing things ***not*** related to the lecture this semester. 3. I plan to use a mobile device during class for doing things ***not*** related to the lecture this semester.

Table 9 – Questions for Behavioral Intention, Not Related to Class

The third question examined the moderating factors of the UTAUT model: age, gender, and experience. The descriptive data required to answer this question was derived from answers to demographic questions included in the survey. The demographic questions can be found as part of the survey presented in Appendix C.

The fourth question addressed whether class size and subject matter area have any relationship with students' intention to use a mobile device. The data required for answering this question was found in the descriptive statistics of the participating courses used in this study.

An initial adaptation of the UTAUT questions is available in Appendix B of this document. The final version of the survey is located in Appendix C.

Pilot Testing

In total, pilot testing comprised three distinct sets of students, five rounds of surveying, and one month to complete. The extensive testing was due to unforeseen issues with the rewording of the UTAUT statements, particularly those related to Social Influence construct and mobile device use not related to class. The modifications made to original statements, as described in the previous section, came about due to the testing process with these groups. The changes were eventually assessed in series of trials, first using the survey in its entirety, and then isolated components that required further analysis. All students involved with pilot testing were given a brief description of the research, the need for testing the survey, and the voluntary nature of their participation.

The initial pilot group was comprised of nineteen students from the Computer and Information Sciences (CIS) department at SBU. The researcher was granted permission by the chair of the department to make use of a senior-level capstone course called Applied Software Engineering II required by all CIS majors. It was concluded that the senior CIS students could provide a perspective of students with experience of mobile device use during class, objectively understand the purpose of the research, and offer a constructive analysis of the instrument. This group of students met with the researcher four times, providing suggestions on the wording and format of the survey and generating data that supplied the reliability analysis. The first round of testing revealed the need to make significant changes to the format of the survey and did not produce data that could be used for analysis. Recommended changes included rearranging the order of the questions and grouping the questions topically into two sections, one for class-related activity and another for activity not related to class. The second round confirmed the effectiveness of the changes made to the survey's format and generated usable data. Analysis of the data revealed inconsistent performances of the Social Influence variable for non-lecture-based actions and the Effort Expectancy variable for lecture-based and non-lecture-based actions. The third round evaluated further formatting changes, notably the relocation of demographic questions from the beginning to the end of the survey and adjustments to the question order. The weak performance of Effort Expectancy and Social Influence was confirmed. The fourth round did not involve assessment of the full survey. Instead, participants were asked to comment on their interpretation of the meaning of the Effort Expectancy questions in the current form, give an interpretation of rephrased version of the questions, and provide an answer to the new questions. The answers were combined with the data for all other constructs generated during the third round of testing and replaced the old data for Effort Expectancy. Reliability for the new questions improved to an acceptable level, resulting in the retention of the changes.

A second pilot effort was made with students in two sections of a Business Communications course, required for majors in the Business department. The class consisted of sophomores, juniors, and seniors. The group was recruited between the third and fourth rounds of testing with the CIS students. It was suspected that responses from the CIS students might have been skewing the survey's reliability outcomes due to the students' expertise with computing technology and increased familiarity with the research study. One section of the business course was given an early version of the survey while the second section was administered a version with the proposed changes to the Effort Expectancy questions. The results from both sections were consistent with those generated by the first pilot group of CIS students, thus confirming that issues related to reliability were due to the wording of the questions and could not be attributed to bias on the part of the CIS majors. The Business Communications class was involved in piloting only once but in a confirmatory capacity.

A third group was recruited near the end of the survey development process. The students in the third pilot group came from Strategic Management, a capstone course for seniors in business-related majors. The participation of these students occurred after the fourth and final round of testing with the CIS students. At this point, many of the survey questions had been altered as a result of the previous testing efforts, but there were lingering problems with the set of Social Influence questions related to off-task intention. Due to the surprising and persistent underperformance of these questions, it was decided to significantly rewrite them. Because the CIS students had already been involved in four rounds of testing, there was apprehension about "survey fatigue" on the part of the students, the students' increased familiarity with the study, and the students' awareness of how the questions probably should be answered. Since all factors were demonstrating sufficient reliability except for Social Influence, it was decided to test only the new questions rather than the entire survey. To address the concern of overexposing the CIS students to the survey, it was decided to use a different set of students. The dean of the College of Business and Computer Science volunteered his course of seniors in Strategic Management for this effort. Testing the students demonstrated that changes made to the Social Influence questions produced an acceptable level of reliability. Satisfied with the outcome of testing this group, and based on the results for the other two groups, the survey was determined to be ready for official use.

Reliability of the Survey Instrument

Reliability is the degree to which a test consistently measures whatever it is intended to assess (Gay et al., 2009). Tests that are reliable will produce consistent outcomes. The reliability of a survey instrument is expressed numerically as a reliability coefficient (Litwin, 1995). A perfectly reliable instrument will have a coefficient of 1.00.

Therefore, it is necessary to evaluate a survey with the goal of deriving a reliability coefficient near 1.00.

In this study, internal consistency reliability was addressed since it determines the extent to which items in a single test are consistent among themselves and with the test as a whole (Litwin, 1995). The survey was written with Likert-type items requiring a response from a range of values, typically 1 through 5 and corresponding with a degree of agreement to a statement (Boone & Boone, 2012). Often, Likert-type items are combined into a single composite score or variable for data analysis of a specific trait or characteristic (Boone & Boone, 2012). This was the case with the specific acceptance factors from UTAUT as multiple statements from the questionnaire were used to address aspects of the acceptance model. The questions for each factor are provided in the previous section. Given the need of examining the homogeneity of Likert-scales, the best method for assessing internal consistency reliability was Cronbach's *alpha* (Litwin, 1995).

The measure of Cronbach's *alpha* examines the variance found in responses to individual items in a test as well as the aggregate variance of the test itself. An instrument is considered reliable if it produces an alpha value greater than 0.70 (Litwin, 1995). Accordingly, this was the benchmark utilized for reliability in this study. Cronbach's *alpha* was applied to the Likert scales associated with each UTAUT factor and to the overall survey instrument. This strategy for assessing reliability is common for studies involving UTAUT (Al Awadhi & Morris, 2008; Zhou, 2008; Gao & Deng, 2012; Pardamean & Susanto, 2012; Chu, 2013).

Cronbach's *alpha* was calculated twice for each of the four UTAUT constructs. Each variable was analyzed once for intention lecture-related actions and again for activity not related to the class lecture. Performance Expectancy, Effort Expectancy, and Social Influence were determined by four questions each. Behavioral Intention was informed by three survey items. The process for developing the survey as a result of pilot testing and reliability analysis is described elsewhere.

Outcomes for Cronbach's *alpha* as applied to the lecture-based constructs are presented in Table 10. As shown, the values returned for all four constructs met the desired 0.70 threshold for both mobile device use contexts of related to class and not related to class. This achievement meant that all items were deemed to be reliable.

Reliability Statistics

	Related to Class			Not Related to Class		
	Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items	Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
Performance Expectancy	.768	.775	4	.722	.725	4
Effort Expectancy	.882	.888	4	.898	.899	4
Social Influence	.735	.734	4	.780	.781	4
Behavioral Intention	.884	.889	3	.967	.967	3

Table 10 – Cronbach's *alpha* for Pilot Data

Initial calculation of Cronbach's *alpha* to a version of the entire survey without adjustments to the questions for Effort Expectancy and Social Influence produced a value of 0.813. Thus, the overall survey was reliable even while some of its components were still weak. Subsequent revisions to the Effort Expectancy statements resulted in an improved overall *alpha* value of 0.905. The final rewording of the Social Influence questions was tested separately, as described elsewhere in this chapter. Given that the entire survey instrument was already yielding an acceptable reliability measure and that the Social Influence variable for non-class behavior had improved in its own reliability value after modifications, it was determined that the survey was reliable and could be used in an official capacity.

The struggle with reliability measures on some of the constructs was surprising since UTAUT model is acknowledged in the literature to be a reliable model of behavioral intention. Particularly troublesome were the factors of Effort Expectancy and Social Influence when related to off-task behavior with mobile devices during class. Through the analysis, it became apparent that unanticipated conflicts existed among the context of the study, the phrasing of the original UTAUT questions, and the possible cognitive dissonance of the students in answering the questions. Rephrasing several questions resulted in improved reliability. Further discussion of the ramifications of these reliability issues are presented in Chapters 4 and 5.

Validity of the Survey Instrument

Validity is the degree to which a test measures what it is supposed to measure and permits an appropriate interpretation of scores (Litwin, 1995; Gay et al., 2009). Content validity and construct validity were the two types of validity pertinent to this study.

Content validity is the degree to which a test measures an intended content area (Gay et al., 2009). Often, content validity is determined by expert judgment since there is no formula to measure it and no way to express it quantitatively (Litwin, 1995; Gay et al., 2009). Content validity can be addressed through item validity and sampling validity (Gay et al., 2009). Item validity addresses whether test items are relevant to the intended content (Gay et al., 2009). Sampling validity is concerned with how well the test samples the total content area being tested (Gay et al., 2009). Concerns about item and sampling validity were initially alleviated by basing survey questions on the previously validated work by Venkatesh et al. (2003). Further efforts at satisfying item and sampling validity involved reviews of the survey questions for clarity, readability, and appropriateness. These reviews were conducted by teaching colleagues who have completed dissertations and are familiar with research and surveying processes. Reviewers were primarily located at the SBU. The individuals that volunteered their time for this endeavor included the chair of the Behavioral Sciences department, the chair of Graduate Studies in Education, the chair of the Computer and Information Sciences department, and the dean of the College of Business and Computer Science. An additional reviewer was recruited from the Computer Science department at Harding University to provide perspective outside of SBU. All of the reviewers provided suggestions that resulted in improvements to the wording of some statements and the arrangement of questions. The collective efforts of the reviewers reinforced the validity of the instrument.

Once the survey was evaluated, it was deployed in a series of pilot tests. This effort provided sample data for analysis and allowed for a review of the overall readability and presentation quality of the instrument. The feedback solicited from testing factored into the refining of the instrument. With these steps in establishing item and sampling validity, content validity was satisfied.

Construct validity is defined as the degree to which a test measures an intended hypothetical construct (Gay et al., 2009). Constructs are non-observable traits that explain behavior (Gay et al., 2009). Examples of constructs featured generally in research to describe behavior include intelligence and anxiety. Litwin (1995) states that construct validity is seen in how well an instrument performs in a multitude of settings and populations, often with years of experience. The constructs of the UTAUT model have been validated by Venkatesh et al. (2003). Further validation is noted in technology acceptance literature through the repeated use of UTAUT in a variety studies with different forms of technology and in different contexts (Moran, 2006; Al Awadhi & Morris, 2008; Zhou, 2008; Akour, 2009; Lai & Lai, 2010; Moran et al., 2010; Wang & Wang, 2010; Donaldson, 2011; Cheon et al., 2012; Gao & Deng, 2012; Huffman & Huffman, 2012; Lai et al., 2012; Pardamean & Susanto, 2012; Park et al., 2012; Yu, 2012; Chu, 2013; Irby & Strong, 2013). These studies have served to further validate the individual constructs within the model as well as the model itself. Since this study made use of a recognized and established model of technology acceptance theory, construct validity was satisfied.

Survey Deployment

The survey was administered to several general education courses at Southwest Baptist University. These courses provided a cross-section of the student population in terms of age, gender, class status (freshman, sophomore, junior or senior), and academic major. The courses were chosen through consultation with faculty teaching the courses. Effort was taken to recruit courses from multiple academic areas. The main form of instruction in these courses was a traditional lecture. Students were allowed to use mobile computing devices during class. Multiple courses were selected in order to provide a large population of survey participants.

A face-to-face delivery of the instrument was deemed more likely to produce a sufficient number of responses than an Internet-based deployment which could be easily ignored by potential participants. The survey was completed on paper in a multi-page document. The survey process involved parts of two class sessions. The first class session featured a brief ten-minute introduction to the researcher and an explanation of the study. In the second class session, the students were asked to take the survey. In the introduction, students were notified of the anonymity of the data solicited and were reassured that the survey outcomes would not have any impact on their academic performance. Students were also informed that participation was strictly voluntary and that they could opt out of the study for any reason. Individuals who were already familiar with the study or who had already participated in it through another course or as part of a pilot test were asked not to participate again. Students were invited to ask questions of the researcher during the introduction or prior to the second class session. During the second session, the survey was distributed to students who were willing and able to participate. Approximately twenty minutes was required for completion. In all courses except one, the surveying was done at the beginning of class. In the lone exception, surveying was conducted on the same day as an exam with the students being given the choice of taking the exam first, followed by the survey or vice versa. This minor deviation from the process was made at the request of the cooperating instructor, a faculty member in the Behavior Sciences department.

In order to increase the likelihood of generating unique responses to the survey and avoiding duplicated participants, course rosters were examined before the survey was administered to identify students that were enrolled in more than one of the targeted courses. When duplicated students were found, it was announced to the students during the first class session that individuals who had already participated in the survey should refrain from taking it again. When possible, individual students were approached. Some students voluntarily identified themselves as having taken the survey previously, questioning whether they should take it again. While these measures did not guarantee the elimination of duplicated responses, two possible preventive measures were more problematic. The first alternative was the inclusion of identifying information about each student, such as the student identification number issued by the university. Using the student identification number would allow duplicate submissions to be found and rejected during data analysis, but would have the negative consequence of diminishing the anonymity of the responses. Since anonymity was important to this study, this alternative was rejected. The second alternative was the use of an Internet-based survey delivery system. While this tactic would address the issue of unique responses, it would have been difficult to collect a satisfactory number of submissions since the format would have been more passive than a face-to-face administration. Since a large population was desired and a face-to-face approach was deemed more likely to provide that, the second alternative was also rejected.

Data Analysis

Question One required Likert-scale data for the four main constructs. While individual responses to Likert-type questions are considered ordinal in nature, Likert-scale values are combined scores in which the individual responses are summed to reflect specific constructs and are regarded as interval data (Boone & Boone, 2012). For example, four questions on the survey related to Performance Expectancy for class-related use. The answers provided for these questions were combined as a mean score representing the Performance Expectancy construct for class-related intention.

The use of Likert scales required parametric analysis of interval data. Possible statistical measures for this type of data include the Pearson *r* for correlation, analysis of variance (ANOVA), *t*-test, and regression (Boone & Boone, 2012). In this study, each UTAUT construct was examined for its relationship with Behavioral Intention. For example, the Pearson *r* was calculated on Performance Expectancy and Behavioral Intention to determine if there is a significant correlation between the two constructs. In this analysis, a value of +1 for the correlation coefficient indicates a positive correlation between the two constructs (Fink, 1995). A value of -1 indicates a negative correlation (Fink, 1995). A coefficient value nearer to +1 or -1 indicates a strong relationship between entities (Fink, 1995). Correlation analysis was also performed to see if the constructs were significantly related to each other.

In order to evaluate the magnitude of influence that the UTAUT factors of Performance Expectancy, Effort Expectancy and Social Influence exert on students' intention, it was necessary to use regression as part of the data analysis process. Regression analysis allowed examination of the factors' contribution to predicting behavioral intention. Use of regression was consistent with common practices in UTAUT studies, according to the literature (Al Awadhi & Morris, 2008). It is important to note that regression was used to predict intention, not to identify cause-effect relationships between any of the UTAUT components and intention. A linear regression analysis was performed to determine how each isolated factor affected Behavioral Intention. Multiple regression analysis was conducted to analyze the collective influence the factors have in predicting Behavioral Intention.

Question Two shifted the focus from class-related activity to actions unrelated to class. The statistical measures calculated for Question One were used again for Question Two.

Questions Three and Four involved examining the data from the perspective of different defining characteristics of the population or the courses from which the population was derived. For Question Three, the UTAUT moderators of age, gender, and experience became factors for creating subgroups within the data. For Question Four, the division of the data was along class subject matter and class size. Gay et al. (2009) suggest a *t*-test for comparing two groups for significant differences and ANOVA for comparing multiple groups. Given the data involved, *t*-tests were the primary statistical measure for comparing groups in this study. This method of analysis mirrored approaches used in some previous UTAUT studies (Moran, 2006; Donaldson, 2011; Pardamean & Susanto, 2012).

The results of the statistical analysis are reported in their entirety in Chapter 4. Conclusions drawn from the statistical analysis are presented in Chapter 5.

Formats for Presenting Results

The survey items produced Likert-type data. Individual items representing the different UTAUT factors were combined into Likert-scales. For example, the responses to questions focused on Performance Expectancy were combined as a mean value which was used for subsequent analysis. The analysis and reporting was conducted using IBM SPSS Statistics 22.

Resource Requirements

The following items were identified as necessary for completion of this study.

1. The survey. This was developed by adapting questionnaire items from the original work by Venkatesh et al. (2003).
2. Access to students. This effort required building relationships with classroom instructors to inform them of the importance and relevance of the study.
3. Software for statistical analysis of survey data. The selection of IBM SPSS Statistics 22 was made due to the type of analysis that was needed. Information Technology Services at SBU provided access to this software.

Summary

This was a correlational study based on using the UTAUT model to determine the motivations behind college students' intention to use mobile computing devices during lecture-based classes. The study was conducted with a survey composed of Likert-type questions. Individual questions that are logically related to factors in UTAUT were combined as Likert-scales for statistical analysis. The survey instrument was subjected to reliability assessment. Since this study was using a model previously validated in the literature, validity was satisfied. The survey was administered to general education courses that had a lecture as the primary means of instruction, a policy of allowing unstructured use of mobile devices, and student enrollment that provided a cross-section of the population at the university.

Chapter 4

Results

Data Analysis and Findings

Background

The intent of this study was to determine the factors that would lead college students to use mobile devices during lecture-based classes. Two contexts were considered: unstructured use for activity related to class and unstructured use for activity unrelated to class. The Unified Theory of Acceptance and Use of Technology (UTAUT) was utilized to identify the factors leading to students' intention to use mobile devices. Four constructs from UTAUT were examined: Performance Expectancy, Effort Expectancy, Social Influence, and Behavior Intention. Each construct was represented by questions on a survey derived from the UTAUT model. That template was adapted to the context of mobile device use by students during lecture-based classes. The survey was administered to 254 students at Southwest Baptist University in the classes of Introduction to Computing (CIS 1103); New Testament History (BIB 1023); General Psychology (PSY 1013); History of the United States, 1492-1865 (HIS 2213); Introduction to the History of World Civilization: From the Renaissance to the Present (HIS 1123); and English Composition II (ENG 2213).

The questions comprising the survey instrument were Likert-item statements. Each statement corresponded with one of the UTAUT constructs. The statements were categorized as gauging intention for behavior related to class or not related to class. The responses were subjected to a two-step process to transform them into Likert-scale data for analysis. First, the responses from each participant were averaged by their corresponding constructs to create an overall construct value. Then, the construct values from all participants were averaged to create a single Likert-scale value for each construct. The final values were named with appropriate shorthand notation. For example, four responses given by an individual regarding Performance Expectancy were averaged for a representative construct value for that individual. All other Performance Expectancy mean values were themselves averaged for an overall Likert-scale value to represent the Performance Expectancy score for the entire survey population. The names MeanPE.L and MeanPE.NL identify "mean of Performance Expectancy for activity related to lecture" and "mean of Performance Expectancy for activity not related to lecture", respectively. Descriptive statistics for these Likert-scales are listed in Table 11.

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
MeanPE.L	254	1.00	5.00	3.5981	.88888
MeanEE.L	254	1.00	5.00	4.0085	.77534
MeanSI.L	254	1.00	4.75	3.0167	.66532
MeanBI.L	254	1.00	5.00	3.5433	1.13111
MeanPE.NL	254	1.00	4.75	2.6450	.71042
MeanEE.NL	254	1.00	5.00	3.6801	.87724
MeanSI.NL	254	1.00	4.50	2.2707	.71979
MeanBI.NL	254	1.00	5.00	2.9738	1.11334
Valid N (listwise)	254				

Table 11 – Descriptive Statistics for Likert Scales

Reliability Analysis

For completeness, reliability analysis was conducted on the survey data. Consistent with the process used during pilot testing, Cronbach's *alpha* was chosen to evaluate the reliability of the survey results. Table 12 shows the results of the reliability assessment using data from the survey.

Reliability Statistics

	Related to Class			Not Related to Class		
	Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items	Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
Performance Expectancy	.881	.884	4	.641	.656	4
Effort Expectancy	.866	.867	4	.853	.853	4
Social Influence	.637	.637	4	.587	.589	4
Behavioral Intention	.931	.931	3	.922	.924	3

Table 12 – Cronbach's *alpha* for Survey Data

With two exceptions, all constructs demonstrated a level of reliability at or above 0.70 and were consistent with the results of the pilot testing process. Performance Expectancy-Not Related to Class was deemed acceptable since the *alpha* value returned was near the desired 0.70 threshold; the variable demonstrated satisfactory reliability during testing; and the variable was derived from the reliable UTAUT model. Similar reasoning was applied to assessing the Social Influence construct. The process for attaining reliability for the Social Influence construct is described in Chapter 3. When the entire survey was analyzed for reliability, a Cronbach's *alpha* of 0.894 was returned, demonstrating that the model, even with modifications, performed as anticipated.

Question One

The first question for this study was "Which constructs of the UTAUT model have a significant positive relationship with students' behavioral intention to use mobile devices during lecture for activity related to class?" The research hypothesis and null hypothesis were as follows:

> $H1_A$. The constructs of the UTAUT model will have a significant positive relationship with students' behavioral intention to use mobile devices during lecture for activity related to class.
>
> $H1_0$. The constructs of the UTAUT model will not have a significant positive relationship with students' behavioral intention to use mobile devices during lecture for activity related to class.

Addressing Question One required the Likert scales for each of the UTAUT variables. Four items each were used to determine Performance Expectancy (MeanPE), Effort Expectancy (MeanEE), and Social Influence (MeanSI). Three items were used for Behavioral Intention (MeanBI). The process of calculating Likert-scales was described earlier in this chapter.

The Pearson *r* was used to determine any correlations of Performance Expectancy, Effort Expectancy, and Social Influence with Behavioral Intention. Results of the correlation analysis are given in Table 13.

Correlations

		MeanPE.L	MeanEE.L	MeanSI.L	MeanBI.L
MeanPE.L	Pearson Correlation	1	.767**	.531**	.830**
	Sig. (2-tailed)		.000	.000	.000
	N	254	254	254	254
MeanEE.L	Pearson Correlation	.767**	1	.428**	.692**
	Sig. (2-tailed)	.000		.000	.000
	N	254	254	254	254
MeanSI.L	Pearson Correlation	.531**	.428**	1	.531**
	Sig. (2-tailed)	.000	.000		.000
	N	254	254	254	254
MeanBI.L	Pearson Correlation	.830**	.692**	.531**	1
	Sig. (2-tailed)	.000	.000	.000	
	N	254	254	254	254

**. Correlation is significant at the 0.01 level (2-tailed).

Table 13 – Correlation of UTAUT Constructs, Related to Lecture

The interpretation of the Pearson *r* means coefficients that are near +1 indicate strong positive correlations while coefficients near -1 are reflective of strong negative correlations (Fink, 1995). An examination of the results demonstrated that all of the UTAUT constructs were positively related to each other. Combinations of Performance Expectancy, Effort Expectancy, and Behavioral Intention scored higher than 0.6 and showed strong positive correlations with each other. Social Influence, with coefficients in the range of 0.428 to 0.531, was positively related to the other constructs, but with slightly weaker correlations. Following this assessment, individual relationships to Behavioral Intention were examined using Pearson *r* and linear regression. The statistical analysis using SPSS 22 included ANOVA and coefficients, both of which are available in Appendices D and E, respectively. All ANOVA results indicated the regression models were good fits for the data and statistically significantly predicted Behavioral Intention.

The Pearson *r* for Performance Expectancy and Behavioral Intention was 0.830, which indicated a significant positive correlation between the perceived utility of a mobile device for class and the intention to use one. Linear regression analysis, as shown in Table 14, confirmed this with the coefficient of determination (R^2) indicating that 68.8% of the change in Behavior Intentional was attributed to Performance Expectancy. It was concluded that Performance Expectancy was a significant factor in the Behavioral Intention for students to use a mobile device for class.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.830[a]	.688	.687	.63268

a. Predictors: (Constant), MeanPE.L

Table 14 – Linear Regression, PE to BI (Related to Lecture)

When analyzing Effort Expectancy and Behavioral Intention, the Pearson *r* returned a coefficient of 0.692, a significant positive correlation. As shown in Table 15, linear regression analysis produced a coefficient of determination that noted 47.9% of the variance in Behavioral Intention was due to the variance in Effort Expectancy. The outcome revealed that intention was informed by a perceived ease of use.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.692[a]	.479	.477	.81787

a. Predictors: (Constant), MeanEE.L

Table 15 – Linear Regression, EE to BI (Related to Lecture)

A Pearson *r* value of 0.531 was calculated for Social Influence and Behavioral Intention. This coefficient indicated a positive correlation, though not a particularly strong one, given it was just below the accepted level of 0.6. However, it did suggest a connection between outside influences exerted on students to use mobile devices and their intention to do so. Linear regression analysis revealed 28.2% of the change in Behavioral Intention could be attributed to the Social Influence construct. Results of this analysis are found in Table 16. While the coefficient of determination did imply a positive relationship, it was not a strong association in this case.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.531[a]	.282	.279	.96034

a. Predictors: (Constant), MeanSI.L

Table 16 – Linear Regression, SI to BI (Related to Lecture)

The examination of the individual UTAUT components and their respective relationship to Behavioral Intention seemed to confirm both the hypothesis and the expected performance of the UTAUT model. Multiple regression analysis was conducted to further assess the data. The results of the analysis are given in Table 17

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.841[a]	.707	.703	.61628

a. Predictors: (Constant), MeanSI.L, MeanEE.L, MeanPE.L

Table 17 – Multiple Regression (Related to Lecture)

The multiple correlation coefficient of 0.841 was a good level of prediction. The coefficient of determination indicated that 70.7% of the variance in Behavioral Intention was due to the combined influence of Performance Expectancy, Effort Expectancy, and Social Influence. The coefficient, scoring at that level, demonstrated that the model was a good fit and could predict intention. The ANOVA results, supplied in Appendix D, also showed that the multiple regression model was a good fit for the data. The coefficients, which appear in Appendix E, revealed that Performance Expectancy (0.847) exerted far more influence on Behavioral Intention than Effort Expectancy (0.189) and Social Influence (0.208). These results confirmed the findings of the individual linear regression models, namely that Performance Expectancy was a strong predictor of intention while the other two variables demonstrated positive, but weak, connections to intention.

In summary, the analysis noted that the UTAUT factors of Performance Expectancy, Effort Expectancy, and Social Influence had positive correlations with Behavioral Intention toward the use of mobile devices by students for actions related to class. The findings supported the research hypothesis. Subsequently, the null hypothesis was rejected.

Question Two

The second question asked by this study was "Which constructs of the UTAUT model have a significant positive relationship with students' behavioral intention to use mobile devices during lecture for activity not related to class?" The research hypothesis and null hypothesis were:

> $H2_A$. The constructs of the UTAUT model will have a significant positive relationship with students' behavioral intention to use mobile devices during lecture for activity unrelated to class.
>
> $H2_0$. The constructs of the UTAUT model will not have a significant positive relationship with students' behavioral intention to use mobile devices during lecture for activity unrelated to class.

As with Question One, the Likert scales were used to investigate these hypotheses. The correlation analysis with Pearson *r* was replicated to examine the factors leading to intention to use mobile devices for off-task behavior. The outcomes of the analysis are presented in Table 18. All of the UTAUT constructs were positively related to each other, though only the pairing of Performance Expectancy and Behavioral Intention reached the desired 0.6 threshold. This observation meant that the relationships among the variables were positive but could not be fairly described as strong.

Correlations

		MeanPE.NL	MeanEE.NL	MeanSI.NL	MeanBI.NL
MeanPE.NL	Pearson Correlation	1	.540**	.481**	.615**
	Sig. (2-tailed)		.000	.000	.000
	N	254	254	254	254
MeanEE.NL	Pearson Correlation	.540**	1	.312**	.525**
	Sig. (2-tailed)	.000		.000	.000
	N	254	254	254	254
MeanSI.NL	Pearson Correlation	.481**	.312**	1	.428**
	Sig. (2-tailed)	.000	.000		.000
	N	254	254	254	254
MeanBI.NL	Pearson Correlation	.615**	.525**	.428**	1
	Sig. (2-tailed)	.000	.000	.000	
	N	254	254	254	254

**. Correlation is significant at the 0.01 level (2-tailed).

Table 18 – Correlation of UTAUT Constructs, Not Related to Lecture

Performance Expectancy and Behavioral Intention yielded a coefficient of 0.615, indicative of a positive correlation. The value suggested that the students' understanding of how a mobile device could be used for activity not related to class influenced their intention to engage in that behavior. Linear regression analysis, shown in Table 19, produced a coefficient of determination of 0.378 to confirm a positive relationship.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.615[a]	.378	.376	.87971

a. Predictors: (Constant), MeanPE.NL

Table 19 – Linear Regression, PE to BI (Not Related to Lecture)

The Pearson *r* for Effort Expectancy and Behavioral Intention was 0.525. The value revealed a positive correlation between the students' perception of the ease of using mobile devices for off-task behavior and their subsequent intention to do so. The coefficient of determination from linear regression was 0.275, as displayed in Table 20. This value verified a positive, but weak correlation.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.525[a]	.275	.272	.94975

a. Predictors: (Constant), MeanEE.NL

Table 20 – Linear Regression, EE to BI (Not Related to Lecture)

A value of 0.428 was returned for the correlation analysis of Social Influence and Behavioral Intention, showing a positive relationship and indicating that the intention of students to use mobile devices for off-task activity was affected by external sources. A value of 0.183 was given for the coefficient of determination, as seen in Table 21. The value suggested an almost negligible influence on intention.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.428[a]	.183	.180	1.00836

a. Predictors: (Constant), MeanSI.NL

Table 21 – Linear Regression, SI to BI (Not Related to Lecture)

Multiple regression analysis examined all of the UTAUT factors and their combined relationship with Behavioral Intention. As seen in Table 22, the multiple correlation coefficient of 0.670 suggested a good level of prediction for the model. The ANOVA results in Appendix D confirmed that the model was a good fit. The coefficient of determination suggested that 44.9% of the variance in Behavioral Intention was attributable to the UTAUT factors, meaning the remainder was due to other factors or error. The multiple regression coefficients, available in Appendix E, showed that Performance Expectancy (0.627) exerted the greatest influence on Behavioral Intention, followed by Effort Expectancy (0.331) and Social Influence (0.238).

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.670[a]	.449	.442	.83167

a. Predictors: (Constant), MeanSI.NL, MeanEE.NL, MeanPE.NL

Table 22 – Multiple Regression (Not Related to Lecture)

The analysis demonstrated that Performance Expectancy, Effort Expectancy, and Social Influence all had positive relationships with Behavioral Intention related to off-task activity. None of the factors could be described as significant when analyzed individually. When combined, only Performance Expectancy could be deemed as significant. The results failed to reject the null hypothesis, meaning the research hypothesis was not supported.

Question Three

The third question posed in this study was “What effect do the UTAUT moderators of age, gender, and experience have on students’ behavioral intention to use mobile devices during lecture?" A non-directional hypothesis and a null hypothesis were stated as:

> $H3_A$. The UTAUT moderators of age, gender, and experience will be significant with respect to students' behavioral intention to use mobile devices.
>
> $H3_0$. The UTAUT moderators of age, gender, and experience will not be significant with respect to students' behavioral intention to use mobile devices.

Data for the age of the study participants was collected in the survey as part of a section of demographic questions. The descriptive statistics for the ages of the participants are given in Table 23.

Age

Age		Frequency	Percent	Descriptive Statistics		
Valid	16	1	.4	N	Valid	254
	17	1	.4		Missing	0
	18	47	18.5	Mean		19.62
	19	122	48.0	Median		19.00
	20	50	19.7	Mode		19
	21	14	5.5	Std. Deviation		3.072
	22	12	4.7	Range		39
	23	3	1.2			
	26	1	.4			
	36	1	.4			
	42	1	.4			
	55	1	.4			
	Total	254	100.0			

Table 23 – Descriptive Statistics for Age

Only six of the 254 participants were outside the range of 18 to 23 years old. Nearly half (n = 122) of the participants were 19 years old. The measures of central tendency were clustered around 19 years old. Since the assessment of age as a moderator of intention requires a sufficiently wide range of ages, this presented a problem for the current study. Moran (2006) conducted a UTAUT-based study with college students, encountered a similar distribution, and determined that such a population of typical did not contain enough diversity to effectively measure age as a moderator of Behavioral Intention. The same reasoning was applied to this study, resulting in the decision to disregard age as a moderator of Behavioral Intention.

To analyze the moderator of gender, an independent-sample *t*-test was conducted. Of the 254 participants in the study, one individual did not respond to the question about gender, leaving 105 males and 148 females. The *t*-tests that were conducted on Behavioral Intention for actions related to lecture and Behavioral Intention for actions not related to lecture used 1.960 as the critical value of *t* and a standard alpha value of 0.05. A summary of the results are in Table 24. The complete results are in Appendix F.

Lecture Based	Male	Female
Male	∞	t = -.228 p = .820
Female	t = -.228 p = .820	∞
Not Lecture Based	**Male**	**Female**
Male	∞	t = .937 p = .350
Female	t = .937 p = .350	∞

Table 24 – Summary of *t*-Tests on Gender and Intention

For lecture-based intention, the value of *t* returned by the analysis was -0.228, within the range of the critical value of *t*. The outcome indicated that any difference in intention between males and females was not significant. The *p* value of 0.820 confirmed this since it is much greater than the alpha value. In examining behavioral intention toward activity unrelated to lecture, the *t* value was 0.937. Since this result was within the range of the critical value of *t*, it was concluded that any difference in intention between males and females was not significant. The observation was confirmed by the *p* value of 0.350 being greater than the alpha value. In both cases of intention centered on class and not centered on class, the results led to a failure to reject the null hypotheses. Therefore, gender was not a significant moderator of behavioral intention in the study.

In order to assess experience as a moderator, three questions were included in the survey. First, participants were asked to identify their academic level, selecting from freshman, sophomore, junior, or senior. Next, participants were asked to report on their level of experience in the general use of mobile devices. Finally, participants were asked to identify their experience in using mobile devices for academic purposes.

A series of *t*-tests compared the four academic levels with one another. The survey population had 173 freshmen, 47 sophomores, 18 juniors, and 15 seniors for a total of 253 participants. One respondent reported to be a graduate level student and was omitted from the analysis. A distinction was made between intention for on-task behavior and intention for off-task behavior. The complete results are presented in Appendix G. A summary, showing the computed values of *t* and *p*, appears in Table 25. The tests revealed that there were no significant differences, meaning experience, as defined by academic level, did not act as a moderator of intention.

Lecture Based	Freshman	Sophomore	Junior	Senior
Freshman	∞	t = -1.437 p = .152	t = .800 p = .425	t = .849 p = .397
Sophomore	t = -1.437 p = .152	∞	t = 1.521 p = .133	t = 1.598 p = .115
Junior	t = .800 p = .425	t = 1.521 p = .133	∞	t = .071 p = .944
Senior	t = .849 p = .397	t = 1.598 p = .115	t = .071 p = .944	∞
Not Lecture Based	Freshman	Sophomore	Junior	Senior
Freshman	∞	t = -.038 p = .970	t = -.493 p = .623	t = -.744 p = .458
Sophomore	t = -.038 p = .970	∞	t = -.400 p = .691	t = -.633 p = .529
Junior	t = -.493 p = .623	t = -.400 p = .691	∞	t = -.231 p = .819
Senior	t = -.744 p = .458	t = -.633 p = .529	t = -.231 p = .819	∞

Table 25 – Summary of *t*-Tests on Academic Level and Intention

Participants were asked to rate their experience in the general use of mobile devices using a five-point Likert-item with responses ranging from “very inexperienced” to “very experienced”. Only 2 individuals described their use as “very inexperienced”. These were combined with the 6 respondents who identified their expertise as “inexperienced”, creating a group of 8 “inexperienced” users. The number of “neutral” users was 25. “Experienced” and “very experienced” users numbered 130 and 90 persons, respectively. *t*-tests were conducted on these four groups to detect any significant differences related to intention for class-related activity and class-unrelated activity. The complete results are provided in Appendix H. A summary in Table 26 contains both the computed values of *t* and *p*.

Lecture Based	Inexperienced	Neutral	Experienced	Very Experienced
Inexperienced	∞	t = -.652 p = .519	t = -2.313 p = .022	t = -2.607 p = .011
Neutral	t = -.652 p = .519	∞	t = -2.506 p = .013	t = -3.012 p = .003
Experienced	t = -2.313 p = .022	t = -2.506 p = .013	∞	t = -1.136 p = .257
Very Experienced	t = -2.607 p = .011	t = -3.012 p = .003	t = -1.136 p = .257	∞
Not Lecture Based	Inexperienced	Neutral	Experienced	Very Experienced
Inexperienced	∞	t = -.399 p = .692	t = -.879 p = .381	t = -1.052 p = .295
Neutral	t = -.399 p = .692	∞	t = -.706 p = .481	t = -1.075 p = .285
Experienced	t = -.879 p = .381	t = -.706 p = .481	∞	t = -.791 p = .430
Very Experienced	t = -1.052 p = .295	t = -1.075 p = .285	t = -.791 p = .430	∞

Table 26 – Summary of *t*-Tests on General Experience and Intention

When considering intention toward lecture-based behavior, no significant difference was noted when analyzing inexperienced users with neutral users and experienced with very experienced users. However, there were significant differences when examining inexperienced with experienced users; inexperienced with very experienced users; neutral users with experienced users; and neutral users with very experienced users. The results showed that the degree of experience or inexperience did not matter. A significant difference was noted when the broader status of experienced versus inexperienced was analyzed. When considering intention for behavior not related to class, the data did not produce any significant differences. In summary, it is evident that general experience with mobile devices did moderate intention for class-based usage when considered by degrees, but only when viewed broadly as “inexperienced” and “experienced”, and did not factor into the intention for activity unrelated to class.

Prior use of mobile devices for academic purposes was the last form of experience analyzed. As with general experience, data was collected via a single Likert-item with a five-point scale from “very inexperienced” to “very experienced”. The responses in two inexperienced categories were combined, yielding 22 users. There were 75 neutral users, 115 experienced users, and 41 very experienced users, meaning over half of the participants expressed a degree of experience using mobile devices for academic reasons. *t*-tests were conducted on the data to determine if there were any significant differences. The complete results are contained in Appendix I. Table 27 contains the computed value of *t* and the value of *p* to summarize the results.

Lecture Based	Inexperienced	Neutral	Experienced	Very Experienced
Inexperienced	∞	t = -3.644 p = .000	t = -6.858 p = .000	t = -8.268 p = .000
Neutral	t = -3.644 p = .000	∞	t = -4.313 p = .000	t = -5.892 p = .000
Experienced	t = -6.858 p = .000	t = -4.313 p = .000	∞	t = -2.451 p = .015
Very Experienced	t = -8.268 p = .000	t = -5.892 p = .000	t = -2.451 p = .015	∞
Not Lecture Based	**Inexperienced**	**Neutral**	**Experienced**	**Very Experienced**
Inexperienced	∞	t = -1.595 p = .114	t = -1.309 p = .193	t = -.771 p = .444
Neutral	t = -1.595 p = .114	∞	t = .643 p = .521	t = .667 p = .507
Experienced	t = -1.309 p = .193	t = .643 p = .521	∞	t = .267 p = .790
Very Experienced	t = -.771 p = .444	t = .667 p = .507	t = .267 p = .790	∞

Table 27 – Summary of *t*-Tests on Academic Experience and Intention

For lecture-based activity, the *t*-tests revealed that there were significant differences in the groups, suggesting that academic experience was a moderator of intention. For actions unrelated to class, the outcomes indicated that prior academic experience did not moderate intention.

The data analysis was inconclusive about the role of experience as a moderator of intention in this study. When examining the students' academic level, there were no significant differences for either lecture-based or non-lecture-based intention. The students' self-identified general experience did not demonstrate any significant differences for non-lecture behavioral intention, but revealed that it did act as a moderator of lecture-related intention only when inexperienced and experienced were the categories considered. Trying to define experience in an academic context did not yield any significant differences for non-class behavioral intention but did show significant differences for class-related intention.

Collectively viewed, there was not a clear pattern of predictable performance for experience. It is difficult to conclude that experience, by any definition, consistently acted as a moderator of behavioral intention. The differences that were revealed for general experience and academic experience for class-related behavioral intention are areas that deserve future exploration.

In summary, age could not be considered as a moderator for this study due to the population, gender did not demonstrate any significant difference with regards to intention, and experience was inconsistent with what it revealed. As a consequence, the research hypothesis could not be supported and the null hypothesis was not rejected.

Age, gender, and experience did not act as moderators of behavioral intention in the study.

Question Four

The fourth question of this study was “What effect do the defining characteristics of a class, such as subject area and size, have on students’ behavioral intention to use mobile devices during lecture?” The research hypothesis and null hypothesis were:

> $H4_A$. Course subject matter area and class size will be significant with respect to students’ behavioral intention to use mobile devices.
>
> $H4_0$. Course subject matter area and class size will not be significant with respect to students’ behavioral intention to use mobile devices.

Chapter 3 contains a full description of the methodology for including the classes in the study. The courses were Introduction to Computing (CIS 1103); New Testament History (BIB 1023); General Psychology (1013); Introduction to the History of World Civilization: From the Renaissance to the Present (HIS 1123); History of the United States, 1492-1865 (HIS 2213); and English Composition II (ENG 2212). PSY 1013, HIS 1123, and HIS 2213 were each single-section courses. BIB 1023 had two sections and ENG 2213 had three sections, all of which were combined into a single section per subject due to low response rates resulting from students being enrolled in more than one of the courses included in the study. For consistency, the three sections of CIS 1103, which were the earliest courses to participate in the survey, were also combined into one section. The group statistics are presented in Table 28. The necessary combination of sections meant that size as a descriptor was not be exclusively examined. The topic of size as a moderator of intention is left as a suggestion for future research.

Course	N
CIS 1103 – Intro to Computing	95
BIB 1023 – New Testament History	48
PSY 1013 – General Psychology	49
HIS 1123 – World Civilization II	13
HIS 2213 – US History II	21
ENG 2213 – English Comp II	28

Table 28 – Group Statistics for Courses

t-tests analyzed the data concerning intention for on-task behavior and off-task behavior to determine if there were any significant differences based on the class itself. Complete results are available in Appendix J while Table 29 provides an overview, including the computed values of *t* and the values of *p* derived from the analysis of the classes.

Lecture Based	CIS 1103	BIB 1023	PSY 1013	HIS 1123	HIS 2213	ENG 2213
CIS 1103	∞	t = 1.355 p = .178	t = .317 p = .752	t = 1.301 p = 1.96	t = -.368 p =.714	t = -.773 p = .441
BIB 1023	t = 1.355 p = .178	∞	t = -.885 p = .378	t = .408 p = .685	t = -1.214 p = .229	t = -1.640 p = .105
PSY 1013	t = .317 p = .752	t = -.885 p = .378	∞	t = 1.031 p = .307	t = -.543 p = .589	t = -.914 p = .364
HIS 1123	t = 1.301 p = 1.96	t = .408 p = .685	t = 1.031 p = .307	∞	t = -1.401 p = .171	t = -1.664 p = .104
HIS 2213	t = -.368 p =.714	t = -1.214 p = .229	t = -.543 p = .589	t = -1.401 p = .171	∞	t = -.269 p = .789
ENG 2213	t = -.773 p = .441	t = -1.640 p = .105	t = -.914 p = .364	t = -1.664 p = .104	t = -.269 p = .789	∞
Not Lecture Based	**CIS 1103**	**BIB 1023**	**PSY 1013**	**HIS 1123**	**HIS 2213**	**ENG 2213**
CIS 1103	∞	t = 1.523 p = .130	t = -.894 p = .373	t = .802 p = .424	t = 1.527 p = .130	t = .597 p = .552
BIB 1023	t = 1.523 p = .130	∞	t = -2.134 p = .035	t = -.089 p = .929	t = .392 p = .697	t = -.579 p = .565
PSY 1013	t = -.894 p = .373	t = -2.134 p = .035	∞	t = 1.268 p = .210	t = 2.033 p = .046	t = 1.205 p = .232
HIS 1123	t = .802 p = .424	t = -.089 p = .929	t = 1.268 p = .210	∞	t = .347 p = .731	t = -.309 p = .759
HIS 2213	t = 1.527 p = .130	t = .392 p = .697	t = 2.033 p = .046	t = .347 p = .731	∞	t = -.800 p = .428
ENG 2213	t = .597 p = .552	t = -.579 p = .565	t = 1.205 p = .232	t = -.309 p = .759	t = -.800 p = .428	∞

Table 29 – Summary of *t*-Tests on Courses

For intention for activity related to the class, there were no significant differences, suggesting that class subject did not matter to the students and their intention to use mobile devices. The analysis of intention for activity unrelated to class produced no significant differences except in two instances. Pairing PSY 1013 with BIB 1023 and PSY 1013 with HIS 2213 did result in significant differences. PSY 1013 and HIS 2213 were single section courses with 49 and 21 students participating in the survey, respectively. BIB 1023 had two sections combined into one, due to low response rates, with a total of 48 participants. The data did not indicate that the number of students in the sections would produce a significant difference in intention, suggesting that the results could be due to other factors or simply be outliers. Since the reasons were not clear from the study, the result would constitute an area for future research.

From the analysis, the course itself, defined primarily by its subject matter, did not produce any significant differences in intention. Thus, null hypothesis was not rejected, meaning the research hypothesis was not supported.

Summary of Results

The first research question sought to discover which of the UTAUT constructs affected the intention of students to use mobile devices for class-related behavior. The linear regression analysis indicated that Performance Expectancy, Effort Expectancy, and Social Influence had significant positive correlations with Behavioral Intention. Multiple regression analysis showed that all three constructs combined had a positive correlation with intention. As a result, the null hypothesis was rejected. Of the three constructs, Performance Expectancy was the strong predictor of intention, followed by Effort Expectancy and Social Influence. The outcome suggested that students were more likely to use a mobile device if they believe it would help them improve their academic performance.

The second research question was centered on Behavioral Intention for activity not related to class and the UTAUT factors that would influence it. Linear regression analysis revealed that Performance Expectancy, Effort Expectancy, and Social Influence were positively correlated with intention but not significantly. Multiple regression analysis demonstrated that only Performance Expectancy was significant. Consequently, there was a failure to reject the null hypothesis. The results meant that the UTAUT constructs were not significant predictors of students' intention to use mobile devices for off-task behavior. The subtle significance of Performance Expectancy suggested, however, that the students believed the utility of a mobile device for non-class purposes was exerting some influence on their intention to use it.

The third research question investigated the effect of the UTAUT moderators of age, gender, and experience on intention. Due to the narrow age distribution of the students participating in the survey, age could not be effectively analyzed. Gender did not demonstrate any significant impact on intention. Experience was examined in three ways. First, the students' academic level was considered, but did not demonstrate any significant difference with respect to intention. General experience with mobile devices appeared to be significant, but only for lecture-related behavior and only when comparing inexperienced users with experienced users. Academic experience with mobile devices was also exclusively significant for lecture-based intention. Experience did not affect intention of off-task behavior. When viewed collectively, experience was inconsistent as moderator of intention. Since age and gender were not significant, and experience performed without a coherent pattern, the null hypothesis was not rejected. The UTAUT moderators of age, gender, and experience did not demonstrate significant differences in intention in this study.

The fourth and final question intended to examine the role of the class itself in influencing behavioral intention. Due to low response rates in some of the courses selected for this study, largely because of students being enrolled in more than one course, the size of the class was not considered. The subject matter of the course became the principal identifying trait that was examined. Analysis of the data revealed that the null hypothesis could not be rejected. The course subject did not influence intention for behavior related to class nor for behavior not related to class.

The findings of this study conclude that Performance Expectancy served as the strongest indicator of a student's behavioral intention to use a mobile device, whether for class or for other purposes. The other UTAUT constructs had little to no influence on intention and the UTAUT moderators did not make a significant difference.

Chapter 5

Conclusions, Implications, Recommendations, and Summary

Conclusions

The aim of the study was to determine the motivations of students to use a mobile device during class. The Unified Theory of Acceptance and Use of Technology (UTAUT) was chosen as the model to guide the investigation. Three constructs in the model – Performance Expectancy, Effort Expectancy, and Social Influence – were examined for their impact on Behavioral Intention. Additionally, the UTAUT moderators of age, gender, and experience were considered for any effect they had on intention. The nature of the class was also examined for its role in intention. There were two contexts in the study: the use of mobile devices for class-related activities and the use of mobile devices for activity not related to class.

For class-related behavior, the study revealed that Performance Expectancy was the strongest predictor of Behavioral Intention. The result meant that students were more likely to use a mobile device for class because they believed it would help them in their learning or improve their academic performance. Effort Expectancy and Social Influence showed positive correlations to Behavioral Intention, but not in as strong a relationship as Performance Expectancy. This suggested that the ease in using a mobile device was not a main determinant for the students' intention. The relative weakness of Social Influence indicated that students' intention was not meaningfully affected by the opinions or beliefs of other people viewed as important or influential by the students. Students in this study clearly believed that using a mobile device for class would be beneficial to their success and that other considerations, like effort or the influence of others, were not as significant.

For behavior unrelated to class, Performance Expectancy was again the most important factor leading to intention. Effort Expectancy and Social Influence were not significant determinants. The study indicates that students rejected the notion that the ease of using a mobile device to disengage from a class lecture was a powerful influence on their behavior. The students also rejected the idea that there were social factors at work, influencing their intention to use a mobile device for off-task behavior. Instead, the study revealed that the ability of the mobile device to complete desired tasks was significant.

The UTAUT moderators of age, gender, and experience did not play a significant role in this study. Because of the narrow age range of the college students in this study, age could not be effectively examined. Gender did not demonstrate any significance, meaning the intention to use a mobile device for on-task or off-task behavior was not relegated to a specific gender group. Experience was only significant when viewing behavioral intention for lecture-based activity. There was a significant difference among inexperienced users and experienced users regarding intention to use device for classes. Off-task behavioral intention was not affected by experience. Varying degrees of experience did not demonstrate any significant differences, either. When analyzing intention by class subject, there were no significant differences.

In summary, the intention to use a mobile device for class or for disengaging from class was predicted by the performance of the mobile device itself. The ability of a mobile device to complete a wide range of tasks was the most important consideration to students, with a moderating influence exerted by their general expertise in using the device.

Implications

This study began as an attempt to understand why students were choosing to use mobile devices during class. It was hoped that the results of the study would contribute to the ongoing conversation about the unstructured use of mobile devices in the classroom. The study has shown that the expected performance of a mobile device was the most significant factor in the intention leading to its use. The students seemed to be saying, "I want to use this device because it will do what I want it to do", whether those actions are for class or not. There were several implications resulting from this study.

The significance of Performance Expectancy leading to intention indicated there were tasks that students wanted or needed to complete. While the current study did not include the identification of the tasks, it pointed to continued research in this area.

Given that students' intention was performance-driven, the results suggested that learning and management strategies were employed, or were going to be employed, to accomplish some specific tasks. Extrapolating this idea from the study's results revealed a need to identify and evaluate such strategies for effectiveness. In this manner, the current study echoed the findings of Lindroth and Bergquist (2010) who noted that students were using mobile devices to create personalized learning environments.

While correlated to Behavioral Intention, the factors of Effort Expectancy and Social Influence were less significant than Performance Expectancy. This intimated that the ease in using a mobile device could be disregarded in future research. The diminished role of Social Influence would suggest the same, but the difficulties in establishing the reliability of the construct indicated that this study may not have adequately addressed the topic of how intention is formed by social pressures.

Recommendations

Three aspects of this study, for various reasons, did not bear fruit. These remain areas for future research. The first area was an examination of experience as a moderator of intention. The study did not produce a consistent view of experience and how it affected intention. Of particular note was the disparity between the intention toward on-task and off-task behavior as moderated by experience. The study indicated experience mattered for behavior related to class, but was not a factor for behavior not related to class. The distinction raises more questions than it answers and should be explored further.

The second area unsatisfactorily addressed in this study was the analysis of intention by class size. Multiple courses were included in this study, resulting in efforts to avoid students participating more than once and thus reducing participation rates. The side effect was that courses with multiple sections had to be combined into one section per subject, removing class size as a variable for investigation. Future research should manage courses differently, perhaps surveying all sections of a single subject rather than multiple classes of different subjects or surveying classes meeting at the same time. It would worthy of research to somehow examine whether the number of students present during class has any impact on an individual's intention to use a mobile device during that class. Unfortunately, this study was unable to address this point effectively.

The third area dealt with the role of the Social Influence construct. As described in Chapter 3, the process of attaining reliability for this variable was quite challenging, particularly when attempting to investigate the intention for behavior unrelated to lecture. The results of the data collection, as mentioned in Chapter 4, demonstrated that Social Influence did not play a role in intention. These results, as well as the challenges arising during pilot testing, seemed counterintuitive. Through observation and research such as that described in Chapter 2, students are engaging in behaviors with mobile devices that are learned somehow and somewhere. That suggests there should be a social component. But the students in this study did not indicate any role for the Social Influence construct. This could be due to cognitive dissonance: the students know their use of mobile devices has been affected by the views of other people and simply denied it. This could also be due to ignorance: the students were simply unaware of what ideas that they have picked up about mobile devices because they have never stopped to consciously think about it. As a consequence, the role of Social Influence remains a topic for future research.

Beyond the scope of this study, some other ideas for future research include:

1. Conducting a replicative study at another university to see if a different student population with yield different results
2. Conducting a replicative study with a different set of classes or using different criteria when selecting classes to see if the outcomes would be similar

3. Performing additional research by customizing the UTAUT model, routinely done in the literature, to include other possible factors not already considered in the model
4. Conducting a qualitative study to explore in greater detail the factors leading to intention
5. Examining faculty for their acceptance of the use of mobile devices by students during lecture-based classes
6. Investigating whether a student's academic major plays a role in the intention to use a mobile device during class
7. Exploring and testing individual learning strategies with mobile devices to determine their effectiveness on improving academic performance.

Summary

Mobile devices permit an individual to access computing technology infrastructure in order to support the retrieval, analysis, and communication of data and information (Lawrence, Bachfischer, Dyson, & Litchfield, 2008; Moran, Hawkes, & El Gayar, 2010; Irby & Strong, 2013). These devices can include laptop computers, netbooks, e-readers, smartphones, and tablets (Akour, 2009; Williams, 2009; Kulesza et al., 2010; Baker et al., 2012; Khalid, Chin, & Nuhfer-Halten, 2012; Sarrab, Elgamel, & Aldabbas, 2012). The modern college student has grown up in an era of pervasive computing due in no small part to mobile technology (Lawrence et al., 2008; Murphy, 2010; Junco, 2012; Wood et al., 2012; Gu et al., 2013). For the educational context in which mobile devices are not required in the classroom but are permitted to be used by students in an unstructured manner, there are two contrasting views. On one side are the students, who have already leveraged mobile computing for personal productivity and entertain and anticipate doing the same for their academic pursuits (Young, 2006; Kulesza, DeHondt II, & Nezlek, 2010; Lindroth & Bergquist, 2010; Smith & Caruso, 2010; Chen, 2011; Donaldson, 2011; Baker, Lusk, & Neuhauser, 2012). On the other side are the classroom instructors, who do not understand or misinterpret the motivations of students to use the devices (Akour, 2009; Donaldson, 2011; Baker et al., 2012; Cheon, Lee, Crooks, & Song, 2012; Gu, Zhu, & Guo, 2013; Irby & Strong, 2013). The literature notes that students do indeed use mobile devices to engage in behavior that distracts them from the class session and negatively impacts their academic performance (Fried, 2008; Kraushaar & Novak, 2010; Kulesza et al., 2010; Robertson, 2011; Sana, Weston, & Cepeda, 2013). However, research also points to mobile devices being used to create personalized learning situations that support the classroom lecture (Lindroth & Bergquist, 2010; Kay & Lauricella, 2011b; Cheon et al., 2012). This study sought to bridge the gap between these contrasting views by investigating the reasons why college students seek to use mobile devices during lecture-based classes.

Technology acceptance theory presented itself as a viable means to support this research since it provides insight into the reasons individuals adopt and utilize technological innovations (Straub, 2009; Huffman & Huffman, 2012). The main idea in technology acceptance theory is that a strong intention to use technology, based on individually-held beliefs, will lead to a greater likelihood of its actual use (Moran et al., 2010; Chen, 2011; Huffman & Huffman, 2012). Venkatesh et al. (2003) presented the Unified Theory of Acceptance and Use of Technology (UTAUT) as a “best of the best” model containing the common features and factors of behavioral intention present in pre-existing models and theories. The model has been validated in subsequent studies using a wide range of technological innovations and contexts, explaining the factors of technology acceptance at a level of accuracy beyond its predecessors (Venkatesh et al., 2003; Moran, 2006; Williams, 2009; Moran et al., 2010; Wang & Wang, 2010; Chen, 2011; Donaldson, 2011; Irby & Strong, 2013). This study applied UTAUT to the context of the open-ended use of mobile devices by college students in a lecture-based classroom.

UTAUT contains several constructs that inform and predict Behavioral Intention. Performance Expectancy measures the utility of a technological form (Venkatesh et al., 2003). Effort Expectancy gauges the ease in using technology (Venkatesh et al., 2003). Social Influence describes the external pressures that promote the adoption of technology (Venkatesh et al., 2003). Facilitation Conditions assesses the environmental circumstances that can lead to the use of technology (Venkatesh et al., 2003). The UTAUT model includes age, gender, and experience as moderators of intention (Venkatesh et al., 2003). For this study, Facilitating Conditions was the only component of UTAUT that was not considered. Since the successful use of mobile devices in the classroom is predicated on the existence of a functional wireless network and the classroom instructor has allowed the unstructured use of mobile devices during class, it was decided that Facilitating Conditions was a factor that was already satisfied for this study.

Venkatesh et al. (2003) included survey questions with the UTAUT model that could be utilized in future research. This survey template was adapted for the current study in two distinct contexts. Questions were asked regarding the intention to use mobile devices for activity related to class. The same questions were repeated for the context of activity not related to class. The survey was developed on this basis, piloted with several groups of college students, and was demonstrated to be reliable

General education courses were targeted as having an ideal population for surveying. First, the classes held a diverse population of students across different academic levels and majors. Second, the classes were sufficiently large enough to provide a pool of possible participants. Third, the classes had a lecture as the primary form of instruction. Finally, the unstructured use of mobile devices was permitted by the classroom instructor. Six unique courses – Introduction to Computing; New Testament History; General Psychology; Introduction to the History of World Civilization: From the Renaissance to the Present; History of the United States, 1492-1865; and English Composition II – were included in the surveying process, yielding 254 participants across all four academic grade levels (i.e. senior, junior, sophomore, and freshman). The surveys were conducted in a face-to-face manner in order to attain a high level of responses. The survey was completed via paper-and-pencil and included a total of 30 Likert-item questions and 6 demographic questions.

The first question of the study addressed the students' motivation to use mobile devices for class-related behavior. Analysis of the data involved linear regression to evaluate each UTAUT construct's relationship to Behavioral Intention and multiple regression to assess the combined relation of the constructs with intention. The analysis revealed that Performance Expectancy, Effort Expectancy, and Social Influence were individually and collectively positively correlated to Behavioral Intention. Performance Expectancy was most significant, demonstrating that students were influenced by a mobile device's ability to complete tasks in pursuit of improving their academic performance.

The second research question centered on the intention to engage in behavior unrelated to lecture. All three constructs demonstrated positive relationships with Behavioral Intention but none were significant. Multiple regression analysis showed that only Performance Expectancy was significant. The results suggested that none of the UTAUT factors were significant predictors of intention. However, the presence of Performance Expectancy as a significant factor in the multiple regression analysis suggested that it was a factor leading to intention for off-task behavior. This meant the students were drawn to using a mobile device for disengaging from class because it would satisfactorily complete tasks associated with that goal.

The third question in this research involved the moderating influences of age, gender, and experience on intention. Age could not be effectively considered in this study due to the narrow range of ages, 18 to 23 years old, in the survey population. Gender was analyzed using *t*-tests and was not significant for either on-task or off-task behavioral intention. Experience was considered three different ways utilizing demographic information collected from the survey. First, the students' academic level was analyzed. A series of *t*-tests did not reveal any significant differences based on academic level. Second, the students self-reported their general experience using mobile devices in a five-point range from "very inexperienced" to "very experienced". *t*-test results demonstrated significant differences only for intention for class-related behavior and only when combining all students expressing degrees on inexperience and degrees of experience into two large groups. The degrees of inexperience or experience did not produce any significant differences. Third, participants were asked to report on their experience using mobile devices for academic purposes using the same five-point scale. Academic experience was only significant in the context of intention for lecture-based behavior. These three attempts to analyze experience did not produce consistent outcomes, so experience was evaluated as not significant. Subsequently, the UTAUT moderators of age, gender, and experience did not produce significant difference in intention in this research.

The fourth question focus on whether there were difference among the classes themselves, based primarily on the course subject. After a series of *t*-tests, it was concluded that there were no significant differences in behavioral intention. This suggested that course subjects did not matter to students' intention to use mobile devices during class.

The findings of this study indicated that the performance of a mobile device to complete specific tasks was the dominant motivation in students' behavioral intention. The implication is that students have in mind a specific action that they wish to complete when using a mobile device. The nature of those actions, along with further testing with additional factors attached to the UTAUT model, constitute future research.

Appendix A

Original UTAUT Questions

Performance Expectancy

1. I would find the system useful in my job.
2. Using the system enables me to accomplish tasks more quickly.
3. Using the system increases my productivity.
4. If I use the system, I will increase my chances of getting a raise.

Effort Expectancy

1. My interaction with the system would be clear and understandable.
2. It would be easy for me to become skillful at using the system.
3. I would find the system easy to use.
4. Learning to operate the system is easy for me.

Social Influence

1. People who influence my behavior think that I should use the system.
2. People who are important to me think that I should use the system.
3. The senior management of this business has been helpful in the use of the system.
4. In general, the organization has supported the use of the system.

Facilitating Conditions

1. I have the resources necessary to use the system.
2. I have the knowledge necessary to use the system.
3. The system is not compatible with other systems I use.
4. A specific person (or group) is available for assistance with system difficulties.

Behavioral Intention

1. I intend to use the system in the next <n> months.
2. I predict that I would use the system in the next <n> months.
3. I plan to use the system in the next <n> months.

Appendix B

Proposed Survey Questions

Instructions: The following statements concern the use of a mobile device (such as a laptop, tablet, e-reader or smartphone) during a lecture-based class in which mobile devices are allowed to be used. Please select an answer indicating your agreement with the statement using the scale provided.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

Consider the following statements regarding the expected performance of a mobile computing device used during class.

1. I would find using a mobile device useful for doing things related to the lecture.
2. I would find using a mobile device useful for doing things not related to the lecture.
3. Using a mobile device enables me to do things related to the lecture more quickly.
4. Using a mobile device enables me to do things not related to the lecture more quickly.
5. Using a mobile device for doing things related to the lecture increases my productivity for the class.
6. Using a mobile device for doing things not related to the lecture increases my productivity for the class.
7. If I use a mobile device for doing things related to the lecture, I will increase my chances of improving my grade for the class.
8. If I use a mobile device for doing things not related to the lecture, I will increase my chances of improving my grade for the class.

Consider the following statements regarding the expected effort needed to use a mobile computing device during class.

9. My interaction with a mobile device would be clear and understandable.
10. It would be easy for me to become skillful at using a mobile device for doing things related to the lecture.
11. It would be easy for me to become skillful at using a mobile device for doing things not related to the lecture.
12. I would find a mobile device easy to use.
13. Learning to operate a mobile device is easy for me.

Consider the following statements regarding how other people view the use of mobile computing devices during class.

14. People who influence my behavior think that I should use a mobile device for doing things related to the lecture.
15. People who influence my behavior think that I should use a mobile device for doing things not related to the lecture.
16. People who are important to me think that I should use a mobile device for doing things related to the lecture.
17. People who are important to me think that I should use a mobile device for doing things not related to the lecture.
18. The instructors at this university have been helpful in the use of a mobile device for doing things related to the lecture.
19. The instructors at this university have been helpful in the use of a mobile device for doing things not related to the lecture.
20. In general, the university has supported the use a mobile device during lecture.

Consider the following statements about whether you are likely to use a mobile computing device during class.

21. I intend to use a mobile device for doing things related to the lecture during this semester.
22. I intend to use a mobile device for doing things not related to the lecture during this semester.
23. I predict that I would use a mobile device for doing things related to the lecture during this semester.
24. I predict that I would use a mobile device for doing things not related to the lecture during this semester.
25. I plan to use a mobile device for doing things related to the lecture during this semester.
26. I plan to use a mobile device for doing things not related to the lecture during this semester.

Please provide some demographic information about yourself.

27. What is your gender? (M or F)
28. What is your age?
29. What is your year (FR, SO, JR, SR) in college?
30. What is your experience with using mobile devices generally? (1 – Very Weak, 5 – Very Strong)
31. What is your experience with using mobile devices for academic purposes? (1 – Very Weak, 5 – Very Strong)

Appendix C

Final Version of the Survey

Introduction

This survey is part of a PhD study into the reasons college students choose to use mobile devices during lecture-based classes. The questions in this survey examine factors related to the choice to use a mobile device during class. Your participation by answering the questions in this survey is greatly appreciated.

This survey should take approximately 15 minutes to complete. Regarding the survey and the data collected from the survey, please note the following:

- Your responses are solely for the purpose of research, will not be shared with anyone, and will not have any impact on your academic performance for this course.
- Your answers will be anonymous and no personal information will be collected.
- Participation in the study via this survey is voluntary. By completing this survey, you are consenting to participate.

Instructions

The statements on the following pages concern the use of a mobile device (such as a laptop, tablet, e-reader or smartphone) during a lecture-based class in which mobile devices are allowed to be used but are not purposefully included as part of the lesson.

At the end of the survey, there will be six questions collecting anonymous demographic data.

Please turn the page to begin the survey.

Part 1 – Mobile Device Use Related to Class

For each of the following statements concerning ***mobile device use related to a lecture***, please circle one answer on the scale provided indicating your agreement with the statement.

Question		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1.	People who are important to me think that I should use a mobile device during class for doing things related to the lecture.	1	2	3	4	5
2.	Using a mobile device during class enables me to do things related to the lecture more quickly.	1	2	3	4	5
3.	I predict that I would use a mobile device during class for doing things related to the lecture this semester.	1	2	3	4	5
4.	My interaction with a mobile device during class for doing things related to the lecture would be done with relative ease.	1	2	3	4	5
5.	In general, the university has supported the use of a mobile device for doing things related to lecture.	1	2	3	4	5
6.	Using a mobile device during class for doing things related to the lecture increases my productivity for the class.	1	2	3	4	5
7.	The instructors at this university have been helpful in the use of a mobile device during class for doing things related to the lecture.	1	2	3	4	5
8.	It would be easy for me to become skillful at using a mobile device during class for doing things related to the lecture.	1	2	3	4	5
9.	People who influence my behavior think that I should use a mobile device during class for doing things related to the lecture.	1	2	3	4	5
10.	I plan to use a mobile device during class for doing things related to the lecture this semester.	1	2	3	4	5
11.	Learning to operate a mobile device for doing things related to lecture is easy for me.	1	2	3	4	5

Question		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
12.	If I use a mobile device during class for doing things related to the lecture, I will increase my chances of improving my grade for the class.	1	2	3	4	5
13.	I would find a mobile device easy to use for doing things related to the lecture.	1	2	3	4	5
14.	I would find using a mobile device during class useful for doing things related to the lecture.	1	2	3	4	5
15.	I intend to use a mobile device during class for doing things related to the lecture this semester.	1	2	3	4	5

Part 2 – Mobile Device Use NOT Related to Class

For each of the following statements concerning ***mobile device use NOT related to a lecture***, please circle one answer on the scale provided indicating your agreement with the statement.

Question		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
16.	In general, the culture of the university has accepted the use of a mobile device during class for doing things ***not*** related to the lecture.	1	2	3	4	5
17.	I plan to use a mobile device during class for doing things ***not*** related to the lecture this semester.	1	2	3	4	5
18.	Using a mobile device during class enables me to do things ***not*** related to the lecture more quickly.	1	2	3	4	5
19.	People who influence my behavior believe that it is acceptable to use a mobile device during class for doing things ***not*** related to the lecture.	1	2	3	4	5
20.	My interaction with a mobile device during class for doing things ***not*** related to the lecture would be done with relative ease.	1	2	3	4	5
21.	I predict that I would use a mobile device during class for doing things ***not*** related to the lecture this semester.	1	2	3	4	5

Question		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
22.	The instructors at this university have allowed the use of a mobile device during class for doing things ***not*** related to the lecture.	1	2	3	4	5
23.	It would be easy for me to become skillful at using a mobile device during class for doing things ***not*** related to the lecture.	1	2	3	4	5
24.	I intend to use a mobile device during class for doing things ***not*** related to the lecture this semester.	1	2	3	4	5
25.	If I use a mobile device during class for doing things ***not*** related to the lecture, I will increase my chances of improving my grade for the class.	1	2	3	4	5
26.	Learning to operate a mobile device for doing things ***not*** related to lecture is easy for me.	1	2	3	4	5
27.	People whose opinions I value believe that it is acceptable to use a mobile device during class for doing things ***not*** related to the lecture.	1	2	3	4	5
28.	Using a mobile device during class for doing things ***not*** related to the lecture increases my productivity for the class.	1	2	3	4	5
29.	I would find a mobile device easy to use for doing things ***not*** related to the lecture.	1	2	3	4	5
30.	I would find using a mobile device during class useful for doing things ***not*** related to the lecture.	1	2	3	4	5

Please turn the page to answer six demographic questions.

Part 3 – Demographic Information

Please provide some demographic information about yourself by answering the following questions.

A. What is your general experience with mobile devices? (Please circle the number under your level of experience.)

Very Inexperienced	Inexperienced	Neutral	Experienced	Very Experienced
1	2	3	4	5

B. What is your general experience with using mobile devices for academic purposes? (Please circle the number under your level of experience.)

Very Inexperienced	Inexperienced	Neutral	Experienced	Very Experienced
1	2	3	4	5

C. What is your student level? ☐ Freshman ☐ Sophomore

☐ Junior ☐ Senior

D. What is your age? ____________

E. What is your gender? ☐ Male ☐ Female

F. What is your academic major? ____

Appendix D

ANOVA Results

The calculations for linear and multiple regression using IBM SPSS 22 included results for ANOVA. These results are as follows:

Performance Expectancy and Behavioral Intention, Related to Class:

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	222.818	1	222.818	556.644	.000[b]
	Residual	100.873	252	.400		
	Total	323.690	253			

a. Dependent Variable: MeanBI.L

b. Predictors: (Constant), MeanPE.L

Effort Expectancy and Behavioral Intention, Related to Class:

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	155.124	1	155.124	231.903	.000[b]
	Residual	168.567	252	.669		
	Total	323.690	253			

a. Dependent Variable: MeanBI.L

b. Predictors: (Constant), MeanEE.L

Social Influence and Behavioral Intention, Related to Class:

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	91.282	1	91.282	98.976	.000[b]
	Residual	232.409	252	.922		
	Total	323.690	253			

a. Dependent Variable: MeanBI.L

b. Predictors: (Constant), MeanSI.L

Combined Performance Expectancy, Effort Expectancy, and Social Influence and Behavioral Intention, Related to Class:

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	228.739	3	76.246	200.751	.000[b]
	Residual	94.951	250	.380		
	Total	323.690	253			

a. Dependent Variable: MeanBI.L

b. Predictors: (Constant), MeanSI.L, MeanEE.L, MeanPE.L

Performance Expectancy and Behavioral Intention, Not Related to Class:

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	118.582	1	118.582	153.228	.000[b]
	Residual	195.021	252	.774		
	Total	313.603	253			

a. Dependent Variable: MeanBI.NL

b. Predictors: (Constant), MeanPE.NL

Effort Expectancy and Behavioral Intention, Not Related to Class:

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	86.291	1	86.291	95.664	.000[b]
	Residual	227.311	252	.902		
	Total	313.603	253			

a. Dependent Variable: MeanBI.NL

b. Predictors: (Constant), MeanEE.NL

Social Influence and Behavioral Intention, Not Related to Class:

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	57.374	1	57.374	56.427	.000[b]
	Residual	256.229	252	1.017		
	Total	313.603	253			

a. Dependent Variable: MeanBI.NL

b. Predictors: (Constant), MeanSI.NL

Combined Performance Expectancy, Effort Expectancy, and Social Influence and Behavioral Intention, Not Related to Class:

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	140.682	3	46.894	67.797	.000[b]
	Residual	172.921	250	.692		
	Total	313.603	253			

a. Dependent Variable: MeanBI.NL

b. Predictors: (Constant), MeanSI.NL, MeanEE.NL, MeanPE.NL

Appendix E

Regression Coefficients

The calculations for linear and multiple regression using IBM SPSS 22 included the determination of coefficients used in the regression models. These results are as follows:

Performance Expectancy and Behavioral Intention, Related to Class:

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-.255	.166		-1.541	.125
	MeanPE.L	1.056	.045	.830	23.593	.000

a. Dependent Variable: MeanBI.L

Effort Expectancy and Behavioral Intention, Related to Class:

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-.505	.271		-1.865	.063
	MeanEE.L	1.010	.066	.692	15.228	.000

a. Dependent Variable: MeanBI.L

Social Influence and Behavioral Intention, Related to Class:

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.820	.280		2.924	.004
	MeanSI.L	.903	.091	.531	9.949	.000

a. Dependent Variable: MeanBI.L

Combined Performance Expectancy, Effort Expectancy, and Social Influence and Behavioral Intention, Related to Class:

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			95.0% Confidence Interval for B	
		B	Std. Error	Beta	t	Sig.	Lower Bound	Upper Bound
1	(Constant)	-.888	.229		-3.873	.000	-1.339	-.436
	MeanEE.L	.189	.078	.129	2.421	.016	.035	.342
	MeanPE.L	.847	.073	.665	11.676	.000	.704	.990
	MeanSI.L	.208	.069	.122	3.025	.003	.073	.343

a. Dependent Variable: MeanBI.L

Performance Expectancy and Behavioral Intention, Not Related to Class:

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	.425	.213		1.993	.047
	MeanPE.NL	.964	.078	.615	12.379	.000

a. Dependent Variable: MeanBI.NL

Effort Expectancy and Behavioral Intention, Not Related to Class:

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	.524	.257		2.034	.043
	MeanEE.NL	.666	.068	.525	9.781	.000

a. Dependent Variable: MeanBI.NL

Social Influence and Behavioral Intention, Not Related to Class:

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.471	.210		7.015	.000
	MeanSI.NL	.662	.088	.428	7.512	.000

a. Dependent Variable: MeanBI.NL

Combined Performance Expectancy, Effort Expectancy, and Social Influence and Behavioral Intention, Not Related to Class:

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	-.443	.253		-1.747	.082	-.942	.056
	MeanEE.NL	.331	.071	.261	4.660	.000	.191	.471
	MeanPE.NL	.627	.095	.400	6.602	.000	.440	.814
	MeanSI.NL	.238	.083	.154	2.863	.005	.074	.402

a. Dependent Variable: MeanBI.NL

Appendix F

t-Test Results on Gender

Gender was analyzed as a moderator of Behavioral Intention for actions related to lecture and actions not related to lecture. Two *t*-tests were performed using gender to establish the grouping of the data. The results are provided here.

t-Test Results, Gender (Related to Lecture):

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	T	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
MeanBI.L	Equal variances assumed	.292	.590	-.228	251	.820	-.03290	.14435	-.31719	.25138
	Equal variances not assumed			-.229	228.371	.819	-.03290	.14356	-.31578	.24997

t-Test Results, Gender (Not Related to Lecture):

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	T	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
MeanBI.NL	Equal variances assumed	.178	.673	.937	251	.350	.13320	.14213	-.14672	.41313
	Equal variances not assumed			.929	216.584	.354	.13320	.14344	-.14950	.41591

Appendix G

t-Test Results on Academic Level

Experience was examined as a moderator of Behavioral Intention in this study. Both on-task (lecture-related) and off-task (not lecture-related) intention was analyzed. The academic level of the students (freshman, sophomore, junior, and senior) was one way in which experience was assessed. A series of *t*-tests was conducted to compare each group with the others. The results are provided here.

t-Test Results, Freshman-Sophomore (Related to Lecture):

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
MeanBI.L	Equal variances assumed	.124	.725	-1.437	218	.152	-.26508	.18446	-.62863	.09848
	Equal variances not assumed			-1.445	73.495	.153	-.26508	.18345	-.63066	.10050

t-Test Results, Freshman-Junior (Related to Lecture):

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
MeanBI.L	Equal variances assumed	1.256	.264	.800	189	.425	.22586	.28231	-.33102	.78275
	Equal variances not assumed			.714	19.765	.484	.22586	.31650	-.43485	.88658

t-Test Results, Freshman-Senior (Related to Lecture):

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
MeanBI.L	Equal variances assumed	.047	.828	.849	186	.397	.25549	.30096	-.33824	.84922
	Equal variances not assumed			.900	16.916	.381	.25549	.28377	-.34344	.85442

t-Test Results, Sophomore-Junior (Related to Lecture):

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
MeanBI.L	Equal variances assumed	1.389	.243	1.521	63	.133	.49094	.32273	-.15399	1.13586
	Equal variances not assumed			1.422	27.208	.166	.49094	.34530	-.21731	1.19918

t-Test Results, Sophomore-Senior (Related to Lecture):

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
MeanBI.L	Equal variances assumed	.000	.998	1.598	60	.115	.52057	.32567	-.13087	1.17201
	Equal variances not assumed			1.650	24.910	.112	.52057	.31557	-.12948	1.17062

t-Test Results, Junior-Senior (Related to Lecture):

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
MeanBI.L	Equal variances assumed	1.144	.293	.071	31	.944	.02963	.41555	-.81788	.87714
	Equal variances not assumed			.073	30.986	.943	.02963	.40756	-.80160	.86086

t-Test Results, Freshman-Sophomore (Not Related to Lecture):

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
MeanBI.NL	Equal variances assumed	.620	.432	-.038	218	.970	-.00693	.18455	-.37065	.35680
	Equal variances not assumed			-.036	69.739	.971	-.00693	.19106	-.38802	.37416

t-Test Results, Freshman-Junior (Not Related to Lecture):

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
MeanBI.NL	Equal variances assumed	.353	.553	-.493	189	.623	-.13498	.27405	-.67557	.40561
	Equal variances not assumed			-.495	20.739	.626	-.13498	.27291	-.70297	.43301

t-Test Results, Freshman-Senior (Not Related to Lecture):

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
MeanBI.NL	Equal variances assumed	1.057	.305	-.744	186	.458	-.22017	.29574	-.80360	.36327
	Equal variances not assumed			-.817	17.177	.425	-.22017	.26935	-.78801	.34767

t-Test Results, Sophomore-Junior (Not Related to Lecture):

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
MeanBI.NL	Equal variances assumed	.931	.338	-.400	63	.691	-.12805	.32051	-.76854	.51243
	Equal variances not assumed			-.412	32.773	.683	-.12805	.31116	-.76127	.50516

t-Test Results, Sophomore-Senior (Not Related to Lecture):

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
MeanBI.NL	Equal variances assumed	1.903	.173	-.633	60	.529	-.21324	.33672	-.88678	.46031
	Equal variances not assumed			-.692	27.707	.495	-.21324	.30804	-.84453	.41805

t-Test Results, Junior-Senior (Not Related to Lecture):

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
MeanBI.NL	Equal variances assumed	.114	.738	-.231	31	.819	-.08519	.36812	-.83598	.66561
	Equal variances not assumed			-.234	30.790	.817	-.08519	.36451	-.82880	.65843

Appendix H

t-Test Results on General Experience

An analysis of experience as a moderator of Behavioral Intention was included in this study. The analysis incorporated intention related to lecture and unrelated to lecture. The data used to measure experience was derived from responses to a five-point Likert-item question with a range from “very inexperienced” to “very experienced”. The analysis consisted of *t*-tests in which the data was separated into groups based on experience. The results of the comparisons are provided here.

t-Test Results, Inexperienced-Neutral (Related to Lecture):

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
MeanBI.L	Equal variances assumed	.000	.998	-.652	31	.519	-.32000	.49059	-1.32056	.68056
	Equal variances not assumed			-.604	10.583	.558	-.32000	.52957	-1.49120	.85120

t-Test Results, Inexperienced-Experienced (Related to Lecture):

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
MeanBI.L	Equal variances assumed	.210	.647	-2.313	136	.022	-.91282	.39471	-1.69338	-.13226
	Equal variances not assumed			-1.883	7.552	.099	-.91282	.48472	-2.04223	.21659

t-Test Results, Inexperienced-Very Experienced (Related to Lecture):

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
MeanBI.L	Equal variances assumed	.138	.711	-2.607	96	.011	-1.08148	.41488	-1.90502	-.25795
	Equal variances not assumed			-2.209	7.863	.059	-1.08148	.48966	-2.21406	.05110

t-Test Results, Neutral- Experienced (Related to Lecture):

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
MeanBI.L	Equal variances assumed	.626	.430	-2.506	153	.013	-.59282	.23658	-1.06022	-.12543
	Equal variances not assumed			-2.362	32.226	.024	-.59282	.25103	-1.10402	-.08162

t-Test Results, Neutral- Very Experienced (Related to Lecture):

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
MeanBI.L	Equal variances assumed	.409	.524	-3.012	113	.003	-.76148	.25280	-1.26232	-.26065
	Equal variances not assumed			-2.924	36.890	.006	-.76148	.26044	-1.28923	-.23374

t-Test Results, Experienced - Very Experienced (Related to Lecture):

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
MeanBI.L	Equal variances assumed	.015	.901	-1.136	218	.257	-.16866	.14852	-.46139	.12407
	Equal variances not assumed			-1.128	187.202	.261	-.16866	.14947	-.46352	.12620

t-Test Results, Inexperienced-Neutral (Not Related to Lecture):

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
MeanBI.NL	Equal variances assumed	.013	.908	-.399	31	.692	-.17500	.43833	-1.06897	.71897
	Equal variances not assumed			-.408	12.269	.690	-.17500	.42903	-1.10751	.75751

t-Test Results, Inexperienced-Experienced (Not Related to Lecture):

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
MeanBI.NL	Equal variances assumed	.066	.797	-.879	136	.381	-.33910	.38558	-1.10160	.42340
	Equal variances not assumed			-.890	7.910	.400	-.33910	.38116	-1.21981	.54160

t-Test Results, Inexperienced-Very Experienced (Not Related to Lecture):

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
MeanBI.NL	Equal variances assumed	.454	.502	-1.052	96	.295	-.46019	.43732	-1.32826	.40789
	Equal variances not assumed			-1.178	8.713	.270	-.46019	.39057	-1.34817	.42780

t-Test Results, Neutral- Experienced (Not Related to Lecture):

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
MeanBI.NL	Equal variances assumed	.035	.851	-.706	153	.481	-.16410	.23233	-.62310	.29489
	Equal variances not assumed			-.693	33.327	.493	-.16410	.23672	-.64554	.31733

t-Test Results, Neutral- Very Experienced (Not Related to Lecture):

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
MeanBI.NL	Equal variances assumed	.809	.370	-1.075	113	.285	-.28519	.26536	-.81091	.24054
	Equal variances not assumed			-1.134	41.521	.263	-.28519	.25158	-.79307	.22270

t-Test Results, Experienced - Very Experienced (Not Related to Lecture):

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
MeanBI.NL	Equal variances assumed	1.767	.185	-.791	218	.430	-.12108	.15316	-.42294	.18078
	Equal variances not assumed			-.773	176.11	.440	-.12108	.15657	-.43008	.18791

Appendix I

t-Test Results on Academic Experience

Students' self-reported experience using mobile devices for academic purposes was collected during surveying. The data resulted from a single Likert-item consisting of five possible responses ranging from "very inexperienced" to "very experienced". Analysis of this data was conducted as part of an assessment of experience as a moderator of intention of on-task and off-task behavior. *t*-tests were performed to analyze the data, with the results provided here.

t-Test Results, Inexperienced-Neutral (Related to Lecture):

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference Lower	95% Confidence Interval of the Difference Upper
MeanBI.L	Equal variances assumed	2.226	.139	-3.644	95	.000	-.92202	.25302	-1.42434	-.41970
	Equal variances not assumed			-3.759	35.95	.001	-.92202	.24530	-1.41953	-.42451

t-Test Results, Inexperienced-Experienced (Related to Lecture):

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
MeanBI.L	Equal variances assumed	.243	.623	-6.858	135	.000	-1.56917	.22880	-2.02167	-1.11667
	Equal variances not assumed			-6.774	29.281	.000	-1.56917	.23165	-2.04274	-1.09560

t-Test Results, Inexperienced-Very Experienced (Related to Lecture):

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
MeanBI.L	Equal variances assumed	.078	.781	-8.268	61	.000	-1.99335	.24108	-2.47543	-1.51127
	Equal variances not assumed			-7.911	38.031	.000	-1.99335	.25198	-2.50343	-1.48326

t-Test Results, Neutral-Experienced (Related to Lecture):

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
MeanBI.L	Equal variances assumed	2.542	.113	-4.313	188	.000	-.64715	.15004	-.94312	-.35118
	Equal variances not assumed			-4.246	149.844	.000	-.64715	.15241	-.94830	-.34600

t-Test Results, Neutral-Very Experienced (Related to Lecture):

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
MeanBI.L	Equal variances assumed	5.807	.018	-5.556	114	.000	-1.07133	.19282	-1.45331	-.68935
	Equal variances not assumed			-5.892	97.065	.000	-1.07133	.18182	-1.43220	-.71046

t-Test Results, Experienced -Very Experienced (Related to Lecture):

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
MeanBI.L	Equal variances assumed	1.162	.283	-2.451	154	.015	-.42418	.17307	-.76607	-.08228
	Equal variances not assumed			-2.603	79.331	.011	-.42418	.16294	-.74848	-.09988

t-Test Results, Inexperienced-Neutral (Not Related to Lecture):

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
MeanBI.NL	Equal variances assumed	.912	.342	-1.595	95	.114	-.42222	.26465	-.94762	.10318
	Equal variances not assumed			-1.536	32.521	.134	-.42222	.27480	-.98162	.13717

t-Test Results, Inexperienced-Experienced (Not Related to Lecture):

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
MeanBI.NL	Equal variances assumed	1.301	.256	-1.309	135	.193	-.32174	.24582	-.80790	.16442
	Equal variances not assumed			-1.220	27.932	.232	-.32174	.26362	-.86181	.21833

t-Test Results, Inexperienced-Very Experienced (Not Related to Lecture):

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
MeanBI.NL	Equal variances assumed	1.397	.242	-.771	61	.444	-.26016	.33744	-.93492	.41459
	Equal variances not assumed			-.807	49.024	.423	-.26016	.32222	-.90768	.38736

t-Test Results, Neutral-Experienced (Not Related to Lecture):

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
MeanBI.NL	Equal variances assumed	.011	.916	.643	188	.521	.10048	.15622	-.20769	.40866
	Equal variances not assumed			.639	154.409	.524	.10048	.15736	-.21037	.41133

t-Test Results, Neutral-Very Experienced (Not Related to Lecture):

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
MeanBI.NL	Equal variances assumed	7.018	.009	.711	114	.479	.16206	.22799	-.28958	.61370
	Equal variances not assumed			.667	68.537	.507	.16206	.24308	-.32294	.64706

t-Test Results, Experienced -Very Experienced (Not Related to Lecture):

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
MeanBI.NL	Equal variances assumed	9.717	.002	.301	154	.764	.06158	.20444	-.34229	.46545
	Equal variances not assumed			.267	58.060	.790	.06158	.23038	-.39956	.52272

Appendix J

t-Test Results on Course

Data was collected for this study from six courses: Introduction to Computing (CIS 1103); New Testament History (BIB 1023); General Psychology (PSY 1013); Introduction to the History of World Civilization: From Renaissance to the Present (HIS 1123); History of the United States, 1492-1865 (HIS 2213); and English Composition II (ENG 2213). In some cases, a single section was surveyed. In others, the sections were combined into one group. This was necessary to account for low participation rates in some of the sections. The results of the survey were analyzed for differences among the courses themselves. The *t*-test outcomes are presented here.

t-Test Results, CIS 1103-BIB 1023 (Related to Lecture):

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
MeanBI.L	Equal variances assumed	.951	.331	1.355	141	.178	.27361	.20194	-.12561	.67283
	Equal variances not assumed			1.321	88.347	.190	.27361	.20706	-.13786	.68508

t-Test Results, CIS 1103-PSY 1013 (Related to Lecture):

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
MeanBI.L	Equal variances assumed	.229	.633	.317	142	.752	.06259	.19771	-.32824	.45341
	Equal variances not assumed			.313	94.128	.755	.06259	.19996	-.33444	.45961

t-Test Results, CIS 1103-HIS 1123 (Related to Lecture):

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
MeanBI.L	Equal variances assumed	.354	.553	1.301	106	.196	.42051	.32332	-.22051	1.06154
	Equal variances not assumed			1.466	16.844	.161	.42051	.28676	-.18493	1.02595

t-Test Results, CIS 1103-HIS 2213 (Related to Lecture):

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
MeanBI.L	Equal variances assumed	.143	.706	-.368	114	.714	-.09841	.26754	-.62841	.43158
	Equal variances not assumed			-.369	29.611	.715	-.09841	.26670	-.64339	.44657

t-Test Results, CIS 1103-ENG 2213 (Related to Lecture):

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
MeanBI.L	Equal variances assumed	.053	.819	-.773	121	.441	-.18571	.24027	-.66140	.28997
	Equal variances not assumed			-.761	43.208	.451	-.18571	.24390	-.67751	.30608

t-Test Results, BIB 1023-PSY 1013 (Related to Lecture):

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference Lower	Upper
MeanBI.L	Equal variances assumed	.196	.659	-.885	95	.378	-.21103	.23843	-.68438	.26233
	Equal variances not assumed			-.885	94.644	.379	-.21103	.23854	-.68460	.26255

t-Test Results, BIB 1013-HIS 1123 (Related to Lecture):

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference Lower	Upper
MeanBI.L	Equal variances assumed	1.397	.242	.408	59	.685	.14690	.36006	-.57358	.86738
	Equal variances not assumed			.467	23.479	.645	.14690	.31488	-.50374	.79754

t-Test Results, BIB 1023-HIS 2213 (Related to Lecture):

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference Lower	Upper
MeanBI.L	Equal variances assumed	.996	.322	-1.214	67	.229	-.37202	.30636	-.98352	.23947
	Equal variances not assumed			-1.254	41.214	.217	-.37202	.29672	-.97118	.22713

t-Test Results, BIB 1023-ENG 2213 (Related to Lecture):

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference Lower	Upper
MeanBI.L	Equal variances assumed	.808	.372	-1.640	74	.105	-.45933	.28001	-1.01725	.09860
	Equal variances not assumed			-1.662	58.889	.102	-.45933	.27641	-1.01244	.09379

t-Test Results, PSY 1013-HIS 1123 (Related to Lecture):

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
MeanBI.L	Equal variances assumed	.778	.381	1.031	60	.307	.35793	.34721	-.33660	1.05246
	Equal variances not assumed			1.154	22.334	.261	.35793	.31025	-.28494	1.00080

t-Test Results, PSY 1013-BIB 2213 (Related to Lecture):

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
MeanBI.L	Equal variances assumed	.448	.505	-.543	68	.589	-.16100	.29660	-.75286	.43086
	Equal variances not assumed			-.552	39.353	.584	-.16100	.29181	-.75108	.42908

t-Test Results, PSY 1013-ENG 2213 (Related to Lecture):

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference Lower	Upper
MeanBI.L	Equal variances assumed	.299	.586	-.914	75	.364	-.24830	.27173	-.78961	.29301
	Equal variances not assumed			-.916	56.705	.364	-.24830	.27113	-.79129	.29469

t-Test Results, HIS 1123-HIS 2213 (Related to Lecture):

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference Lower	Upper
MeanBI.L	Equal variances assumed	.054	.817	-1.401	32	.171	-.51893	.37027	-1.27314	.23529
	Equal variances not assumed			-1.454	28.540	.157	-.51893	.35694	-1.24945	.21160

t-Test Results, HIS 1123-ENG 2213 (Related to Lecture):

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
MeanBI.L	Equal variances assumed	.123	.728	-1.664	39	.104	-.60623	.36434	-1.34318	.13072
	Equal variances not assumed			-1.782	27.931	.086	-.60623	.34023	-1.30324	.09079

t-Test Results, HIS 2213-ENG 2213 (Related to Lecture):

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
MeanBI.L	Equal variances assumed	.017	.897	-.269	47	.789	-.08730	.32503	-.74117	.56657
	Equal variances not assumed			-.270	43.956	.789	-.08730	.32351	-.73931	.56470

t-Test Results, CIS 1103-BIB 1023 (Not Related to Lecture):

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
MeanBI.NL	Equal variances assumed	.233	.630	1.523	141	.130	.29576	.19418	-.08813	.67965
	Equal variances not assumed			1.531	95.784	.129	.29576	.19317	-.08768	.67920

t-Test Results, CIS 1103-PSY 1013 (Not Related to Lecture):

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
MeanBI.NL	Equal variances assumed	1.206	.274	-.894	142	.373	-.17164	.19209	-.55137	.20808
	Equal variances not assumed			-.902	99.521	.369	-.17164	.19037	-.54936	.20607

t-Test Results, CIS 1103-HIS 1123 (Not Related to Lecture):

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
MeanBI.NL	Equal variances assumed	.914	.341	.802	106	.424	.26478	.33014	-.38976	.91932
	Equal variances not assumed			.741	14.801	.470	.26478	.35710	-.49725	1.02680

t-Test Results, CIS 1103-HIS 2213 (Not Related to Lecture):

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
MeanBI.NL	Equal variances assumed	.057	.812	1.527	114	.130	.40886	.26774	-.12154	.93925
	Equal variances not assumed			1.488	28.740	.148	.40886	.27473	-.15325	.97096

t-Test Results, CIS 1103-ENG 2213 (Not Related to Lecture):

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
MeanBI.NL	Equal variances assumed	.066	.797	.597	121	.552	.14298	.23953	-.33123	.61719
	Equal variances not assumed			.582	42.608	.563	.14298	.24556	-.35237	.63833

t-Test Results, BIB 1023-PSY 1013 (Not Related to Lecture):

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
MeanBI.NL	Equal variances assumed	.268	.606	-2.134	95	.035	-.46740	.21900	-.90218	-.03263
	Equal variances not assumed			-2.134	94.897	.035	-.46740	.21903	-.90224	-.03257

t-Test Results, BIB 1023-HIS 1123 (Not Related to Lecture):

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
MeanBI.NL	Equal variances assumed	1.310	.257	-.089	59	.929	-.03098	.34831	-.72795	.66598
	Equal variances not assumed			-.083	17.474	.935	-.03098	.37316	-.81666	.75470

t-Test Results, BIB 1023-HIS 2213 (Not Related to Lecture):

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
MeanBI.NL	Equal variances assumed	.278	.600	.392	67	.697	.11310	.28883	-.46341	.68960
	Equal variances not assumed			.383	36.342	.704	.11310	.29531	-.48563	.71182

t-Test Results, BIB 1023-ENG 2213 (Not Related to Lecture):

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
MeanBI.NL	Equal variances assumed	.321	.573	-.579	74	.565	-.15278	.26405	-.67891	.37335
	Equal variances not assumed			-.569	53.829	.572	-.15278	.26839	-.69090	.38535

t-Test Results, PSY 1013-HIS 1123 (Not Related to Lecture):

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
MeanBI.NL	Equal variances assumed	1.859	.178	1.268	60	.210	.43642	.34425	-.25218	1.12502
	Equal variances not assumed			1.174	17.227	.256	.43642	.37172	-.34706	1.21990

t-Test Results, PSY 1013-HIS 2213 (Not Related to Lecture):

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
MeanBI.NL	Equal variances assumed	.775	.382	2.033	68	.046	.58050	.28551	.01077	1.15023
	Equal variances not assumed			1.978	35.682	.056	.58050	.29349	-.01491	1.17591

t-Test Results, PSY 1013-ENG 2213 (Not Related to Lecture):

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
MeanBI.NL	Equal variances assumed	.923	.340	1.205	75	.232	.31463	.26106	-.20542	.83468
	Equal variances not assumed			1.181	52.973	.243	.31463	.26638	-.21968	.84893

t-Test Results, HIS 1123-HIS 2213 (Not Related to Lecture):

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
MeanBI.NL	Equal variances assumed	.451	.507	.347	32	.731	.14408	.41488	-.70100	.98916
	Equal variances not assumed			.342	24.337	.735	.14408	.42120	-.72461	1.01277

t-Test Results, HIS 1123-ENG 2213 (Related to Lecture):

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
MeanBI.NL	Equal variances assumed	.450	.506	-.309	39	.759	-.12179	.39424	-.91921	.67562
	Equal variances not assumed			-.302	22.297	.765	-.12179	.40279	-.95648	.71289

t-Test Results, HIS 2213-ENG 2213 (Related to Lecture):

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
MeanBI.NL	Equal variances assumed	.000	.996	-.800	47	.428	-.26587	.33221	-.93419	.40245
	Equal variances not assumed			-.801	43.356	.428	-.26587	.33196	-.93517	.40342

Appendix K

IRB Documents

Permission from Southwest Baptist University:

Jeff Kimball

From: Terry Cox
Sent: Tuesday, August 12, 2014 11:49 AM
To: Jeff Kimball
Subject: RE: Question About Research Review Board

Congratulations, after review of your application for research for the project listed below, it has been determined that your project meets the criteria for Exempt status. As per policy 1.15.3 in the faculty guidelines:

"If the project is certified exempt, the principle investigator need not resubmit the project for continuing RRB review as long as there are no modifications in the exempted procedures"

Title of Project: Motivations of Students in the Open-Ended Use of Mobile Computing in Lecture-Based Classrooms (Dissertation)

Good luck on your research,

Terry Cox PT, DPT, OCS, FAAOMPT
Research Review Board Chair

Terry Cox PT, DPT, OCS, FAAOMPT
Professor of Physical Therapy
Southwest Baptist University
Office Number: 417-328-1992

From: Jeff Kimball
Sent: Friday, August 08, 2014 4:20 PM
To: Terry Cox
Subject: RE: Question About Research Review Board

Terry –

I am attaching my completed RRB documents for my dissertation research. A paper copy of the form, signed by my chair and dean (Tim DeClue and Troy Bethards, respectively), is in campus mail on its way to you. Please let me know if you need anything else or if I have done something in error.

Sincerely,
JK

Mr. Jeff Kimball
Assistant Professor of Computer Science
Southwest Baptist University
1600 University Avenue
Bolivar, MO 65613
(417) 328-1701

1

Permission from Nova Southeastern University:

NOVA SOUTHEASTERN UNIVERSITY
Office of Grants and Contracts
Institutional Review Board

NSU

MEMORANDUM

To: Jeff Kimball

From: Ling Wang, Ph.D.
Institutional Review Board

Date: Oct. 17, 2014

Re: *Motivations of Students in the Open-Ended Use of Mobile Computing in Lecture-Based Classrooms*

IRB Approval Number: wang10151402

I have reviewed the above-referenced research protocol at the center level. Based on the information provided, I have determined that this study is exempt from further IRB review. You may proceed with your study as described to the IRB. As principal investigator, you must adhere to the following requirements:

1) CONSENT: If recruitment procedures include consent forms these must be obtained in such a manner that they are clearly understood by the subjects and the process affords subjects the opportunity to ask questions, obtain detailed answers from those directly involved in the research, and have sufficient time to consider their participation after they have been provided this information. The subjects must be given a copy of the signed consent document, and a copy must be placed in a secure file separate from de-identified participant information. Record of informed consent must be retained for a minimum of three years from the conclusion of the study.

2) ADVERSE REACTIONS: The principal investigator is required to notify the IRB chair and me (954-262-5369 and 954-262-2020 respectively) of any adverse reactions or unanticipated events that may develop as a result of this study. Reactions or events may include, but are not limited to, injury, depression as a result of participation in the study, life-threatening situation, death, or loss of confidentiality/anonymity of subject. Approval may be withdrawn if the problem is serious.

3) AMENDMENTS: Any changes in the study (e.g., procedures, number or types of subjects, consent forms, investigators, etc.) must be approved by the IRB prior to implementation. Please be advised that changes in a study may require further review depending on the nature of the change. Please contact me with any questions regarding amendments or changes to your study.

The NSU IRB is in compliance with the requirements for the protection of human subjects prescribed in Part 46 of Title 45 of the Code of Federal Regulations (45 CFR 46) revised June 18, 1991.

Cc: Protocol File

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Fax: (954) 262-3977 • Email: *inga@nsu.nova.edu* • Web site: www.nova.edu/cwis/ogc

References

Adams, D. (2006, September). Wireless laptops in the classroom (and the Sesame Street syndrome). *Communications of the ACM, 49*(9), 25-27.

Akour, H. (2009). Determinants of mobile learning acceptance: An empirical investigation in higher education. (Doctoral dissertation). Retrieved from ProQuest Dissertations & Theses database: http://search.proquest.com/docview/610058264?accountid=14196

Al Awadhi, S., & Morris, A. (2008, January). The Use of the UTAUT Model in the Adoption of E-government Services in Kuwait. In *Hawaii International Conference on System Sciences, Proceedings of the 41st Annual* (pp. 219-219). IEEE.

Annan-Coultas, D. L. (2012). Laptops as Instructional Tools: Student Perceptions. *TechTrends*, *56*(5), 34-41.

Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes, 50*(2), 179-211.

Baker, W. M., Lusk, E. J. & Neuhauser, K. L. (2012). On the use of cell phones and other electronic devices in the classroom: Evidence from a survey of faculty and students. *Journal of Education for Business, 87*(5), 275-289.

Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory*. Englewood Cliffs, NJ: Prentice-Hall.

Barak, M., Lipson, A., & Lerman, S. (2006). Wireless Laptops as Means For Promoting Active Learning In Large Lecture Halls. *Journal of Research on Technology in Education*, *38*(3), 245-263.

Boone, H. N., Jr. & Boone, D. A. (2012, April). Analyzing Likert data, *Journal of Extension, 50*(2), Article Number 2TOT2. Retrieved September 5, 2013 from http://www.joe.org/joe/2012april/tt2.php

Buche, M. W., Davis, L. R., & Vician, C. (2012). Does technology acceptance affect e-learning in a non-technology intensive course? *Journal of Information Systems Education, 23*(1), 41-50.

Carlsson, C., Carlsson, J., Hyvönen, K., Puhakainen, J., & Walden, P. (2006). Adoption of mobile devices/services – Searching for answers with the UTAUT. In *Proceedings of the 39th Hawaii International Conference on System Sciences.*

Chen, J. L. (2011). The effects of education compatibility and technological expectancy on e-learning acceptance. *Computers & Education, 57*(2), 1501-1511.

Cheon, J., Lee, S., Crooks, S. M., & Song, J. (2012). An investigation of mobile learning readiness in higher education based on the theory of planned behavior. *Computers & Education, 59*(3), 1054-1064.

Chu, K. M. (2013). Motives for participation in Internet innovation intermediary platforms. *Information Processing and Management, 49*(4), 945-953.

Compeau, D. R. & Higgins, C. A. (1995, June). Computer self-efficacy: Development of a measure and initial test. *MIS Quarterly, 19*(2), 189-211.

Conole, G. de Laat, M., Dillon, T., & Darby, J. (2008). 'Disruptive technologies', 'pedagogical innovation': What's new? Findings from an in-depth study of students' use and perception of technology. *Computers & Education, 50*(2), 511-524.

Davis, F. D., Bagozzi, R. P., & Warshaw, P. R. (1989, August). User acceptance of computer technology: A comparison of two theoretical models. *Management Science, 35*(8), 982-1003.

Davis, F. D., Bagozzi, R. P., & Warshaw, P. R. (1992). Extrinsic and intrinsic motivation to use computers in the workplace. *Journal of Applied Social Psychology, 22*(14), 1111-1132.

DeGagne, M. & Wolk, R. M. (2006). Unwired: Student use of technology in the ubiquitous computing world. *The Proceedings of the Information Systems Education Conference, 23*. Retrieved February 21, 2011 from http://proc.isecon.org/2006/3533/ISECON.2006.DeGagne.pdf

Demb, A., Erickson, D., & Hawkins-Wilding, S. (2004). The laptop alternative: Student reactions and strategic implications. *Computers & Education, 43*(2004), 383-401.

Donaldson, R. L. (2011). Student acceptance of mobile learning. (Doctoral dissertation). Retrieved from Electronic Theses, Treatises and Dissertations (Paper 716) http://diginole.lib.fsu.edu/etd/716.

eun Oh, K. & Gwizdka. (2011). Impatient opportunists: A study of technology use in a higher education classroom. *Journal of Applied Research in Higher Education, 3*(2), 81-96.

Fink, A. (1995). *How to analyze survey data* (Vol. 8). Sage.

Fishbein, M. & Ajzen, I. (1975). *Belief, attitude, intention and behavior: An introduction to theory and research*, Reading, MA: Addison-Wesley.

Fried, C. B. (2008). In-class laptop use and its effects on student learning. *Computers & Education, 50*(3), 906-914.

Fulton, S., Schweitzer, D., Scharff, L., & Boleng, J. (2011, October). Demonstrating the impact of multitasking in the classroom. In *Frontiers in Education Conference (FIE), 2011* (pp. F2J-1). IEEE.

Gao, T., & Deng, Y. (2012, June). A study on users' acceptance behavior to mobile e-books application based on UTAUT model. In *Software Engineering and Service Science (ICSESS), 2012 IEEE 3rd International Conference on* (pp. 376-379). IEEE.

Garfield, M. J. (2005). Acceptance of ubiquitous computing. Information Systems Management, 22(4), 24-31.

Gaudreau, P., Miranda, D., & Gareau, A. (2014). Canadian university students in wireless classrooms: What do they do on their laptops and does it really matter? *Computers & Education, 70*, 245-255.

Gay, L. R., Mills, G. E., & Airasian, P. (2009). *Educational Research: Competencies for Analysis and Applications (9th ed).* Upper Saddle River, NJ: Pearson Education, Inc.

Gehlen-Baum, V. & Weinberger, A. (2012). Notebook or Facebook? How students actually use mobile devices in large lectures. In *Proceedings of the 7th European Conference on Technology Enhanced Learning*, 103-112.

Golub, E. (2005, February). On audience activities during presentations. *Journal of Computing Sciences in Colleges, 23*(4), 38-47.

Gruzd, A., Staves, K. & Wilk, A. (2012). Connected scholars: Examining the role of social media in research practices of faculty using the UTAUT model. *Computers in Human Behavior, 28*(6), 2340-2350.

Gu, X., Zhu, Y. & Guo, X. (2013). Meeting the "digital natives": Understanding the acceptance of technology in classrooms. *Educational Technology & Society, 16*(1), 392-402.

Hammer, R., Ronen, M., Sharon, A., Lankry, T., Huberman, Y., & Zamtsov, V. (2010). Mobile culture in college lectures: Instructors' and students' perspectives. *Interdisciplinary Journal of E-Learning and Learning Objects, 6,* 293-304.

Hembrooke, H., & Gay, G. (2003). The laptop and the lecture: The effects of multitasking in learning environments. *Journal of Computing in Higher Education*, *15*(1), 46-64.

Huffman, W. H. & Huffman, A. H. (2012). Beyond basic study skills: The use of technology for success in college. *Computers in Human Behavior, 28*(2), 583-590.

Irby, T. L. & Strong, R. (2013, March). Agricultural education students' acceptance and self-efficacy of mobile technology in classrooms. *NACTA Journal*, 57(1), 82-87.

Jambulingham, M. (2013). Behavioural intention to adopt mobile technology among tertiary students. *World Applied Sciences Journal, 22(9)*, 1262-1271.

Junco, R. (2012). In-class multitasking and academic performance. *Computers in Human Behavior, 28*(6), 2236-2243.

Kay, R. H. (2012). Exploring the use of laptops higher education: An analysis of benefits and distractions. In *World Conference on E-Learning in Corporate, Government, Healthcare, and Higher Education, 2012*(1), 630-635.

Kay, R. H., & Lauricella, S. (2011a). Exploring the Benefits and Challenges of Using Laptop Computers in Higher Education Classrooms: A Formative Analysis. *Canadian Journal of Learning & Technology*, *37*(1).

Kay, R. H. & Lauricella, S. (2011b). Unstructured vs. structured use of laptops in higher education. *Journal of Information Technology Education, 10,* 34-42.

Khalid, A., Chin, C., & Nuhfer-Halten, B. (2012). Effectiveness of the use of portable electronic devices (PEDs) in classrooms across disciplines: Faculty and student perspectives. *Proceedings of the INFORMS Southeastern Chapter 2012 Conference, 2012*. Retrieved February 11, 2013 from www.spsu.edu/library/research_instruction/spsu_authors/effectivenessofportable.pdf

Kraushaar, J. M. & Novak, D. C. (2010). Examining the affects of student multitasking with laptops during the lecture. *Journal of Information Systems Education, 21*(2), 241-251.

Kulesza, J., DeHondt II, G., & Nezlek, G. (2010). More technology, less learning? *The Proceedings of the Information Systems Education Conference, 27*(1333). Retrieved February 21, 2011 from http://proc.isecon.org/2010/pdf/1333.pdf

Lai, I. K. W. & Lai, D. C. L. (2010, October). Negative user adoption behaviors of mobile commerce: An empirical study from Chinese college students. *Supply Chain Management and Information Systems (SCMIS), 2010 8th International Conference on*.

Lai, C., Wang, Q., & Lei, J. (2012). What factors predict undergraduate students' use of technology for learning? A case from Hong Kong. *Computers & Education, 59*(2), 569-579.

Lawrence, E., Bachfischer, A., Dyson, L. E., & Litchfield, A. (2008, July). Mobile learning and student perspectives: An mReality check! *7th International Conference on Mobile Business*, 287-295.

Lindroth, T. & Bergquist, M. (2010). Laptopers in an educational practice: Promoting the -personal learning situation. *Computers & Education, 54*(2), 311-320.

Litwin, M. S. (1995). *How to measure survey reliability and validity* (Vol. 7). Sage.

Marchewka, J. T., Liu, C., & Kostiwa, K. (2007). An application of the UTAUT model for understanding student perceptions using course management software. *Communications of the IIMA*, *7*(2), 93-104.

Marques, B. P., Villate, J. E., & Carvalho, C. V. (2011, June). Applying the UTAUT model in Engineering Higher Education: Teacher's technology adoption. In *Information Systems and Technologies (CISTI), 2011 6th Iberian Conference on* (pp. 1-6). IEEE.

McDonald, S. (2012). Reclaiming the wireless classroom when netiquette no longer works. *College Teaching, 60*(3), 130.

McLaren, Z. (2011). Effect of laptop technology on student interaction. (Doctoral dissertation). Retrieved from ProQuest Dissertations & Theses database: http://search.proquest.com/pqdtft/docview/863203437/1402B4DE7743CB34910/1?accountid=14196

Mohammadi-Aragh, M. J. & Williams, C. B. (2013). Student attention in unstructured-use, computer-infused classrooms. *120th ASEE Annual Conference & Exposition*. Retrieved August 10, 2013 from http://www.asee.org/public/conferences/20/papers/6979/view.

Moore, G. C. & Benbasat, I. (1991). Development of an instrument to measure the perceptions of adopting an information technology innovation. *Information Systems Research, 2*(3), 192-222.

Moran, M. J. (2006). College student's acceptance of tablet personal computers: A modification of the Unified Theory of Acceptance and Use of Technology model. (Doctoral dissertation). Retrieved from ProQuest Dissertations & Theses database: http://search.proquest.com.ezproxylocal.library.nova.edu/docview/304910593?accountid=6579

Moran, M., Hawkes, M., & El Gayar, O. (2010). Tablet personal computer integration in higher education: Applying the unified theory of acceptance and use technology model to understand supporting factors. *Journal of Educational Computing Research, 42*(1), 79-101.

Mueller, J., Wood, E., De Pasquale, D., & Cruikshank, R. (2012). Examining mobile technology in higher education: Handheld devices in and out of the classroom. *International Journal of Higher Education, 1*(2), 43-54.

Murphy, E. L. (2010). Ask the audience: The role of technology in students' university education. (Masters thesis). Retrieved from ProQuest Dissertations & Theses database: http://search.proquest.com/pqdtft/docview/822408741/61B4023086FF4CBBPQ/1?accountid=14196

Nworie, J. & Haughton, N. (2008, September/October). Good intentions and unanticipated effects: The unintended consequences of the application of technology in teaching and learning environments. *TechTrends, 52*(5), 52-58.

Pardamean, B. & Susanto, M. (2012). Assessing user acceptance toward blog technology using the UTAUT model. *International Journal of Mathematics and Computers in Simulation, 6*(1), 203-212.

Park, S. Y., Nam, M. W. & Cha, S. B. (2012). University students' behavioral intention to use mobile learning: Evaluating the technology acceptance model. *British Journal of Educational Technology, 43*(4), 592-605.

Plymale, W. O. (2007). Do we need discreet computing in instruction? *Educause Review*, *42*(3), 84-85.

Robertson, J. (2011, January). Laptops in the classroom. *Communications of the ACM, 54*(1), 15.

Rogers, E. M. (1995). *Diffusion of innovations,* (4th ed.). New York, NY: The Free Press.

Salter, D., & Purgathofer, P. (2010, June). Students use of Laptops in Large Lecture Classes: Distraction, Partial Attention or Productive Use? In *World Conference on Educational Multimedia, Hypermedia and Telecommunications* (Vol. 2010, No. 1, pp. 2136-2141).

Sana, F., Weston, T., & Cepeda, N. J. (2013). Laptop multitasking hinders classroom learning for both users and nearby peers. *Computers & Education, 62*(2013), 24-31.

Sarrab, M., Elgamel, L., & Aldabbas, H. (2012, July). Mobile learning (m-learning) and educational environments. *International Journal of Distributed and Parallel Systems, 3*(4), 31-38.

Smith, S. D. & Caruso, J. B. (2010, October). Key findings: The ECAR study of undergraduate students and information technology, 2010. Retrieved from EduCause website: http://net.educause.edu/ir/library/pdf/EKF/EKF1006.pdf

Straub, E. T. (2009, June). Understanding technology adoption: Theory and future directions for informal learning. *Review of Educational Research, 79*(2), 625-649.

Taylor, S. & Todd, P. (1995). Assessing prior IT usage: The role of prior experience. *MIS Quarterly, 19*(2), 561-570.

Thompson, R. L., Higgins, C. A., & Howell, J. M. (1991). Personal computing: Toward a conceptual model of utilization. *MIS Quarterly, 15*(1), 125-143.

Vallerand, R. J. (1997). Toward a hierarchical model of intrinsic and extrinsic motivation. In M. Zanna (Ed.), Advances *in Experimental Social Psychology, 29* (pp. 271-360). New York: Academic Press.

Venkatesh, V., Morris, M., Davis, G., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *MIS Quarterly, 27*(3), 425-478.

Wang, Y. S. & Shih, Y. W. (2009). Why do people use information kiosks? A validation of the Unified Theory of Acceptance and Use of Technology. *Government Information Quarterly, 26(2009)*, 158-165.

Wang, H. Y., & Wang, S. H. (2010). User acceptance of mobile internet based on the Unified Theory of Acceptance and Use of Technology: Investigating the determinants and gender differences. *Social Behavior and Personality: an international journal, 38*(3), 415-426.

Wang, Y. S., Wu, M. C., & Wang, H. Y. (2009). Investigating the determinants and age and gender differences in the acceptance of mobile learning. *British Journal of Educational Technology, 40*(1), 92-118.

Williams, P. W. (2009). Assessing mobile learning effectiveness and acceptance. (Doctoral dissertation). Retrieved from ProQuest Dissertations & Theses database: http://search.proquest.com/pqdtft/docview/304880387/13CA20C50854DBFF644/1?accountid=14196

Wood, E., Zivcakova, L., Gentile, P., Archer, K., De Pasquale, D. & Nosko, A. (2012). Examining the impact of off-task multitasking with technology on real-time classroom learning. *Computers & Education, 58*(1), 365-374.

Wurst, C., Smarkola, C., & Gaffney, M. A. (2008). Ubiquitous laptop usage in higher education: Effects on student achievement, student satisfaction, and constructivist measures in honors and traditional classrooms. *Computers & Education, 51*(4), 1766-1783.

Young, J. R. (2006, June 2). The fight for classroom attention: Professor vs. laptop. *The Chronicle of Higher Education, 52*(39). Retrieved October 18, 2010 from http://chronicle.com/article/The-Fight-for-Classroom/19431

Yu, C. S. (2012). Factors affecting individuals to adopt mobile banking: Empirical evidence from the UTAUT model. *Journal of Electronic Commerce Research, 13(*2*)*, 104-121.

Zhou, T. (2008, August). Exploring mobile user acceptance based on UTAUT and contextual offering. In *Electronic Commerce and Security, 2008 International Symposium* on. (pp. 241-245). IEEE.

Zivcakova, L. (2011). Multi-tasking: The effects of interacting with technology on learning in a real-time classroom lecture. (Masters thesis). Retrieved from ProQuest Dissertations & Theses database http://search.proquest.com/pqdtft/docview/878138464/60E69495066C4F06PQ/1?accountid=14196