CHAPTER 20

REDEFINING LEARNING USING A COMMON MOBILE PLATFORM: ONE UNIVERSITY’S JOURNEY THROUGH INITIAL IMPLEMENTATION¹

VICTORIA M. CARDULLO

Abstract

This paper will report findings from a yearlong study that implemented a common mobile platform using iPads. The research setting afforded a glimpse at the differences between two unique classrooms: a large lecture hall and a learning community classroom. In this report, we will share research collected related to: productivity, classroom management, classroom design, content integration using technology, and the need for faculty and student professional development. We will position these findings in relation to two theoretical frameworks for coding: Substitution, Augmentation, Modification, and Redefinition (SAMR, Puentedura, 2006); and Bloom’s Taxonomy (Bloom et al., 1956). The intent of the paper is to provide evidence from our research conducted to examine, analyze, and extract information of lessons learned throughout the yearlong research feasibility study.

Keywords: Mobile Technologies, iPads, Bloom’s Taxonomy, Emerging Technologies, Pedagogical Content Knowledge, SAMR Model, Ubiquitous Environment

---

¹ Assistant Reading Professor
Curriculum and Teaching
Auburn University, Auburn, Alabama, USA
Chapter 20

Introduction

The emergence of revolutionary technologies has had a significant impact on teaching and learning in higher education. It has increased the potential to transform learning, yet the challenge is to determine the underlying processes for implementing technologies efficiently and effectively to enhance teaching and learning. As evidence grows regarding usage, effectiveness, and feasibility, pressure is now building to move beyond anecdotal accounts and incorporate a more rigorous stance to the design of research regarding mobile technologies. The intent of this paper is to provide evidence from our research to support, examine, analyze, and extract information of lessons learned throughout a longitudinal research study.

Review of Literature

Mobile learning is a new shift in education (Sharples, Corlett, & Westmancott, 2002) that utilizes mobile devices such as the iPad. There is evidence of ubiquity in classrooms from Kindergarten to PhD programs, yet many of these tools and devices are most likely not school-issued but rather are brought to school by the student. In North America, curriculum and policy makers have embraced the possibilities of ubiquitous technologies and their importance within the education process (Peluso, 2012). Yet there is still a lack of educational technology access that will be detrimental to young people as they begin to join the work force. Economic shift and technological advancements in robotics, artificial intelligence, and augmented reality will shift the ways in which students learn. Educate to Innovate, which was launched in 2009 by President Obama, merely assists in the progress towards the end goal of a fully ubiquitous learning environment. Currently what is needed is additional research to clearly identify what constitutes useful technology that will support and enhance learning.

Global Perspectives

High school students reported that they use mobile device in their classrooms in the United States to make learning more effective. They reported that the use of mobile devices such as the iPad, tablet, and or smart phone transformed the way they approached learning. Results from a recent survey revealed 72% of students frequently checked their grades using their mobile device and 46% of high school students regularly
communicated with their teachers and classmates using chat, email or some other online communication. Furthermore, 65% of students used their device for research of a given topic while 47% of students used a mobile device to take notes making the use of mobile technologies in high school classes efficient and effective. Transformation took on many different forms uniquely related to the device. Forty-six percent of the students captured lecture notes or assignments using the photo app on their mobile device and 37% of students used a social media application (app) to collaborate on class assignments or projects (Edwards, 2014).

In the United States, educators are still debating the educational value of mobile devices, yet students already see the value and transformation of mobile learning. What we have noticed is the fact that students are effectively and efficiently using mobile devices to support, scaffold, and improve their learning environment.

**Mobile Technologies in Education**

The mobility of digital learning devices is beyond refuting. Learning is personalized, learner-centered, collaborative, ubiquitous, and contextual. Today's definition of mobile technologies is continually evolving yet remains narrowed specifically to handheld devices.

A mobile device is a handheld tablet or other device that is made for portability, and is therefore both compact and lightweight. New data storage, processing and display technologies have allowed these small devices to do nearly anything that had previously been traditionally done with larger personal computers. Mobile devices are also known as handheld computers (Techopedia, 2016).

In the United States, there is an on-going dialogue concerning issues of student engagement and technology (Brewer & Smith, 2011). Among the many recommendations emerging from this discussion is the need to incorporate more effective pedagogies, to increase student involvement in scientific discovery, and to increase the relevance of concepts to students’ lives. The focal point of this dialogue is to encourage new pedagogies, encouraging faculty to rely less on lecture, and to incorporate technologies efficiently and effectively. Faculty often recognize that students understand the potential for using smartphones and other mobile devices in learning; however, incorporating these devices effectively and efficiently is difficult when students have dissimilar (or no) devices.

Mobile technologies and digital tools help increase connectivity and access to information to disadvantaged countries. For example, an
innovative program in Turkey called Snowdrops developed by Turkcell and the Association in Support of Contemporary Living has provided thousands of women opportunities for learning, and many of these learning opportunities are delivered through Massive Open Online Courses (MOOC; West, 2015).

Mobile learning encourages the freedom to move beyond the classroom allowing learning to take place anytime anywhere. In a recent study (ECAR, 2011), 78% of students considered Wi-Fi to be extremely valuable to their academic success. Educational institutions around the world are embracing mobile learning and ubiquitous learning environments, yet there are still many inequalities.

Mobile learning is growing exponentially outside of the United States. In the United Kingdom, they have developed a program called The Mobile Learning Network (MoLeNET) supported by over $25 million in funding from the government and academia (Oller, 2012), an initiative that supports over 40,000 learners in 104 different projects. This is a diverse implementation of mobile learning affecting 147 colleges and 37 schools in the United Kingdom. In addition to the MoLeNET initiative, the United Kingdom also had another learning project called MyArtSpace which ran from 2006 to 2012. This program introduced students to over 500,000 images of contemporary art, as well as a large collection of interviews from emerging artists (Oller, 2012). This initiative provided students on field trips at museums and galleries multimedia content for individual interaction at the exhibits. This initiative supported the notion of learning anytime anywhere as students took photos, recorded themselves speaking, and entered notes that were shared when they returned to the classroom.

There are currently 5.3 billion mobile subscribers in the world, which equates to 77% of the world’s developed population yet there are still inequalities in developing countries. Although mobile technologies are growing exponentially outside of the United States, in developing countries access to Internet technologies is 20% lower for women, creating additional inequalities. In developing countries, the cost of purchasing and maintaining technology such as the iPad is just as problematic as the cost of textbooks. Recent studies in Australia, Canada, and the US have all noted the need for a stable infrastructure to support a meaningful adoption and integration of educational technologies in the classroom (ECAR, 2011). These disparities result in disproportionate literacy rates throughout the world.

Universities around the world are looking at the implementation of iPads to revolutionize education at all levels of teaching, learning, and research (Mitchell, 2012). The rollout of these devices has varied from
small-scale rollout in Dubai, UAE (Saavedra & Murray, 2014) to large-scale roll out in Sydney (Rankine & Macnamara, 2014). New tools, resources and devices are being used to transform student-centered learning, engagement of learning, and transformation of pedagogy. It simply is not enough to adopt a common mobile platform such as the iPad, it must be fully adopted, adapted, and integrated into the learning environment (Cavanaugh, Hargis, Munns, & Kamli, 2012).

Aim of Research

Exploratory Pilot Year One

Auburn University launched an iPad Pilot that consisted of a yearlong exploratory research model (Mobile Learning Platform). This pilot was initiated to support ubiquitous learning for students 24 hours a day, seven days a week. This initiative allowed students access to the University’s learning management system (Canvas) as well as University campus resources and apps delivered by the university to support their transition to the university. Glassett and Schrum (2009) theorize that information and communication technologies play a critical role in empowering learners to demonstrate meaningful learning and interaction within their learning environment. Our research identified this as an area of strength as well.

Year one of our research helped to capture data to provide a unique perspective from both students and faculty as they used iPads to transform their learning and teaching approaches. In year one, we focused on a large lecture section of freshmen biology and a small freshmen-learning community enrolled in the Fall of 2014, as well as one large lecture section of freshmen biology in the Spring of 2015. During this time, all students received an iPad distributed by the Provost e-learning committees’ subgroup: iPad work group. In year one, we distributed nearly 125 iPads in Fall 2014 and 100 iPads in Spring 2015. During this time, the research team used classroom observation protocols to observe the interaction of the device for learning and teaching. We also held focus groups, surveys, and interviews to capture information that is more detailed related to the transformation and organization of learning.

Start-up Perspectives

One of the goals focused on during this feasibility study at Auburn University was identification of a common mobile platform and the delivery of mobile apps to both students and faculty engaged in the pilot.
After meeting with several different vendors over the course of Spring 2014, we chose the JAMF Casper Suite for use as our Mobile Device Management (MDM) server to link up with the approximately 100 iPads (Air 2) deployed for the pilot. JAMF Casper Suite is a software management program built exclusively for MAC, iPad, and iPhone devices. It provides a simple, flexible, and scalable framework to maintain, update, and ensure the device is running at optimal performance. JAMF Casper Suite supports automated updates, security updates, and inventory. This server gave us a delivery vehicle for both for-pay and free apps.

After several meetings with faculty members involved with the pilot several apps were deemed important to facilitate in the course of the deployment. These apps were Notability (paid for by the Office of the Provost), the Microsoft Mobile Office Suite (paid but included with an AU student’s Office365 subscription), the Apple iWorks apps (included with the purchase of this set of iPads), and an open biology textbook that could be seen more as content rather than an app. We also included apps that seemed to be useful to a student including a scientific calculator app (pay), the Auburn app (free), and the Canvas Learning Management System (LMS) app (free) (see Table 20.1).

<table>
<thead>
<tr>
<th>Name of App</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Notability</td>
<td>$5.99 (Paid for by the Provost Office)</td>
</tr>
<tr>
<td>Microsoft Office Suite</td>
<td>$79.99 4 year subscription (included with an AU student’s Office 360 Subscription)</td>
</tr>
<tr>
<td>Apple iWorks</td>
<td>Included with the purchase of this set of iPads</td>
</tr>
<tr>
<td>Scientific Calculator</td>
<td>$0.99</td>
</tr>
<tr>
<td>Canvas Learning</td>
<td>Free</td>
</tr>
<tr>
<td>Management System</td>
<td></td>
</tr>
<tr>
<td>Open Biology Textbook</td>
<td>Free</td>
</tr>
</tbody>
</table>

Our intention in deployment was to push the apps to the end-users with as little intervention and interruption as possible. This became problematic as several different and unrelated issues emerged in the first days of the deployment and the first few meetings of the classes. These issues included:

- wireless infrastructure inconsistency
- lack of robustness in Apple’s Push Notification Service (APNS)
queuing issues

The wireless infrastructure inconsistency on AU’s campus included a rare but debilitating outage of the Active Directory system login that kept the students from gaining Internet access during scheduled hands-on deployment times. Deployment was also hampered by the lack of robustness in Apple’s Push Notification Service (APNS). The last issue was only a problem due to the first two issues, as APNS is not designed to queue apps in a fashion that would allow the devices to “catch up” to older commands from the MDM. In an effort to remedy the problems of push deployment, we decided to also make the apps available in the MDM’s Self-Service Clip (SSC). With the SSC, we were able to load all of the apps inside of another app folder visible on the device homepage and the student or faculty member could download the app on-demand. In both of the app deployment delivery methods, a valid Apple ID was required, so once the end-user successfully logged in to the iTunes store, the apps would be available via either push or on-demand. We did find through one-on-one meetings with students that in most instances of problematic app deployment the Apple ID (iTunes store and App store) had not been used correctly.

The Spring app deployment was more effective than the Fall deployment, although not without issue. In both cases, at the end of the semester, we were able to reclaim the licensing fee paid for the Notability app so that those licenses can be reissued in the future. In addition, even though we took back our license, the end-user is actually still granted access to the app. We deployed nine apps, both for pay and free, via the MDM for the pilot. The process of doing so taught us a good bit about not only app deployment but also the need to have certain things such as wireless infrastructure, directory availability, and a simple understanding of the App Store and APNS in a proper state before attempting to get content on iOS devices via MDM for a large group.

Research Design

This research took place at Auburn University, a suburb of Auburn, Alabama. Auburn is a comprehensive land-sea- and space grant institution. The population consisted of freshmen level students between 17-21 years old. This study was developed to understand iPad use from multiple perspectives; therefore, the research design was a mixed method approach. By combining two research methods with different strengths and weaknesses we sought to understand 1) the extent to which a personalized device can assist and support student learning; 2) identify challenges and
strengths to implementing a common mobile platform; and 3) examine teacher and student perspectives and attitudes associated with a common mobile platform. Qualitative data was used to capture and illustrate patterns and characteristics descriptively, providing insight into students’ and instructors’ attitudes and perceptions. Whereas quantitative data helped to identify percentages found in the research data.

**Data Analysis**

As part of the study the research team used the following questions to guide the exploratory research: 1) How does the use of mobile technologies such as the iPad support student learning in a freshmen biology course; 2) How does the use of a common mobile platform influence a lecturer’s teaching approach; 3) How do students and faculty perceive the use of mobile devices for teaching and learning? To answer these questions, we employed a taxonomy analysis as well as constant comparative analysis.

Using constant comparison analysis three people (researcher and 2 graduate students) read through the entire data set then chunked the data into smaller units labelling each with a descriptor code. Each code was compared to previous codes so that chunks would be labelled with similar codes. Codes were grouped by sub codes and the theme was identified and documented based on each group and subgroup. All codes were verified by three people (researcher and 2 graduate students) coming to agreement to achieve inter-rater reliability. Prior to coding and aggregating the data, the researcher and the graduate students met several times for an extended period of time (two to three hours each session) to discuss the research and the coding process. Subsequently, the researcher and the graduate students met weekly to code and discuss data and observations. During this process, we achieved 94% inter-rater reliability.

Using the taxonomy analysis, we relied on a system of classification that inventories the domain into a flow chart or diagram to help the researchers understand the relationship among the domains. Using the SAMR model (PuenteDura, 2006) and Bloom’s Taxonomy (Bloom & Krathwohl, 1956) we were able to identify critical thinking and the level of integration of technology using the iPad for teaching and learning. See Table 20.2 for a sample of the codebook used to code the data (observations, evaluations, focus groups, interviews, and surveys).
Table 20.2

*Codebook for SAMR Model Analysis*

<table>
<thead>
<tr>
<th>Code</th>
<th>Operational Definition</th>
<th>Inclusive Criteria</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Substitution</td>
<td>Technology acts as direct tool substitute with no functional improvement.</td>
<td></td>
<td>SAMR (PuenteDura, 2006)</td>
</tr>
<tr>
<td>Augmentation</td>
<td>Technology acts as direct tool substitute with functional improvement.</td>
<td>Learning Catalytics</td>
<td></td>
</tr>
<tr>
<td>Modification</td>
<td>Technology allows for significant task redesign.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Redefinition</td>
<td>Technology allows for the creation of new tasks that were previously inconceivable.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Support Student Learning**

Data collection used to address Research Question 1 helped the researchers identify how the use of mobile technologies such as the iPad supported student learning in a freshmen biology course. The researchers relied on multiple data for triangulation, which included classroom observations, surveys, and focus group sessions.

The researchers gathered observational data based on an observation protocol in which seven researchers rotated through a bi-weekly observation schedule for 16 weeks each semester. The researchers observed all class sessions and captured anecdotal notes based on observational data using the observation protocol form.
Table 20.3

*Codebook for Bloom’s Taxonomy Analysis*

<table>
<thead>
<tr>
<th>Code</th>
<th>Operational Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge</td>
<td>Exhibits previously learned material by recalling facts, terms, basic concepts, and answers. Demonstrating understanding of facts and ideas by</td>
</tr>
<tr>
<td></td>
<td>organizing, comparing, translating, interpreting, giving descriptions, and stating main ideas.</td>
</tr>
<tr>
<td>Comprehension</td>
<td>Solving problems by applying acquired knowledge, facts, techniques, and rules in a different way.</td>
</tr>
<tr>
<td></td>
<td>Analysis</td>
</tr>
<tr>
<td></td>
<td>Compiling information together in a different way by combining elements in a new pattern or proposing alternative solutions.</td>
</tr>
<tr>
<td>Synthesis</td>
<td>Presenting and defending opinions by making judgments about information, validity of ideas or quality of work based on a set of criteria.</td>
</tr>
<tr>
<td>Evaluation</td>
<td></td>
</tr>
</tbody>
</table>

Note: Anderson et al. revised Bloom’s Taxonomy (Bloom et al., 1956) in 2001.

The following is an outline (Cardullo & Burton, 2015) of the stages based on work from Puentedura (2006) and the alignment of Bloom’s Taxonomy (Bloom et al., 1956). Using this framework, the researchers sought to explore the level of integration and the depth of critical thinking within the class lectures and assignments.

- **Substitution**: Simply substituting one task for the other with no functional change.
  - Bloom’s level of integration *Understanding* (U) Student explains the concept or idea or *Remembering* (R) Student recalls or remembers the information.

- **Augmentation**: A direct substitution of the task with some functional improvement.
  - Bloom’s level of integration *Understanding* (U) Student explains the concept or idea and *Application* (AP) Student executes or applies the new information

- **Modification**: Allows for significant redesign of the task.
Redefining Learning Using a Common Mobile Platform

- Bloom’s level of integration Analysis, (A) Student uses the information in a new way and Evaluation (E) Student justifies a stand or position
- **Redefinition**: Allows for the creation of a new task, previously inconceivable.
  - Bloom’s level of integration Evaluation and Creation (C) Student creates new product or point of view

Focus group sessions were held at the end of each term and students were invited to participate. The focus group sessions were comprised of 18 students in total, which equated to more than 10% of the total population. The sessions were audio recorded and then transcribed. The lead researcher and two graduate students reviewed all transcriptions and identified codes and sub-codes throughout the transcriptions.

Using the framework, the researchers sought to explore the level of integration and the depth of critical thinking within the class lectures and assignments. What we found was students more readily moved through the levels of integration and could often be viewed using the augmentation stage or modification stage, whereas the instructor often stayed within the redefinition or augmentation level in a large lecture class. In the smaller class, we observed (25 students) both the students and the professor often straddled modification and redefinition.

Each observer was asked to address two statements at the end of their observation, thoughts to ponder, and questions to wonder. In reflecting throughout the observations, the researchers conducting the observations were asked to reflect and ponder on what they noticed. A few items worth mentioning became apparent. In the observations, the subject of training came up repeatedly. Observers often wondered “if students know how to use airdrop, couldn’t they airdrop notes and lectures slides.” The observers saw ways to incorporate a deeper use of technology and wondered, “If there was way to incorporate a back channel chat on the iPad, that might get the quiet, more reserved student involved in the discussion?” The researchers wondered if student and instructor training would help bridge these gaps.

Writing was another theme that became apparent in our observations, as many students chose a variety of writing tools (i.e., iPad, laptop, notebook) to capture notes or work on assignments. Observers often wondered, “How can instructors incorporate more serious writing on the iPad.” What we noticed is every time they are required to do any serious writing, most students pulled out their laptops. In addition, students often wanted more from the iPad and the integration of it in their class. Several
students used the iPad to capture an audio recording of the session so they could listen to it later for clarification of concepts or missed items in their note taking. During the focus group session, a comment was made about note taking, “Some people struggle with note taking and others just write down everything they hear, me I struggle so I use the recording button in Notability to capture all of the lecture notes. This way I can go back and listen for clarification.” Students were also using the Notability app to write, draw diagrams, pictures and concepts, highlighting, and web searching for additional information to support their understanding of concepts taught. Yet, not everyone felt note taking on the iPad was effective, many could be seen taking notes on paper while reviewing the slides on the iPad. Students commented that they often liked the tactile feeling of taking notes “physically writing out my notes going back and highlighting, the actual movement helps me understand the concepts more.”

The use of multiple screens in the classroom became evident throughout our observations as well. Although it was not directly related to our questions, we felt it was important to comment on. Over 85% of students surveyed stated that they often used multiple screens to support their academic learning. Through our observations, we could observe students’ viewing lecture notes on their iPad and taking notes on their laptop or paper, we wonder if this is due to the small screens, the need to toggle between screens, or student preference of device. Students often captured lecture recording on their iPad using Notability while taking notes and then viewed the textbook on their phone or laptop. The iPad was often used to screen capture drawings or lecture notes on the white board.

Organization was a major concept identified in both focus groups and observations. Students stated, “All of my notes are in one place” they have the option to type, write, or draw. They enjoyed the “flexibility of space” one student stated, “its forgiving which for me is a lot less stressful.” Many students stated that they used the iPad in multiple courses and all of their textbooks are on the one device. One of the students commented on the flexibility to study when all textbooks are on one device. “If I have extra time between classes… like if I have down time to study I wouldn’t be lugging all of my textbooks around, but if I could pull out this [iPad] and start studying just a little whenever I had the chance it would be a lot easier.” The size and convenience of the device rang out as well, “it’s small, and fits nicely in my backpack.” The device is “more accessible” and “all my files and textbooks are on one device.” One student discussed what he does if he forgets his lab manual or materials “I’ll just snap a
picture of my lab partners manual or handouts and continue working as if I had my lab manual.”

Attendance was noted as improved from previous sections of this same course taught by the same professor. Non-exam day’s student attendance averaged 90% or better, whereas past course average on non-exam days was equivalent to 60%. Exam rate make up was less than 1% whereas in the past semester it was typically over 5%. In Fall 2014, 82% of the student passed with a C or higher and in Spring 2015, 95% of the students passed with a C or higher. Overall, these passing rates display a dramatic increase in pass rates among freshmen biology students. When comparing pass rates to previous semesters, the pass rates for all sections of BIOL 1030 it would show an 8% increase of success in Fall 2014 and a 21% increase of success in the Spring.

Teaching Approaches

Data collection used to identify how the use of a common mobile platform influenced teaching approaches relied on observations and student feedback during course evaluations to answer Question 2: How does the use of a common mobile platform influence a lecturer’s teaching approach? Observations were coded using both theoretical constructs: Bloom’s Taxonomy and SAMR Model. Data revealed students’ level of integration often surpassed the instructor’s level. During our observations it was apparent that instructors often stayed within the substitution/augmentation level whereas students often dabbled in modification/redefinition. When we reviewed the student evaluations, many comments were related to a deeper, more authentic use of the device in the classroom. Students wanted lectures to be more interactive, wondering if the instructor could have training to become more familiar with the functions of the iPad. Students felt that time was wasted on technological issues involving the iPad. Examples to support this view included needing autocorrect for biology words and trouble drawing on the iPad. Some students felt that most of what was done in a section in the Fall could have been completed using paper. A few students felt the iPads were not useful and were often a distraction in class. A student stated “the iPad is not very helpful, only because we are not used to being taught in this way. For this method to work we would have had to feel comfortable with the required technology. However I think it will be helpful in the long run.” Students often felt the iPads would be useful but felt ill prepared.
Student Attitudes and Perceptions

Data collection used to identify attitudes and perceptions relied on multiple data for triangulation and included interviews, surveys, and observations to answer Question 3: How do students and faculty perceive the use of mobile devices for teaching and learning? The researcher used triangulation of data for the purposes of assuring completeness and confirming findings from different perspectives and overcoming the limitations of a single method of data collection (Campbell & Fiske, 1959; Denzin, 1978).

Students and faculty revealed several perceptions and attitudes toward digital learning devices for educational implementation. Several students indicated on the survey that they had used an iPad in high school for various academic opportunities (e.g., textbooks, assessments, e-reading) as well as for personal use (e.g., FaceTime, Skype, Social Media). These findings are important as we looked at student attitudes and perceptions. Students had some prior usage with an iPad; therefore, they had some familiarity with the device and were eager to use it for academic learning. Survey results indicated 100% of students surveyed used their device to access Canvas, Auburn University’s common mobile platform. Ninety-eight percent of the students stated they often completed online searches using their iPad, as well as 85% of the students used the iPad to take notes or view PowerPoint presentations (70%). Further evaluation of the data revealed student perspectives of the iPad as a helpful tool that offered portability, convenience, and ease of use. More than 40% of students surveyed felt the iPad helped them become more successful in their first year of studies at Auburn. One student stated “I can do anything with my notes, change colors and draw easily and have it all laid out on a scrolling page.” This same student went on to discuss the use of features of both the device and the app Notability, “I can record the lecture with my iPad in Notability so if I miss something during class I can go back in the lecture and write it down.” These types of comments were written throughout the survey. Students felt they could study anywhere as well as retrieve information within just a few short seconds if they needed help on homework.

Further analysis of the data revealed student perspectives of the device related to time management and organization. Students perceived the device as a tool for organization, the simplicity of the app Notability helped students become organized and feel successful as noted in the following comment, “I love Notability and how I can set up folders for all my notes instead of having to keep up with paper copies. I also love that
iCloud can sync my papers and PowerPoints with my MacBook.” Several students commented on the ease of scheduling and the convenience of the calendar on the iPad “it is easier to schedule everything on the same device you do the work on” and “the immediate access to my email keeps me on top of things. Notability is also great for organizing your classes...and thoughts.”

Next Steps in Research

Moving beyond the first year exploratory research, we carefully reviewed our findings to drive the next phase of research. Good research is fluid and adaptable and our research has grown and branched off into two different directions for the second year of the feasibility research. We are currently looking at a BYOi model as well as continuing with the current programs involving university-supplied iPads, which have shown early successes. Lessons learned from the first year’s research showed the need for professional development and direction; therefore, all instructors who apply for the use of iPads during the semester are required to attend 8-10 hours of professional development and then implement their training during the semester.

The BYOi model will require students to bring their own iPads to their course sections and use the iPads as learning tools in core math courses, which will help engage students in Algebra problems. Working in a more problem-based atmosphere allows students to develop critical thinking skills. By presenting their solutions, students learn how to communicate mathematical ideas. iPads will be used to give the students instant access to resources and practice provided through Canvas and WebAssign. Students will use the device to conduct research needed to solve real-world problems using the Internet and relevant apps. Finally, students will use the iPads to record presentations of their solutions in collaboration with their classmates. The common platform will ensure that all students have equal access in and outside the classroom to all necessary resources and tools. Since Algebra and Trigonometry are both very symbol and picture heavy courses, the iPad will be useful in writing notes and drawing diagrams, which can be shared with fellow students.

In Spring 2015, the department chair and the lead instructor will identify two teaching assistants (TAs). The instructor will begin constructing materials and lesson plans, and the course will be advertised to potential students and advisors. During the summer semester 2015, the
instructor and TAs were trained in the use of the iPads for the classroom and teaching/classroom management strategies. Assessments were designed to measure the success of this approach. Students will be enrolled during Camp War Eagle in such a way as to ensure that they are aware of the requirements and expectations.

The exploratory research developed last year 2014-2015 using university-supplied iPads has shown early success and will continue for the academic 2015-2016 year. This year the research will move from exploration to efficacy and replication looking at interventions to support student outcomes. Research questions: 1) Is there a beneficial impact on student education outcomes when professional development is implemented. 2) What is the impact upon the lecturer and their teaching approaches when all students have access to iPads? 3) Is there a positive impact on the level of integration when teachers are offered professional development prior to the integration of device (iPad) in their courses? 4) Is there a significant impact on student success when instructors participate in professional development prior to the integration of device (iPad)? 5) Does the provision of the device (iPad) for academic learning change the way we approach and transform literacy?

In the Fall, we will have three groups of courses in architecture, drama, and biology, using university-supplied iPads. Instructors of these courses have participated in 8-10 hours of professional development training on the iPad. Having two unique branches of research—BYOi model as well as university-supplied iPads model—will allow us to identify variables that could help successfully sustain a mobile deployment. Faculty members in both research sections completed pre and post surveys related to items such as level of comfort with the iPads, concerns they may have with using the iPads in an academic setting, and teaching using the device to support learning and their comfort level. Results from the pre and post survey revealed that faculty are excited to use the iPad for teaching and learning but are very anxious at the same time. Comments collected with the survey display the excitement and the trepidation that professors have “The possibilities for teaching are numerous; I want to learn from others, what works and what doesn’t work. I don’t have time to research and try each app in my classroom, so I look forward to the collaborative effort in this workshop.” Others commented on the opportunity to experiment with the iPad for classroom application and moving away from paper-based classrooms. The professors felt the iPad has the potential to engage and motivate student learning “The portability and access to information… has the potential to make the learning process much more engaged and
dynamic. It should also encourage students to pursue additional resources related to class topics.”

Reviewing the results of the post survey, it is easy to see concerns are still prevalent within the group. When asked what concerns they still have several became known. The use of the iPad in the classroom needs to have a purpose not just an add-on because it is cool or innovative. One professor commented, “I know how to use it [iPad] and am very comfortable using it for many purposes. I simply have not found the best purpose for the classroom.” Others felt there was little time to devote to becoming an [iPad] expert and other more pressing issues were in the forefront, promotion and tenure, publications, research.” Professors were also concerned about the level of integrations as using it effectively “in my teaching (getting to the R in SAMR) rather than just making my class about technology.”

**Conclusion**

Technology has evolved and continues to evolve at a rapid pace allowing access to learning wherever and whenever students need creating a ubiquitous learning environment. This rapid evolution of technology will require preparation of students for the 21st century, including post-secondary students, necessitating a fundamental and systematic change in how schools are organized for ubiquitous learning. For mobile learning technologies to truly facilitate student learning and prepare students for learning beyond the 21st century, a paradigm shift in teaching and learning is needed (Cardullo, 2014).
References


Van Oostveen, R., Muirhead, W., & Goodman, W. M. (2011). Tablet PCs and reconceptualizing learning with technology: A case study in
higher education. *Interactive Technology and Smart Education, 8*(2), 78-93.