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M-Learning: A Psychometric Study of the Mobile Learning Perception Scale

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M-Learning: A Psychometric Study of the Mobile Learning Perception Scale and the Relationships Between Teachers' Perceptions and School Level/Technology Skill Level

by

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TABLE OF CONTENTS

APPENDICES

LIST OF TABLES

Abstract

The purpose of this research was to evaluate the psychometric properties of Uzunboylu and Ozdamli (2011) Mobile Learning Perception Scale (MLPS) in order to determine whether it was an acceptable instrument to measure U.S. teachers' perception of mobile learning (m-learning) in the classroom. A second purpose was to determine if relationships existed between teachers' perceptions of m-learning in comparison to school level and the teachers self-reported technology skill level. Two hundred twenty-four teachers from 16 public schools in Pennsylvania participated in this study for a response rate of43%. Factor analysis confirmed a similar three factor structure with K-12 teachers with high reliability to that of the secondary teachers of Uzunboylu and Ozdamli's study. Significant relationships were found for both school level and self-report skill level. High school teachers' perceptions of m-learning were found to be significantly lower for Factor 1 compared to the elementary teachers' perceptions and the overall school level mean (elementary, middle and high school) was 3.62 on a 1-5 Likert scale. For self-reported technology skill level, the teachers at the proficient/expert level rated items significantly higher for both Factor 1 and Factor 3 compared to the teachers in the novice/beginner level. Chi square analysis found 13 total significant relationships between school level (5) and skill level (8) and reported usage of specific technologies in the classroom on a weekly basis. The findings suggested that, although school level and self-reported skill level are related to teachers' m-learning attitudes and use of specific technologies, other variables should be tested as well such student motivation to use technology, teachers' beliefs about change, and teachers' experience with professional development about technology use. It was suggested that strategic planning in technology implementation, targeted professional training and challenging teachers' beliefs are needed for fuller acceptance of m-learning.

CHAPTER ONE

PURPOSE and LITERATURE REVIEW

Purpose

Technological advances are moving forward at an exponential rate. In a review of 50 randomly selected Pennsylvania public school districts' strategic plans and websites, 82% of the school districts included technology or technology integration as a part of their strategic plan, mission, vision or a highlight on the district website (Roche, 2012, personal communication). Even with the desire to integrate technology into their schools, school districts often find themselves behind the technology curve. They purchases computers and accompanying hardware and software programs only to find out that updated models or versions were released shortly thereafter. School districts also seem to trail behind the technology curve because of limited budgets, minimal time and opportunities for faculty and staff training as well as the inability to change hardware and software systems in a timely manner. Nevertheless, school districts invest millions of dollars into their technology infrastructure as well as the actual computers, interactive white boards and software programs that support the daily instruction of students. In 2012, the estimated total of Information Technology spending for K-12 schools across the United States was $9.5 billion with an anticipated increase to $9.7 billion in 2013 (Center for Digital Education, 2012).

During the late 1990s and early 2000s, the concept of e-learning or electronic learning became a much discussed topic in the education community (Hassan, 2007). As e-learning continued to develop and expand, no standard definition was agreed upon as to what constituted e-learning. After reviewing all of the variations and discussions on e-learning, Piskurich (2002) defined e-learning as the use of a computer network or the web for the delivery of learning. Piskurich's definition provided for a wide range of possible lessons, activities and learning experiences under the e-learning umbrella and established a rationale for the increase in the number of computers and technology expenditures in school district budgets.

As e-learning opportunities became more prevalent, schools continued to add technology hardware and software in the classrooms to support technology integration. In addition to the hardware and software investments that accompany any new initiative, schools attempted to provide teachers with professional development in technology integration to support the use of e-learning. Training efforts for technology integration in the classroom ranged from conducting in-service sessions, after-school workshops, paying for college-level technology integration courses, providing opportunities for teachers to visit other classrooms and schools that have successfully integrated technology, and providing in-classroom support with another teacher or technology integration coach. However, in spite of these efforts, many teachers were not comfortable with the various technologies and were not ready to embrace and use e-learning strategies to the fullest extent (Kumar, Rose & D'Silva, 2008).

Nevertheless, schools attempted to make progress with implementing e-learning techniques in the classroom but there was not a consistent effort from all teachers or administrators. Before e-learning techniques were a part of every classroom, the next major technology innovation in the classroom was thrust upon schools and teachers: m-learning or mobile learning. M-learning, similar to e-learning, does not have a single definition that is universally agreed upon. Ally (2009) defined m-learning as learning through the use of wireless mobile technology that allows anyone to access information and learning materials from any place and at any time. Alternate definitions of m-learning include the ability to connect and interact with computers and other mobile devices and allow for an exchange of information between the students and teacher (Georgiev, Georgieva & Smirkarov, 2004).

As m-learning moved forward in the early 2000s and schools continued to discuss technology integration, teachers were asked and often expected to change some of their classroom practices to integrate technology and mobile devices into lessons. As with any change or the introduction of a new instructional technique, teachers needed to understand the reason for the change, see the benefits for the students and for themselves and participate in a professional development program. The change of allowing cell phones and other mobile devices in the classroom as well as using these devices as a part of the lesson was a major change for many teachers because these items were often banned from classrooms for many years. The potential misuse of student mobile devices in the classroom caused many teachers to develop negative perceptions toward the use of mobile devices in the classroom (Lynne, 2007; Hayden, 2008).

In order to foster a successful m-learning environment in the classroom, teachers and administrators need to "buy-in" to change the instructional practice. Guskey (1986) presented a model for the process of teacher change that included four steps: 1) staff development, 2) change in teachers' classroom practices, 3) change in student learning outcomes and 4) change in teachers' beliefs and attitudes. Prior to any change or at the initial stage of planning for change, school leaders should solicit the current perceptions of the staff so that professional development opportunities are targeted to meet each teacher's needs (Russell &Bradley, 1997). Understanding the perceptions of the teachers toward teaching in an m-learning environment provides the principals and administration the opportunity to create the mission and vision of m-learning while addressing some of the key concerns for teachers: new expectations, the benefits to students and reliable technology in the classroom. In addition, the input will provide information to principals and administrators planning professional development for teachers by taking into account their teacher's current skill levels and perceptions as they relate to the implementation or change in practice. Planning professional development offerings to the middle (one-size fits all) will only benefit the teachers that have a skill level ready to learn at that level. Teachers that are below the level and above the level will not benefit from professional development and not move forward in the change process.

The primary purpose of this study is to evaluate the psychometric properties of an instrument designed to measure teachers' perceptions of m-learning (Uzunboylu & Ozdamli, 2011). The original administration of the survey was conducted with teachers from the Turkish Republic of Northern Cyprus and this administration of the survey will be conducted with U.S. teachers. The information from this study can be used by superintendents, school administrators and principals planning for targeted professional development with m-learning, and as an instrument to conduct a pre and post assessment of m-learning implementation. A secondary purpose of this study is to investigate the current status of perceptions of m-learning from a sample of U.S. teachers and the relationship of those perceptions with teaching level (elementary, middle and high schools) and with teacher self-reported technology skill level (novice/beginner, competent, proficient/expert). The literature review will summarize the increased focus on m-learning in today's schools as well as the paradoxical potential benefits vs. concerns with the misuse of technology prevalent in the research. A description of the Mobile Learning Perception Scale will conclude the review.

Evolution of Electronic Learning (E-learning) in Schools

The traditional classroom structure that uses face-to-face instruction with students began to change in the early part of the 19th century (Georgiev, Georgieva & Smirkarov, 2004). Education businesses and higher education institutions first attempted distance learning (d-learning) through correspondence courses (James & Wedemeyer, 1959). In correspondence courses, students received content and lessons to complete and return via mail to the instructor for review and grading. Universities invested time and money in the concept of distance learning because they viewed it as a means of expanding educational delivery to those students unable to attend traditional campus courses (Alexander, 2001). D-learning grew in popularity for many students and educational institutions including business, higher education, military and the training sectors (Nicholson, 2007).

D-learning techniques were slow to gain widespread acceptance because most of the instructional approaches were anchored in an asynchronous environment in which teachers and students were working with pre-recorded or prepared materials with little teacher-to-student communication (Rosenberg, 2001). As universities and educational companies increasingly incorporated d-learning techniques into general practice, technological advances in the area of communication, word processing, computers, audio/video and the Internet yielded a specialized field of distance learning called electronic learning or e-learning (Welsh, Wanberg, Brown & Simmering, 2003). In the mid-1990s, universities and educational companies sought to remove the space and time barriers d-learning instruction posed by incorporating e-learning technology.

E-learning techniques advanced d-learning practices by increasing the opportunities and timeliness of communication between teacher and student. According to Horton (2000), e-learning was a part of the biggest change in the way schools and education in general conducted teaching and learning since the invention of the chalkboard. E-learning techniques provided opportunities for both synchronous and asynchronous learning. Students were able to communicate with the teacher and other students in the class in real time from a variety of locations. Many organizations began blending e-learning with both asynchronous and synchronous techniques to provide the best educational experience for students (Welsh, Wanberg, Brown & Simmering, 2003). Many e-learning technologies proved to be an efficient approach for both students and schools (Horton, 2000).

Research found that the major benefits of e-learning included five key components. E-learning provided consistent learning and training for all students in the course. E-learning increased convenience and accessibility for students because the technology allows for flexibility and individualized learning. E-learning reduced information overload by allowing students the control to learn at their own pace. Electronic record keeping and digital document management improved tracking and record keeping for both the teacher and student. Finally, e-learning practices lessened the overall cost to run a course on campus or at an off-site location (Welsh, Wanberg, Brown & Simmering, 2003; Zhang, Zhao, Zhou & Nunamaker, 2004).

As the e-learning movement entered the early 2000s, the evolution of websites like LiveJournal and Friendster and advances in Internet technology pushed e-learning into the mainstream (Downes, 2005). Soon after the introduction of the first social networking websites, the next tools to increase the use of e-learning formats such as webpages, blogs and electronic grading and reporting procedures evolved. E-learning was not limited to just universities and educational business. K-12 schools around the world began integrating e-learning techniques into their instructional methods with virtual classes, cyber schools and both synchronous and asynchronous learning opportunities for students (Horn, 2012).

Emergence of Mobile Learning (M-learning) in Schools

The success of e-learning combined with the increase in portable electronic mobile devices launched the next phase of educational change: mobile learning (m-learning). M-learning allows learning to take place in any location and at any time, often without special preparation (Bransford, Brown, & Cocking, 1999; Georgiev, Georgieva & Smirkarov, 2004; DeGani, Martin, Stead & Wade, 2010). M-learning offers all the benefits of e-learning and "cuts the cord" by allowing learning to occur away from a desk or computer station. In m-learning, students take ownership of their learning as the tools for m-learning are found in close proximity to the student, if not actually on their person – in a purse, pocket or book bag (Alexander, 2004). M-learning is said to: 1) help learners improve literacy and numeracy skills, 2) encourage both independent and collaborative experiences, 3) help learners identify areas in which assistance and support are needed, 4) help to bridge the gap between mobile technology and Information and Communication Technology, 5) help remove some of the formality from the learning experience and encourage reluctant learners, 6) help learners remain focused for longer periods, and 7) help raise students' self-esteem and self-confidence (Attewell, 2005).

M-learning is also considered a pathway to personalized learning and a more intimate way for students to connect to the content and lesson (DeGani, Martin, Stead & Wade, 2010). In some cases, mobile technology such as iPods, iPads, and specific downloadable applications supports disabled and special education students to help monitor academic progress and ensure access to the curriculum (Georgiev, Georgieva & Smirkarov, 2004). M-learning techniques and strategies in the classroom have the potential to enhance the typical instructor-centered classroom into a more learner-centered classroom with the use of mobile devices (Holsinger, Nischelwitzer, & Meisenberger, 2005).

With the significant increase in mobile devices, students and parents are asking for their use in the classroom. In a 2010 survey conducted by Project Tomorrow, 62% of the responding parents would purchase a mobile device for their child if the school allowed the device to be used for educational purposes. In addition, students stated that the primary barrier in using technology in school was the rules against using their personal devices such as cell phones, Smartphones, laptops and MP3 players (Project Tomorrow, 2010). Before using mobile devices as a platform for a wide range of classroom functions that can significantly change the way instruction is organized, educational leaders need to review the impact of such a change (Lan & Sie, 2010). Teachers at all levels have different viewpoints and perceptions about using mobile devices in the classroom. For instance, teachers identified handheld mobile devices' small screens, poor data and text input methods and limited battery life as concerns in terms of meeting students' needs and having classroom ready devices for each class period (Georgiev, Georgieva & Smirkarov, 2004).

It appears that, in order for e-learning and m-learning in schools to gain acceptance, school policies, teacher expectations and classroom assignments must change (Project Tomorrow, 2010). Teachers must become comfortable with how technology can be used to meet their classroom goals and expectations while addressing students' curricular needs. A missing part in gaining acceptance is adequate professional development. Targeted professional development workshops allow teachers to become knowledgeable with e-learning and m-learning teaching strategies by increasing their current skill level with technology integration

(Russell & Bradley, 1997). The scope of mobile technology in the classroom is so vast that schools and teachers have to make choices about preferred devices, specific hardware and software programs and a basic set of common instructional strategies.

Nevertheless, some pioneering teachers are using m-learning techniques in their K-12 classrooms. Students in Enrique Legaspi's middle school classroom in Los Angeles used Twitter from their personal mobile devices to conduct research about current events and recent news stories (Shein, 2012). The students accessed information for part of their project that was shared with the rest of the class. Examples similar to Enrique Legaspi's classroom are found across the country, but the classrooms that are integrating mobile technology are led by a small but growing number of innovative teachers (Project Tomorrow, 2010). Specifically for this study, portable electronic mobile devices (PEMD) refer to, but are not limited to, the following student-owned devices: cell phones (with or without Internet access), Smartphones (with or without Internet access), laptops or tablet personal computers (including iPad, Kindle and Nook), netbook or mini-netbook computers, MP3 players (including iPod, iTouch, and Nano) and hand-held game players (including PSP and Nintendo DS).

Increase in Mobile Technology in Schools

Some schools have embraced the m-learning concept by purchasing wireless mobile devices such as netbook computers, iPads, and iPods for teachers and students to use for classroom instruction (for example, Kucher, 2012, McWhirter, 2012). The use of wireless, mobile, portable and handheld devices has gradually increased across every sector of education in both the developed and developing worlds (Traxler, 2009). However, given current economic challenges, many schools are, at best, barely able to maintain the current levels of their technology budget while others face the possibility of reducing their technology budget expenditures (Levy, 2012). Such constraints may make providing wireless mobile technology devices in each classroom difficult. Although most schools do not appear to have the resources to match the rapid pace of technology upgrades and advances, a large percentage of their students have personal devices that can be used in the classroom.

The prominence of both e-learning and m-learning movements in education coincides with the explosion in the use of personal cell phones. In 2004, 45% of US students ages 12-17 owned cell phones (Lenhart, Ling, Campbell & Purcell, 2010). According to Pew Research Center in 2010, that percentage has risen to 75%. Applying that percentage to a typical classroom of 28 students means that 21 of them have a cell phone in their possession each day while attending school. While cell phones may feature a variety of functions, all cell phones meet the general criteria of a wireless, mobile, portable and handheld device that can be used for learning and educational purposes (Traxler, 2009).

Given the proliferation of cell phones among teenage students, schools have had to revise their internal cell phone policies. When cell phones first became available, school districts enacted strict no cell phone policies in concert with previous policies for electronic handheld devices such as computer games, beepers, cassette and CD players and iPods (Nielsen, 2012). New York City schools banned all electronic devices since the early 1980s and cell phones are also banned in schools in Detroit (Associated Press, 2009). More recently, some schools have begun to revise their electronic device policies to allow students to carry electronic mobile devices and to use them for instructional purposes at the discretion of classroom teachers (for example, Spring-Ford Area School District, 2011). Some teachers are actively searching for ways and lessons to engage their students through cell phones and other mobile devices. Other teachers would not consider allowing students to use their cell phone or electronic mobile devices in their classroom (Jones, 2001).

Banning Cell Phones from School – Not an Option

As schools were struggling to adjust to the increase focus on PEMDs, the internationally-known National School Safety and Security Services Company (2010) cited five reasons for cell phones bans in schools: 1) bomb threat potential – students can use their cell phone to call in a bomb threat (real or fake) during school hours, 2) bomb detonation – a cell phone can be used to detonate a bomb, 3) rumors spreading and misinformation dissemination – the potential for rumors and miscommunication during a crisis that can potentially disrupt and delay public safety response efforts, 4) students' calls to parents and media outlets creating increased traffic and congestion in an actual crisis - public safety response hindered with accelerating parental or media response to the scene of an emergency, and 5) phone system shutdown - potential overload of a cell phone tower with significantly increased non-essential calls, thereby reducing the likelihood of essential communication among the administration and public safety officials. Hetrick (2010) described an incident in which a high school building principal stated that, during a bomb scare, students used their phones to call parents to pick them up causing a scene outside the school and forcing the administration to shift their attention to the parents' requests for pick-up as opposed to the overall safety of the entire school community. In another case, cell phone use to order a pizza while the school was being evacuated because of a bomb threat added more traffic and confusion in the midst of an already challenging situation (Hetrick, 2010).

A recent study at the collegiate level found that 99.8% of college students have a cell phone and that Smartphones are accounting for more of their electronic communication needs than ever before (Zielger, 2010). The cell phone, much like the traditional land-line telephone, was originally designed for oral communication between two people. Cell phones are portable and able to be stored in pockets or bags during the school day. A Smartphone is a cell phone with advanced feature capabilities that can include a personal computer operating system, e-mail and Internet access (Dictionary.com, 2011). Historically, schools have not had to worry about the use of land-line telephones as a student discipline issue or a classroom disruption because the adults in the schools controlled access to them. In the 1980s, pagers and beepers represented a technological advance that forced schools to develop official policies regarding usage of this new technology. Pagers and beepers were associated with drug dealing; students in possession of a pager or beeper were likely to be viewed as being associated with drugs (DeLisio, 2007). Most schools banned beepers and all other electronic devices because they were thought to lack educational value, disrupt the learning environment and promote crimes.

Two major U.S. events over the course of two and one-half years led many school officials, teachers, parents and students to question and modify their positions on the possession of cell phones in schools. The tragic events at Columbine High School in April 1999 and the terrorists attacks in New York City on September 11, 2001, profoundly influenced people's need for increased communication and the ability to contact one another during an emergency. In each of these events, many victims were able to communicate with loved ones and to assist emergency personnel through the use of personal cell phones. In the Columbine High School situation, students from inside the school were able to communicate with police, rescue and family members outside the school to aid and support the evacuation of students. With the increased threat of school shootings, and the potential for violence and terrorist acts, communication between parents and students has become an increasingly used rationale for allowing cell phones in schools.

In addition to emergency situations, people use cell phones and Smartphones to assist them with the normal complexities of life. During the end of the 1990s and continuing into the 2000s, cell phone technology improved to the point that cell phones were not simply a communication device but rather a Personal Digital Assistant (PDA). PDAs that include such features as calendars, addresses and phone number lists, electronic reminders, to-do and tasks lists, and important birthday notices, grew in popularity. Kennedy, Smith, Wells and Wellman (2008) reported that in married-with-children households, the ownership of multiple PEMDs is a standard feature of family life; 89% of married-with-children households own multiple cell phones, and nearly half (47%) own three or more mobile devices. With the majority of family members having access to a cell phone, communication between family members now relies heavily on the following cell phone features: calling, voicemail, texting, e-mail or posting on social media websites such as Facebook and Twitter.

Using Portable Electronic Mobile Devices in the Classroom

The dilemma is clear: schools are forced to navigate the increasingly complex issue of students' PEMDs and their features and applications. At the same time, schools need to adopt reasonable and workable school board policies regarding PEMD usage. Classroom teachers are faced with the reality that a majority of the students sitting in class possess a PEMD (Lenhart, Ling, Campbell & Purcell, 2010). Some school districts and school boards are beginning to question the traditional "No Cell Phone" policy in order to embrace PEMD technology in certain areas. Similar to the Spring-Ford Area School District, North Penn School District in Lansdale, PA, changed its "No Cell Phone" policy during the 2011-12 school year to allow students at the high school to use their PEMDs in designated areas of the school. Students at North Penn High School were allowed to use text messaging and listen to music with headphones in the cafeteria and in study halls but not in the classroom (North Penn School District, 2011). The policy change acknowledged the significant impact of PEMDs in the lives of students outside of school and the attempt to reduce the discipline issues associated with the ban on the devices in school. Students' use of their PEMDs outside of school familiarizes them with an environment that supports exploration of learning, whenever and wherever, versus the restriction of technology use in the school environment (Nielsen, 2009). Nielsen made a plea to educators to tap into the skills, interests and technology already at the fingertips of the students because it will excite the students and increase learning.

Today's students are considered "Digital Natives" whereas many of today's teachers, who did not grow-up in the digital age, are considered "Digital Immigrants" (Prensky, 2001). In an effort to integrate technology into classroom lessons, teachers may use the school computer laboratory so that all students can access the Internet for specific projects and assignments. However, by allowing students to use their PEMDs in class to directly support a lesson, only a few computers for students without a PEMD or Internet access, rather than an entire lab of computers, may be needed to provide the entire class with individual access to the Internet (Lenhart, Ling, Campbell and Purcell, 2010). Some of the most accomplished teachers and professors in the world are sharing materials and lectures on websites and through various media outlets such as iTunesU, Academic Earth and YouTubeEDU. Teachers and schools that want to expose students to the best teachers and professors in the world have the technological capability to bring them to any classroom at any time through the use of PEMDs.

As a first step, some teachers allow students to use their cell phones in an attempt to create excitement and increase engagement in their classrooms. The website Polleverywhere.com allows teachers to embed multiple-choice questions within a classroom lesson or presentation that students can answer by text messaging a specific selection to a predetermined number. Students' responses are calculated in real time; the teacher and students are able to review group responses together in class, on the screen. The teacher has the capability to quickly assess if the class has mastered the content or if modifications are needed to the lesson plan. The students are able to see the importance of following the lesson and being ready to answer questions at any time during a class period. Websites like Polleverywhere.com are economical alternatives to "electronic clickers" or expensive time-consuming student response systems. Simply allowing students to use their phone for part of an in-class lesson increases student interest and allows them to use a familiar tool as a part of the learning process. PEMD in the hands of students increases active learning and reduce distractions in the classroom (Fang, 2008).

Even more advanced uses have been suggested and are still being developed. The NEC Corporation is developing speech-to-text translation software between Japanese and English that will allow students to use their cell phones to communicate with people around the world in real-time about curriculum, academic projects or assignments about local cultures (Troaca, 2007). Kolb (2011) lists seven different classroom activities using cell phone technology that are designed to excite students about learning while accomplishing all of the curricular goals for the course. The activities include podcasting, oral quizzes, mobile geotagging, digital storybooks, photo projects, classroom response systems and information gathering. Many teachers are discovering that a basic cell phone can be the “Swiss Army knife” of digital learning tools (Kolb, 2011).

Increasing access to information and using authentic assessments to score student work is another theme that teachers tend to allow for the use of PEMDs in the classroom. Google created a specialized search engines that allows students to submit a query and receive results via text message (Geary, 2008). This search engine allows students to quickly obtain information that previously would have required access to a computer and the Internet (Geary, 2008). Students can use this information to participate in a classroom discussion or support a group project activity. Students can also share the information with fellow classmates by forwarding the text message response. Some world language classrooms have incorporated PEMD technology that permits students to use cell phones to call specific voicemail boxes that allow them to practice speaking a language (Roche, 2009, personal communication). The teacher can then call the voicemail box after class and listen, critique and provide feedback to the students about their pronunciation and conversation in the language.

Due to the increase in student PEMDs and the potential for use in learning, schools are beginning to revisit the usage policy and practice on PEMDs in the school setting with discussions of “Bring Your Own Device” programs (for example, Shein, 2012, Stanley, 2012). Financially-challenged schools and those struggling to fund advanced technology purchases are beginning to allow students to use their own PEMDs for classroom lessons. Schools that have a limited number of digital cameras or limited access to the Internet can use the recording features of cell phones to capture images of projects, class work or presentations for placement on the school district website or on the Internet for parents, students and community members to view (Johnson & Kritsonis, 2007). In addition, PEMDs can assist students and teachers with their research projects. Digital picture and video capabilities of PEMDs allow teachers to monitor student progress and accomplishments on projects because students can record updates, take pictures and document the various stages of a project.

In describing the current status of technology use, the Joan Ganz Cooney Center in 2009 found that schools have five opportunities to use mobile learning to improve education: 1) encourage "anywhere, anytime" learning – PEMDs allow students to gather, access and process information outside the classroom, 2) reach underserved children – the cost of mobile technology is far less and students may have greater access to PEMDs than a desktop computer, 3) improve 21st century interactions – supportive lessons that foster collaboration and communication for future success, 4) fit with learning environment – PEMDs including cell and Smartphones can overcome challenges larger technologies present and work well in the classroom and 5) enable a personalized learning experience – adaptable instruction can meet the needs of the individual and diverse learners with the use of mobile technology (Shuler, 2009).

Challenges and Concerns Created for Schools with PEMDs

Although PEMDs have increased the range of options on how instruction is delivered, teachers and school leaders are faced with balancing the benefits of m-learning with legitimate concerns and challenges about student misuse of their PEMDs and the lack of adequate professional development dedicated to m-learning techniques. Standard PEMD features allow the Smartphone to function well beyond the ability to make a phone call, thus increasing the potential for disruption and complicating ways of preventing disruptions. In addition, PEMDs can negatively affect a classroom lesson. For example, the ring of an incoming call is enough to disrupt the learning environment for a few minutes. In this situation, teachers must stop instruction to address the issue, possibly collect the device, and then follow-up with an administrator about the rule violation.

Besides creating a disruptive event, the proliferation of PEMD technology and its use may be the catalyst for increased rule violations such as cheating. A student with a PEMD featuring a calculator function may use it during a math or science test without permission. Students may also gain unapproved assistance in solving advanced equations through pre-programmed formulas and answers that they are expected to have committed to memory. Some students have used PDAs to pre-record answers to tests that they later listen to during assessments (Messmer, 2008). Cheating can easily take place through the use of text messaging (sending of short notes, pictures or website addresses) from one student to another. The use of text messaging among students may lead to unauthorized sharing of exam questions or answers as well as help from friends not in the classroom.

Texting behavior is problematic well beyond the challenges associated with cheating. Lenhart, Ling, Campbell and Purcell (2010) found that text messaging was the most frequently used method of communication for adolescent students because it provides them with the ability to share information quickly and to communicate with anyone during the school day. Teachers and school officials have no control over the content students may be texting. Text messaging during class, lunch or recess, in the bathroom or during the passing time between classes creates the potential for sending inappropriate or threatening messages to one another in a bullying or harassing way (Johnson & Kritsonis, 2007, Cohen, 2008). In some situations, students in the same class will text each other while in the same room and thus participate in a sidebar conversation without paying attention to the classroom lesson or teacher. It is also possible that the students are communicating with people outside the school (Borkar, 2010).

The availability of PEMD technology and the implications its uses may have on the personal rights of students and school personnel is also of concern to districts. Many PEMDs have the ability to take pictures and videos that can violate student and teacher privacy rights. Traditionally, cameras (film and digital) have been considered a PEMD and have generally not been allowed in school. Exceptions are made for their use at specific events such as school dances, musical performances or for special celebrations. PEMD technology has embedded miniature cameras within devices that are hard to detect when used. Students often carry their phones in their pockets or backpacks and can easily snap a picture in any area of the school including the classroom, lunch room, hallway, lavatory or office area. PEMDs have also been reported in recording pictures and videos in student locker rooms, the nurse's office, student and teacher lunch rooms and during school bus trips.

The issues go beyond the images themselves because they may be shared with others. In 2008, a case in Parkland School District in Allentown, PA disrupted the entire school community when nude pictures of two underage female students were shared with at least 40 students through the technology of cell phones (Associated Press, 2008). The legal ramifications regarding the possession of child pornography in this case forced the school and community to deal with the implications of the misuse of cell phone technology. Another case involving six Pennsylvania high school students from Greensburg Salem School District in Greensburg, PA was filed in regard to "sexting" inappropriate pictures of themselves to others (Brunker, 2009). The charges facing the six teenagers include manufacturing, disseminating and/or possession of child pornography. In both of these cases, no evidence existed that the pictures were taken on school grounds; however, the pictures were taken and shared using the students' cell phones which became an educational disruption at each school. These cases became more complicated because the cell phones containing the inappropriate and illegal pictures were with the students on school grounds. Once a picture or a video is taken or received on a PEMD, additional features of the device, such as text messaging or access to the Internet, allow the images or files to be sent to others and be posted on public websites, which can result in a disruption to the school as it did in this case.

Hayden (2008) posed a key question that may cause many teachers to be cautious of their actions on a daily basis: “Who would think that a teacher’s bad day could be captured on a cell phone and posted on YouTube?” This question may cause many to pause and can negatively influence their interest in considering using technology in the classroom. PEMD pictures and videos can be uploaded to websites and posted on the Internet before the class or lunch period is over. A Google search of “angry teacher,” revealed over a million results ranging from pictures to unauthorized video clips of teachers yelling at students (Hayden, 2008). Lynne (2007) addressed the recording of teachers in terms of “no one being perfect” but misbehavior or inappropriate conduct of administrators, teachers, and students alike should be reported to the designated intake person, not posted on the Internet. Even if the picture or video recording is removed from the Internet, the damage may already be done in terms of rumors, reputation and embarrassment for the teacher, school and district. A teacher hearing about another teacher having a video posted on the Internet is enough for them to never consider using any m-learning techniques or allowing students to use their PEMDs.

The ability of PEMDs to access the Internet and websites also presents another challenge to schools. Often firewalls and filters only allow school-owned computers to access websites that have been deemed “appropriate” for school access. However, student PEMDs may have the capability to connect with the Internet separately from the school’s network without any filtering to block inappropriate content or websites. As a result, students with PEMDs may have complete access to the content on the Internet and may be able to share unfiltered content with classmates. Recent legislation has been enacted to assist schools in addressing these issues. The Children's Internet Protection Act (CIPA) of 2000 appropriated funds and provided technology discounts to elementary and secondary schools to support the adoption of Internet use policies and filters to prevent minors from gaining access to sexually explicit, obscene or harmful materials (National Council of State Legislators, 2011). In Pennsylvania, state law requires school boards to adopt and enforce acceptable use policies for the Internet and software programs including the selection of on-line servers that block access to material that is harmful to minors (National Council of State Legislators, 2011). However, the question of liability remains when students use their own PEMDs to access inappropriate material while on school property or during school time. For security purposes, most schools have not moved towards allowing external computers and PEMDs to access the school district Wi-Fi or Internet. Fang (2008) found that The Liverpool Center School District of New York had to ban the use of laptops and personal cell phones because of Internet distraction and disruptions. Teacher complaints about student abuse and distractions in class led to the school phasing out the high school laptop program (Fang, 2008).

Some principals have taken strong action in their schools to control the use of PEMDs, specifically cell and Smartphones, by installing cell phone jammers in their schools. A principal in British Columbia engaged in this tactic only to learn that it is illegal to do so in Canada (Alleyne, 2009). Similarly, in June 2005, the Federal Communications Commission of the United States of America issued a Public Notice entitled *Sale or Use of Transmitters Designed to Prevent, Jam or Interfere with Cell Phone Communications is Prohibited in the United States*

(Federal Communications Commission of the United States of America, 2005) that forbids U.S. schools to install cell phone jammers to block or jam the signals of cell phones on their campuses.

Each example of the misuse of a PEMD in the news or discussed in the teacher lounge pushes teachers who are not comfortable with m-learning techniques further away from reaching the previously discussed educational benefits. Clearly, providing teachers and administrators with adequate training on m-learning techniques will help to overcome this hesitation. With all of the educational initiatives currently in progress in schools, time is a key factor in the success of each of the programs. Professional development is needed for teachers to understand m-learning, its educational benefits and the best practice methods to implement m-learning techniques. For m-learning to be successful and for students to reach their potential through m-learning techniques, a school or district needs to partner with the teachers to understand their perception of m-learning and then develop a plan for successful implementation of m-learning.

Measuring Teacher's Perception and Readiness for M-Learning

Typical of any change process, the integration of PEMD technology into the classroom is at the early stages with a small number of teachers breaking the mold and integrating cell phones into their classroom lessons. For technology integration and m-learning to be fully implemented, the techniques and strategies need to be common across all classrooms and all teachers, and students and parents need to be aware of the expectations. Researchers are developing scales and survey instruments to study and evaluate both teachers' attitudes toward the use of PEMDs and their overall perceptions of m-learning. During an extensive literature review, the researcher consistently found two instruments that reported a high level of reliability and validity in measuring teachers' perceptions or attitudes toward m-learning. Although not interchangeable, a teacher's perception to a change in their practice as well as their personal attitude toward the change can significantly influence the successful implementation of m-learning (Chao, 2005; Uzunboylu & Ozdamli, 2011).

The two effective instruments are the Teachers' Attitudes toward the use of Mobile Technologies in the Classroom (TAMTC; Chao, 2005) and Mobile Learning Perception Scale (MLPS; Uzunboylu & Ozdamli, 2011). The instruments vary in their approach to surveying teachers in terms of assisting with readiness for m-learning. TAMTC measures three constructs of an attitude: cognitive – belief, affective – feeling, and behavioral – a readiness or intent for action (Chao, 2005). MLPS measures teacher perceptions based upon a literature review of m-learning as well as an analysis of feedback from teachers' responses, including their feelings, opinions and attitudes toward m-learning (Uzunboylu & Ozdamli, 2011).

The differences in scale development for each instrument produced different approaches to address a common goal of teacher readiness for success with m-learning strategies. For example, TAMTC describes the value of data about teachers' attitudes in helping to assess teacher readiness to incorporate new technology resources into the classroom as well as a way to create professional development sessions about the flexibility and value of m-learning strategies. In contrast, MLPS describes the value of data about teachers' perceptions as integral because the importance of teaching using the best strategies available that connect and engage the students. The MLPS was constructed with the premise that a positive perception about m-learning will ultimately support student success and increased achievement.

The instruments seek to measure the construct of teachers' responses by soliciting teachers' perceptions or attitudes on statements about m-learning. Each instrument offers a set of items based upon an extensive literature review, a critical examination by experts in the field to provide suggestions on the items and wording as well as test trials of the instrument. MLPS took an additional step by incorporating responses from teachers who were asked to write a composition about their feelings, opinions and attitudes toward m-learning. The information collected from the compositions was incorporated into the literature review as a part of the initial statement development. The instruments use a Likert scale format. Respondents must answer within the given scale. The instruments reported coefficient alphas for reliability for the entire instrument as follows: TAMTC (.85) and MLPS (.97). The factor analysis with TAMTC revealed data that loaded consistently with the three constructs of attitude (Chao, 2005). TAMTC was considered moderately reliable based upon the sample and two expert review panels made adjustments to the instrument to insure content validity and reliability (Chao, 2005). MLPS also used factor analysis to determine validity resulting in sample score for the Kariser-Meyer-Olkin of 0.97 and the Barlett Sphericity tests found 10,163.31 ($p < 0.001$) for the study (Uzunboylu & Ozdamli, 2011). MLPS found three factors in teachers' perception of m-learning. Pearson Correlation was calculated to observe the interaction among the dimension of the factor analysis and it was concluded that the interaction was strong with a 0.79 overall.

However, several limitations surround each instrument. The limitations do not necessarily preclude accurate measurement of the construct. Nevertheless, each instrument is to some degree affected or influenced by these limitations. First, no single or accepted definition of m-learning exists in education so teachers are starting with different preconceived information based solely on their understanding of the term m-learning. Teachers participating in TAMTC all attended a workshop that presented ideas on how to integrate various technology resources into teaching before they were administered the instrument. As part of the administration of the MLPS, teachers were directed to access a website designed to provide beneficial information about m-learning including advantages and limitations. In the administration of each instrument, information about m-learning was shared prior to participation. Therefore, the results may not accurately represent the attitudes or perception of teachers in situ. Second, by using a Likert scale exclusively, the instruments limit the ability of the teacher to respond to or to provide clarity about a specific item. The two instruments provide no other avenue of gathering information. The third limitation is the applicability of using instruments to specific teacher samples. For example, the MLPS was completed in Turkish Republic of Northern Cyprus, raising the question of the applicability to American teachers. In addition, the MLPS was developed specifically for secondary school teachers but all levels of education are faced with m-learning and the increased use of PEMDs in the classroom. TAMTC was administered to 150 heterogeneously mixed K-12 teachers (location of teachers not known). The small sample size across the grade span of 13 years of education limits the generalization at each grade level or commonly accepted grade divisions of elementary, middle, or secondary. A larger sample size is needed to provide information about the attitudes across the grade levels.

After an evaluation of the strengths and weaknesses of the two instruments, MLPS presents the most promise in measuring teachers' perceptions and readiness to successfully implement m-learning strategies. The first reason for selecting MLPS is the overall process, design and analysis used in creating the instrument and the focus on establishing reliability and validity. In creating and testing the MLPS, a four-stage process was used that included a literature review incorporating teachers' opinions, a review by specialists and university faculty members in regard to content and validity of appearance of the scale, pre-trial testing with 150 teachers for reliability and validity, and a final review of the pre-trial results to insure a comprehensive instrument. The second reason for selecting the MLPS's is the relevance of the instrument in the face of recent m-learning advancements. MLPS was developed in 2010 whereas TAMTC was developed in 2005. Significant changes in education as well as advances in PEMD technology have occurred in this short time span thus supporting the use of a more recently created instrument. MLPS incorporates the concepts of Constructivist Learning Approach as well as acknowledges the reality that many teachers and students are not on the same technology proficiency level in terms of familiarity and experience with PEMDs. In addition, the researcher was able to obtain approval from the researchers of the MLPS to use and test the instrument with an American sample.

Research Questions

It is important for instructional leaders to understand teachers' perceptions about any changes in practice. M-learning and technology advances in the classroom are no exception. The current push from the school and local community for more technology use in schools increases pressure for teachers to integrate technology into classroom practices. Increased pressure is added when such a large number of the students in the classroom have PEMDs in their pocket. Teachers need to determine the best manner in which to present their lessons and the best way to assess mastery of the content or lesson. However, a teacher may view PEMDs in the classroom suspiciously because of their potential misuse. Furthermore, most teachers' K-12 school experiences as students and in teacher education courses did not involve PEMDs in the classroom. Uzunboylu and Ozdamli (2011) developed the MLPS to examine teachers' perceptions of m-learning. The results from this study are a valuable source of information for school districts in understanding teacher readiness for the change process from e-learning into m-learning. Several survey questions provided detailed insight into teachers' self-reported technology level and the frequency of use for specific hardware, software and Internet-based resources that can be used for making decisions about what kinds of technology and professional development to support.

The primary purpose of this study was to determine the psychometric properties of the MLPS with a sample of K-12 teachers from the United States. The findings were compared to Uzunboylu and Ozdamli's original findings from 2010 with teachers in the Turkish Republic of Northern Cyprus. A secondary purpose of this study was to examine the relationship between teacher perceptions of m-learning and both the school level (elementary, middle or high school) they teach and their self-reported technology skill level (novice, beginner, competent, proficient or expert). The research questions for this study were as follows:

1. Is the MLPS valid and reliable within all levels of education (elementary, middle and high school)?
2. Is there a relationship between school level and teachers' perception of m-learning devices and strategies for classroom instruction?
3. Is there a relationship between self-reported technology skill level and teachers' perception of m-learning devices and strategies for classroom instruction?
4. Is there a relationship between school level and self-reported technology skill level and the use of specific technology resources?

Definition of Terms

- Distance Learning (d-learning): the use of mail and prepared content materials for the delivery of learning; correspondence courses (James & Wedemeyer, 1959)
- Electronic Learning (e-learning): the use of a computer network or web for the delivery of learning (Piskurich, 2002)
- Mobile Learning (m-learning): the use of mobile devices and wireless hand-held computers for the delivery of learning (Ally, 2009)
- Technology Integration: the use of technology tools in the classroom to allow students to apply computer and technology skills to learning
- Portable Electronic Mobile Device (PEMD): mobile devices including cell phones, Smartphones, laptops, tablet computers, netbook computers, MP3 players including iPod, iTouch and Nano and hand-held game players

CHAPTER TWO

METHOD

Population and Sample

The target population for this study was all elementary, middle, and high school classroom teachers in Montgomery County, Pennsylvania public school districts. Montgomery County, PA public schools were chosen because the public schools present a wide-range of academic achievement, student enrollment sizes, ethnic diversity and socio-economic (free and reduced lunch) students. Although 23 school districts reside in Montgomery County, PA, only 22 were invited and considered a part of the target population. Bryn Athyn School District does not have any public schools or teachers to participate in the survey. Bryn Athyn contracts all of their education services and supports for the students residing in the school district to other local school districts.

Table 1 presents the distribution of characteristics for the 22 school districts in Montgomery County, PA. The average enrollment in the Montgomery County, PA public school districts is 5,051. The average district reading proficiency on the Pennsylvania System of School Assessment (PSSA) is 91.2% and the average district math proficiency on the PSSA is 95.4%. The average percentage of economically disadvantaged students as measured by the PSSA is 15.4%. The ethnic distribution of the county is 73.6% White; 12.9% Black; 4.6% Hispanic; 7.1% Asian/ Pacific Islander; 0.1% Native American/ Alaskan Native; and 1.5% Multiracial. In addition, five of the districts included in the target population extend their borders into other counties (Districts 2 & 21 extend into Berks County, Districts 11 & 15 extend into Bucks County, and District 17 extends into Chester County).

Table 1

Demographic characteristics of Montgomery County, PA Public Schools (n=22)

School District	Total Enrollment	District Reading Proficient (%)	District Math Proficient (%)	Economic Disadv. (%)	Ethnic Distribution (%)					
					W	B	H	A/PI	AI	Mu
District 1	7464	96	97	11	68	22	4	5	0	0
District 2	7091	94	95	12	95	1	1	2	0	1
District 3	4440	94	95	9	40	48	3	9	0	0
District 4	4658	98.	99	14	80	8	2	5	0	4
District 5	4904	97	98	5	86	5	3	5	0	0
District 6	621	96	98	10	83	8	4	3	0	2
District 7	7212	97	98	6	80	8	2	8	0	2
District 8	2117	97	97	2	82	1	1	15	0	0
District 9	5281	96	96	4	76	4	3	14	0	4
District 10	6813	79	84	71	25	45	24	2	0	3
District 11	12698	95	97	10	69	8	4	19	0	0
District 12	5895	95	96	9	86	5	3	6	0	0
District 13	3300	91	91	23	77	17	4	2	0	0
District 14	3090	83	86	67	46	40	12	1	0	1
District 15	6736	95	97	9	86	4	4	5	0	1
District 16	2133	93	95	7	76	14	4	4	0	2
District 17	7729	96	97	8	85	4	3	5	0	2
District 18	4267	97	96	7	77	8	2	12	0	2
District 19	3791	34	98	12	64	9	8	15	1	3
District 20	3054	93	95	14	82	8	4	5	0	2
District 21	3175	94	96	19	92	3	3	2	0	0
District 22	4645	96	97	9	64	14	4	13	0	5

Note: W=White; B=Black; A/PI = Asian/Pacific Islander; AI = American Indian/Alaska Native; Mu = Multiracial. All percentages were rounded to the nearest whole number

For this study, K-12 classroom teachers included teachers from the following subject matter areas who were full-time and considered to be teachers of record for students: English/Language Arts, Social Studies, Math, Science, Reading, World Language, Art, Business, Computers, Family and Consumer Science, Music, Health and Physical Education, Technology and Engineering. The target population included special education, English as a second language (ESL) and gifted support teachers in the identified content areas but excluded teachers who were not regularly designing lesson plans for their students or who had lessons prescribed as a part of a student's educational plan: guidance counselors, nurses, speech-language clinicians, home and school visitors, school psychologists, and social workers. The 22 school districts in Montgomery County employed 8,467 classroom teachers during the 2011-12 school year (Roche, 2012, personal communication). Table 2 presents the number of elementary school, middle school and high school teachers by district during the 2011-12 school year.

Table 2

Elementary, Middle and High School Teachers in Montgomery County, PA Public School Districts

School District	Total Classroom Teachers	Elementary School Teachers	Middle School Teachers	High School Teachers
District 1	541	303	118	120
District 2	482	242	123	117
District 3	376	194	60	122
District 4	377	180	90	107
District 5	426	183	102	141
District 6	56	24	16	16
District 7	617	239	158	220
District 8	162	55	41	66
District 9	418	221	74	123
District 10	495	193	149	153
District 11	943	469	249	225
District 12	396	175	113	108
District 13	266	123	68	75
District 14	244	127	56	61
District 15	498	240	133	125
District 16	182	75	43	64
District 17	579	317	102	160
District 18	331	145	81	105
District 19	284	114	86	84
District 20	211	86	57	68
District 21	214	86	59	69
District 22	369	165	88	116
	8467	**3956**	**2066**	**2445**

Procedure

The proposal for this study was presented in-person at the September 13, 2012 Montgomery County Superintendent's Council Meeting. Eighteen of the 22 superintendents were present and listened to the five-minute presentation and request for approval to conduct this study in their school district. Because time was limited to discuss the study in great detail, all 22 superintendents were sent a formal e-mail invitation (Appendix A) to participate on October 2, 2012. The initial e-mail resulted in six yes responses and one no response. A follow-up e-mail invitation (Appendix B) was sent to the non-respondents on October 11, 2012 and seven additional yes responses were received. One final e-mail invitation was sent to the non-respondents on October 19, 2012 and three additional school districts gave permission for this study to be conducted in their districts. The final number of school districts that agreed to conduct the study was 16 out of 22, or 73%. In one school district, District 9, the researcher was directed from the central office to the high school principal for approval. The high school principal approved the survey to be conducted with the high school staff but was not able to provide approval for the rest of the district. An email was sent back to the central office contact seeking permission to include the elementary and middle school teachers, but a response was never received. As a result, the high school teachers from this district were included in the stratified sampling process at the high school level but teachers from this district were not represented in the elementary or middle level sampling process. Table 3 presents the sixteen school districts that participated in this study and the number of surveys sent to each district by school level.

In the invitation letter, a second request was made for a file or list of teacher e-mail addresses. Only two school districts (District 10 and District 15) provided a list of teacher e-mail addresses by grade level or school. The remaining 14 districts understood that the researcher would use the district website to create the master list of e-mail addresses. However, two unresolved issues had an impact on the sampling procedure. In two districts, District 1 and District 14, the webpage for each high school did not provide information that allowed the researcher to distinguish between the classroom teachers and all other faculty and support staff members. The website provided an alphabetical list of employees and their e-mail addresses. An e-mail request was made to each of the school district contacts to provide a list of the high school teachers. No response was received from either contact. As a result, both high schools were not included in the sampling process.

Table 3

Participating School Districts and the Targeted Distribution of the Initial Sample

School District	Total Surveys Sent	Elementary Surveys Sent	Middle School Surveys Sent	High School Surveys Sent
District 1	38	20	18	0
District 2	46	17	16	13
District 3	31	8	9	14
District 4	6	2	2	2
District 5	39	15	9	15
District 6	82	32	28	22
District 7	40	13	13	14
District 8	28	9	9	10
District 9	16	0	0	16
District 10	18	5	6	7
District 11	62	17	26	19
District 12	32	10	10	12
District 13	28	8	10	10
District 14	8	4	4	0
District 15	18	6	5	7
District 16	30	8	9	13
	522	**174**	**174**	**174**

The stratified random sampling process started with a master teacher-list of e-mail addresses. The list contained a total of 2,153 elementary teachers, 1,326 middle school teachers and 1,424 high school teachers. In comparing the sample sizes determined for each analysis in this study (factor analysis – 520 and multiple regression analysis – 186 teachers), the overall sample size for this survey was determined to be 522 teachers, equally divided among the three strata – 174 elementary, 174 middle school and 174 high school teachers. E-mail invitation letters (Appendix C) were sent to all 522 teachers on October 26, 2012 with two follow-up e-mail reminders on November 4, 2012 and November 11, 2012, respectively. Two-hundred and twenty-four teachers participated in the study for an overall return rate of 43%. Eight participants selected a different school level from the school level they were randomly selected to represent. Six of the eight who were randomly selected as middle school teachers based upon their school designation instead identified themselves as elementary teachers; two who were selected as elementary school teachers chose middle school. These eight participants were assigned to the school level they selected. Both the elementary and high school levels each had 80 teachers respond for a 46% return rate per level. The middle school level had 64 teachers respond for a 37% return rate. Table 4 presents the number of teachers who completed the entire survey by district. When comparing Table 1 and Table 4, the school district numbers do not necessarily match in an effort to maintain anonymity for each participating school district.

Survey Instrument

The MLPS is a 26-item measure designed to assess teachers' perceptions of m-learning in 2010 with a population of secondary school teachers in the Turkish Republic of Northern Cyprus (Uzunboylu & Ozdamli, 2011). The response format of the original MLPS was a Likert scale that provides five choices ranging from "strongly agree" to "strongly disagree." For this study, a sixth option of "Don't Know" was added to the five-choice Likert scale because participants may not be familiar with particular m-learning practices. In the Uzunboylu and Ozdamli, 2011 study, teachers were provided an overview of m-learning including benefits, advantages and limitations before taking the survey. This step was not repeated in this study because the current research project examined the current perceptions of teachers about m-learning without an influence from an administered experience.

Table 4

Participating School Districts and the Survey Return Data

School District	Total Surveys Sent	Total Surveys Completed	Surveys Completed In District	Percent of Completed Surveys
District 1	38	7	18%	3%
District 2	46	13	28%	6%
District 3	31	9	29%	4%
District 4	6	4	67%	2%
District 5	39	21	54%	9%
District 6	82	33	40%	15%
District 7	40	18	45%	8%
District 8	28	10	36%	4%
District 9	16	9	56%	4%
District 10	18	11	61%	5%
District 11	62	40	65%	18%
District 12	32	12	38%	5%
District 13	28	17	61%	8%
District 14	8	2	25%	1%
District 15	18	5	28%	2%
District 16	30	13	43%	6%
	522	**224**		**100%**

Prior to the pilot study, nine of the original 26 items were modified to clarify specific words/phrases that did not easily translate for American teachers. The word *applications* was replaced with *techniques* to avoid any confusion with the term *applications* as it relates to mobile device apps and specific downloadable programs. The words *content/grade level* in two items was substituted for *branch.* This change was made because the instrument was administered to K-12 teachers rather than subject-specific secondary teachers and the term *branch* is not commonly used in U.S. schools to describe content or the specific subject taught. One final pre-pilot adjustment was made to clarify the definition of MMS messaging (Item 19). MMS messaging is a multimedia messaging service used to send and receive content or text messages, including the exchange of videos, text and pictures via mobile device. The change to item 19 replaced MMS with *text, video or picture messages.* Table 5 presents the updated MLPS survey items that were changed prior to the pilot study.

Table 5

Mobile Learning Perception Survey – Initial Researcher Changes from Original Instrument Development

Item Number	Survey Statement
2.	M-learning **techniques** ~~applications~~ do not generate effective learning-teaching environments
4.	I can use M-learning **techniques** ~~applications~~ as a good discussion tool with my students in the learning activities
6.	M-learning **techniques** ~~applications~~ can be used to supplement the traditional education
7.	Learning activities can be realized by means of M-learning **techniques** ~~applications~~ in e-learning
9.	M-learning **techniques** ~~applications~~ facilitate teaching the subjects in my content/grade level ~~branch~~
10.	M-learning **techniques** ~~applications~~ is a good method in learning my specialized subject
14.	I can have a prompt access to materials that I need which is related to my content/grade level ~~branch~~ by means of mobile technologies
15.	M-learning **techniques** ~~applications~~ are reliable for personal use
17.	M-learning **techniques** ~~applications~~ is a good method for the interaction, which is necessary in my class
18	M-learning **techniques** ~~applications~~ are convenient to share my specialized knowledge with my colleagues
19.	Course materials could be sent to students via text, video or picture messages ~~MMS~~ messages
24.	M-learning **techniques** ~~applications~~ provides a convenient environment to do discussions on my specialized subject

Note: New Word/Phrase in Bold and Original Word/Phrase with Strikethrough

Eighteen teachers from three different Montgomery County, PA school districts were invited to participate in the pilot study with two teachers representing each level per district. Fourteen of the 18 teachers (District 2 – four teachers, District 11 – five teachers, District 17 – five teachers) responded. The pilot study teachers reviewed the updated MLPS that included the changes in Table 5. During the pilot process, 12 of the participating teachers recommended inserting the definition of m-learning to the survey as both a reference and to establish a common definition for all. A total of 17 of the 26 survey items were not changed or were only edited to correct a grammar or punctuation error. The nine remaining survey items were changed in order to clarify the question by either inserting a definition or common term or by rewording the statement. For the data analysis, survey item 2 was recoded to be consistent with all the other items because it was the only negatively worded item. Table 6 presents the final version of the nine edited items (post pilot study) that were a part of the final MLPS used in this study (see Appendix D for the final version of the survey used in this study).

Data Analysis

Validity: Factor analysis. Validity refers to the appropriateness, correctness, and usefulness of the inferences a researcher makes (Uzunboylu & Ozdamli, 2010; Cherry, 2012). The first research question directly tested the validity of the MLPS in relation to a sample of teachers from the U.S. Uzunboylu and Ozdamli (2005, p. 552) found three factors during the original factor analysis of the MLPS with a sample of secondary school teachers in Turkish Republic of Northern Cyprus as follows:

I. Aim-Mobile Technologies Fit (A-MTF) – contained statements that described the appropriateness of m-learning – eight items.

II. Appropriateness of Branch (AB) – contained statements about the appropriateness of m-learning to teachers' branches (content area) – nine items.

III. Forms of M-learning Application & Tools Sufficient Adequacy of Communication (FMA & TSAC) – contained statements about the place of m-learning in education and the sufficient merits of the applications of m-learning for the purpose of communication – nine items.

Table 6

Mobile Learning Perception Survey – Pilot Study Changes to Survey Statements

Item Number	Survey Statement
1.	M-learning tools remove the limitation of time and space **from traditional resources.**
3.	The Teaching-Learning process **(planned interaction that promotes behavioral change that is not a result of coincidence)** should be performed with M-learning technologies.
6.	M-learning techniques can be used to supplement **or in place of** the traditional education
7.	Most learning activities can be realized by means of M-learning **techniques and strategies** ~~applications in e-learning.~~
10.	M-learning techniques **provide an effective method** ~~is a good method~~ in learning my specialized content/classroom
11.	M-learning technologies **provide effective methods** ~~is an effective method~~ for exact transmission of knowledge in learning activities
15.	M-learning techniques are reliable for personal use **of learning**
17.	M-learning techniques are a good method **for the necessary interaction** ~~for the interaction, which is necessary~~ in my class
20.	M-learning **methods enhance** ~~systems increase~~ the quality of lessons

Note: New Word/Phrase in Bold and Original Word/Phrase with Strikethrough

The data for this study were also analyzed using exploratory factor analysis from SPSS to determine if the three factors identified by Uzunboylu and Ozdamli in the sample of Cyprus teachers would emerge in a sample of U.S. teachers. The exploratory factor analysis was conducted with Varimax rotation with Kaiser Normalization, assuming low or near-zero interfactor correlations. Both the Kaiser-Meyer-Olkin test and Bartlett's test of sphericity were performed for the purpose of measuring the sampling adequacy to examine the appropriateness of the factor analysis and to examine the hypothesis that the variables were uncorrelated in the population, respectively (American Educational Research Association, American Psychological Association, National Council on Measurement in Education, 1999). The criteria to determine the number of factors to retain in the solution included eigenvalues greater than one with the percentage of variance greater than 5.0% and a scree test (Hair, Anderson, Tatham & Black, 1995). Following the initial examination of the exploratory factor analysis, the criteria were adjusted to retain just three factors and included item coefficients with factors equal or greater than .40.

Due to the addition of the sixth answer choice of "Don't Know" for each of the 26 MLPS survey items, only 128 of the 224 completed surveys provided answers that did not include a single "Don't Know" response or missing data point. As a result, the item specific means were used for "Don't Know" responses to increase the N. The number of "Don't Know" responses for a specific survey item ranged from 12 to 37.

Reliability. Reliability for each factor (or subscale of the MLPS) was measured using Cronbach's alpha (Cronbach, 1951, p. 331). Cronbach's alpha for Uzunboylu and Ozdamli's whole scale was .97 and for each of the three factors were .89, .94, and .94 respectively. Cronbach's alpha for the whole scale in this study was .93 and for each of the three factors were .87, .85 and .75 respectively.

Multiple regression and key variables. The number of factors (dependent variable) was based upon the exploratory factor analysis previously described. For each factor score, a multiple regression analysis was performed to determine the significance of the relationships among the independent variables. The first independent variable entered in the multiple regression analysis of each factor score was school level: elementary, middle, and high school (nominal). This variable included two dummy variables: Middle_school and High_school. The second independent variable was the teacher's self-reported technology skill level on a five-step scale: novice, beginner, competent, proficient and expert (Dreyfus, 2004). Skill level was defined as follows: Novice -- minimal knowledge without connecting technology to practice; Beginner -- working knowledge of key aspects of practice; Competent -- working and background knowledge of technology in practice; Proficient -- depth of understanding of discipline and technology in practice; and Expert -- authoritative knowledge of discipline and deep. One teacher (0.4%) responded as novice, 39 teachers (17.4%) as beginner, 93 teachers (41.5%) as competent, 71 teachers (31.6%) as proficient and 20 teachers (8.9%) as expert. Because of the low response rate for both the novice and expert category in the continuous scale, novice and beginner were combined into one reporting category as were proficient and expert. The responses for the combined categories were 40 teachers (17.9%) in novice/beginner, 93 teachers (41.5%) as competent and 91 teachers (40.6%) as proficient/expert. This variable also included two dummy variables, Skill_Comp and Skill_Profic. Thus, a total of four predictors were used as a part of the multiple regression analysis.

Chi square test. Survey questions one through three asked participants to indicate their use (yes or no) of specific technologies (hardware, software and Internet-based resources) in the classroom on a weekly basis. A Chi Square test was conducted to examine the relationship between the actual responses on the use of each technology component on a weekly basis and the expected responses based upon school level and self-reported skill level. A significant Chi

Square value provides evidence to reject the null hypothesis and conclude that something other than chance is causing the observed responses to differ from the expected responses.

CHAPTER THREE

RESULTS

Research Question One: *Is the MLPS valid and reliable within all levels of education (elementary, middle and high school)?*

Exploratory factor analysis used principal component matrix with a Varimax rotation with Kaiser Normalization. The Kaiser-Meyer-Olkin (KMO) measures of sampling adequacy index for this solution was .92, indicating the data were suitable for factor analysis. Bartlett's Test of Sphericity was significant at (x^2 (325) = 2536.00, p<.05). The exploratory factor analysis was run twice. The first analysis used eigenvalues greater than one with the percentage of variance greater than 5.0% and a scree test. Second, the criteria were adjusted to retain just three factors and include items that correlated at least .40 with a factor. The three factors explained 48% of the variance. The three factors were labeled as classroom strategies/techniques (CST - Factor I): communication – (COM - Factor II); and flexibility/convenience – (FXC - Factor III). The three factors had 11, nine and six items each, respectively. Six items were cross-loaded between two factors. Each of the six items was placed into a factor based upon comparison of the factor scores and analysis of the content connection to the established three factors. One of the 26 items did not meet the .40 criteria for inclusion into the three factor solution: Q3, the Teaching-Learning process (planned interaction that promotes behavioral change that is not a result of coincidence) should be performed with M-learning technologies. In further review of the rotated matrix factor scores, Q3 was assigned to CST – Factor 1 because the score in Factor 1 was .33 and the content related directly to the Factor 1 items. Table 7 presents factor loadings with mean and standard deviation for the three factors.

Table 7

Factor Loadings for Each MLPS Survey Item (n = 224)

Item	Brief Description of Item	Factor I	Factor 2	Factor 3
Classroom Strategies/Techniques (CST)				
Q7	Most activities realized with m-learning	.79		
Q9	Facilitates teaching in my content/classroom	.67		
Q6	Can supplement traditional education	.65		
Q10	Effective method in my content/classroom	.58		
Q8	Can be used for e-mailing lecture notes	.56		
Q11	Effective method for sharing of knowledge	.55		
Q13	Increases motivation	.50	.43	
Q21	Use as a supplement in the future	.48		
Q17	Good method for interaction in my class	..46	.46	
Q2R	Generates ineffective environment	.43	.46	
Q3	Should be used in teaching-learning process	*		
Communication (COM)				
Q22	Facilitates teacher-student communication		.72	
Q16	Increases communication – chat programs		.64	
Q26	Increases communication - traditional ways		.60	
Q25	Access instructional websites with PEMDs		.58	
Q24	Provides convenience for class discussions		.57	
Q15	Reliable for personal use of learning		.57	
Q20	Enhances the quality of lessons	.53	.53	
Q23	Used as a supplement in all classes/subjects	.42	.51	
Q12	Facilitates teacher-student communication		.48	
Flexibility/Convenience (FXC)				
Q5	Allows discussions w/o limits of time/space			.69
Q1	Removes traditional limitations of time/space			.61
Q18	Convenient to share knowledge w/colleagues			.56
Q14	Provides access to content related materials			.56
Q19	Materials could be sent out in many ways		.46	.54
Q4	Used as a classroom discussion tool	.41		.47

Descriptive Statistics

The sixth answer choice of "Don't Know" created missing data for 96 of the 224 completed surveys. The item specific mean was used for any response of "Don't Know" to increase the N. The ranges of "Don't Know" responses were from 12 to 37 for a specific survey item. Table 9 presents the total number of "Don't Know" responses for each survey item for the total sample and the mean and standard deviation for each survey items by factor including the mean and standard deviations for each survey item by school level and skill level. Participants used a Likert scale that was translated into a 1 to 5 scale (1 – Strongly Disagree, 2- Disagree, 3 – Neutral, 4 – Agree, 5 – Strongly Agree). The lowest possible score was a 1.0 and the highest possible score was a 5.0. For the total sample (n= 224), only two survey items had a mean above 4.00. The two items above 4.00 were Q13 (Utilization of m-learning technologies increases students' motivation), and Q25 (Learners can access instructional websites with mobile technologies). Only one item had a mean below 3.00 (Q7 - Most learning activities can be realized by means of m-learning techniques and strategies).

Research Question Two*: Is there a relationship between school level and teacher's perception of m-learning devices and strategies for classroom instruction?*

A multiple regression analysis was performed for each of the three factor scores to determine the significance of the relationships. For Factor 1 – CST, Factor 2 – COM and Factor 3 - FXC with all four predictors produced three R^2 values: $R^2 = .05$, $F(4, 219) = 2.85$, $p < .05$; $R^2 = .01$, $F(4, 219) = .59$, ns; and $R^2 = .08$, $F(4, 219) = 4.62$, $p < .01$, respectively. Table 8 presents the results from the multiple regression analysis for both school level and skill level.

Table 8

Results of Multiple Regression Analysis between Factor Scores from MLPS Compared with School Level and Self-Reported Skill Level (n = 224)

Variable		Factor 1 – CST		Factor 2 - COM		Factor 3 - FXC	
	M(sd)	b	Beta	b	Beta	b	Beta
Intercept		-.17		-.11		-.54	
Middle_school	.29(.45)	-.09	-.04	-.15	-.07	.15	.07
High_school	.36(.48)	-.31	-.15*	-.07	-.03	.25	.12
Skill_comp	.42(.49)	.24	.12	.21	.11	.32	.16
Skill_profic	.41(.49)	.51	.25**	.21	.10	.69	.34***
R^2		.05*		.01		.08***	

Note. b= unstandardized coefficient

* *p* < .05, ** *p* < .01, ****p* <.001

The relationship between school level and teachers' perceptions of m-learning resulted in one significant finding. For Factor 1 and using the unstandardized coefficient (b) value as the average outcome for an elementary school teacher, a high school teacher was significantly lower by .31 standardized units than that of the mean for elementary school teacher ($p < .05$). No statistical significance was found for Factor 2 or Factor 3 in regard to school level.

Table 9 presents the overall means and standard deviations for the 26 survey items at each of the three school levels (elementary, middle and high school) were: 3.65(.89), 3.59(.93), and 3.60(.93), respectively. Elementary school teachers had two survey items with a mean above 4.00 (Q13 & Q25) and no survey items with a mean below 3.00. Middle school teachers had no survey items with a mean above 4.00 and one survey item with a mean below 3.00 (Q7). High school teachers had one survey item with a mean above 4.00 (Q25) and two survey items with means below 3.00 (Q7 & Q8 – An effective learning environment could be produced by sending lecture notes via m-learning tools such as e-mail). All other survey item mean scores across all three school levels were between a 3.00 and 3.97.

Specifically examining Factor 1 and comparing elementary teachers with high school teachers, the overall factor mean and standard deviation for Factor 1 was 3.48(96) with an elementary factor mean and standard deviation of 3.54(.94) and a high school factor mean and standard deviation of 3.42(.98). Nine of the 11 means were higher for the elementary teachers over the high school teachers. The greatest difference between the means was .62 (Q13 – Utilization of M-learning technologies increases students' motivation). Q13 had a mean of 4.39(.56) for elementary teachers and 3.77(.74) for high school teachers. The mean of Q13 for the elementary teachers was the only mean in Factor 1 that exceeded 4.00. The elementary teachers had no means below 3.00 while the high school teachers had two means below 3.00 (Q7 and Q8). The overall Factor 1 average difference between the means for elementary teachers and high school teachers was .12.

Research Question Three*: Is there a relationship between self-reported technology skill level and teacher's perception of m-learning devices and strategies for classroom instruction?*

The relationship between self-reported skill level and teachers' perceptions of m-learning resulted in two statistically significant findings (see Table 8). For Factor 1 and using the unstandardized coefficient (b) value as the average outcome for a self-reported technology novice/beginner, the mean for self-reported technology proficient/expert teachers was significantly higher by .51 standardized units than that of the mean for novice/beginner teachers ($p < .01$). For Factor 3, a self-reported technology proficient/expert teacher was significantly higher by .69 units than that of a typical novice/beginner teacher ($p < .001$).

The overall mean scores and standard deviations for each of the three self-reported skill levels (Novice/Beginner, Competent, Proficient/Expert) for the entire 26 MLPS survey items were 3.32(.89), 3.57(.90), and 3.71(.96), respectively. The self-reported novice/beginner skill group (n=40) had no survey items with a mean above 4.00 and five survey items with a mean below 3.00 (Q7, Q8, Q9 – m-learning techniques facilitate teaching the subjects in my content/grade level, Q10 – m-learning techniques provide an effective method in learning my specialized content/classroom, and Q17 – m-learning techniques are a good method for the necessary interaction in my class).

Teachers in the competent skill group had two survey items (Q13 & Q25) with mean scores above 4.00 and one survey item with a mean below 3.00 (Q7). The proficient/expert skill group had five survey items with a mean above 4.00 (Q13, Q16 – Communication is possible in chat programs by means of mobile technologies, Q18 – m-learning techniques are convenient to share my specialized knowledge/information with my colleagues, Q21 – I would like to supplement my classes in the future with m-learning methods, Q25) and no survey items with a mean below 3.00. All other survey item mean scores across all three skill levels were between a 3.00 and 3.98.

For Factor 1, the self-reported proficient/expert teachers had an overall factor mean and standard deviation of 3.65(.94) as compared to the self-reported novice/beginner teachers who had an overall mean and standard deviation of 3.14(.92). All 11 means were higher for the proficient/expert skilled teachers over the novice/beginner skilled teachers. The greatest difference between the means was .79 (Q17 – M-learning techniques are a good method for the necessary interaction in my class). Q17 had a mean and standard deviation of 3.50(1.00) for

Table 9

Means and Standard Deviations of the Raw Scores for Survey Items by Factor for School Level and Self-Reported Skill Level (n = 224)

	Brief Description of Item (by factor)	Total Mean(sd)	DK	School Level M(sd)			Self-Reported Skill Level (M)sd		
				ES (n=80)	MS (n=64)	HS (n=80)	N/B (n=40)	C (n=93)	P/E (n=91)
Total Score		3.61(.91)		3.65(.89)	3.59(.93)	3.60(.93)	3.32(.89)	3.57(.90)	3.71(.96)
Factor 1 – CST									
Q13	Increases motivation	4.01(.80)	18	4.39(.56)	3.87(.95)	3.77(.74)	3.79(.78)	4.07(.82)	4.05(.77)
Q21	Use as a supplement in the future	3.91(.89)	12	3.96(.89)	3.93(.85)	3.84(.91)	3.50(.93)	3.88(.83)	4.13(.87)
Q2R	Generates ineffective environment	3.77(.73)	23	3.84(.54)	3.80(.78)	3.68(.87)	3.50(.77)	3.81(.63)	3.86(.79)
Q3	Should be used in teaching-learning process	3.52(.78)	37	3.53(.76)	3.52(.81)	3.52(.84)	3.33(.74)	3.43(.80)	3.70(.76)
Q6	Can supplement traditional education	3.47(1.04)	12	3.53(1.02)	3.41(1.12)	3.47(1.00)	3.27(.92)	3.41(.72)	3.62(1.04)
Q11	Effective method for sharing of knowledge	3.47(.88)	19	3.55(.79)	3.39(.96)	3.47(.92)	3.14(.82)	3.43(.90)	3.64(.85)
Q10	Effective method in my content/classroom	3.43(.96)	24	3.40(.93)	3.49(.93)	3.39(1.03)	2.94(1.01)	3.36(.95)	3.70(.87)
Q9	Facilitates teaching in my content/classroom	3.41(.97)	19	3.35(1.01)	3.45(.91)	3.45(1.00)	2.91(.94)	3.42(1.03)	3.61(.87)
Q17	Good method for interaction in my class	3.25(.92)	23	3.27(.86)	3.19(.93)	3.29(.98)	2.71(.83)	3.24(.85)	3.50(1.00)
Q8	Can be used for e-mailing lecture notes	3.09(1.02)	23	3.14(.94)	3.32(1.02)	2.88(1.09)	2.83(.95)	3.10(.98)	3.21(1.09)
Q7	Most activities realized with m-learning	2.89(.94)	19	3.00(.93)	2.75(.96)	2.88(.94)	2.58(.72)	2.72(.96)	3.17(.95)
Total Factor 1		3.48(.96)		3.54(.94)	3.47(.98)	3.42(.98)	3.14(.92)	3.44(.97)	3.65(.94)
Factor 2 – COM									
Q25	Access instructional websites with PEMDs	4.12(.62)	13	4.19(.63)	3.97(.73)	4.18(.50)	3.97(.53)	4.09(.54)	4.22(.72)
Q16	Increases communication – chat programs	3.92(.69)	13	3.87(.75)	3.93(.71)	3.96(.60)	3.76(.66)	3.90(.63)	4.01(.75)
Q12	Facilitates teacher-student communication	3.83(.74)	18	3.79(.69)	3.88(.69)	3.82(.82)	3.51(.73)	3.89(.65)	3.89(.80)
Q22	Facilitates student-student communication	3.77(.78)	28	3.75(.71)	3.85(.76)	3.72(.87)	3.54(.83)	3.85(.80)	3.79(.74)
Q15	Reliable for personal use of learning	3.75(.77)	25	3.87(.57)	3.55(.95)	3.81(.76)	3.75(.72)	3.69(.69)	3.82(.86)

				ES (n=80)	MS (n=64)	HS (n=80)	N/B (n=40)	C (n=93)	P/E (n=91)
Q20	Enhances the quality of lessons	3.74(.78)	18	3.84(.74)	3.96(.80)	3.68(.80)	3.39(.73)	3.76(.75)	3.87(.80)
Q23	Used as a supplement in all classes/subjects	3.54(.98)	29	3.63(.95)	3.53(.96)	3.45(1.03)	3.45(.98)	3.54(.89)	3.57(1.08)
Q24	Provides convenience for class discussions	3.53(.90)	31	3.49(.81)	3.51(.97)	3.59(.93)	3.12(.93)	3.42(.85)	3.80(.86)
Q26	Increases communication - traditional ways	3.25(1.01)	22	3.37(.93)	3.25(1.00)	3.13(1.08)	3.00(1.00)	3.16(.89)	3.45(1.09)
Total Factor 2		3.72(.85)		3.76(.79)	3.69(.87)	3.70(.88)	3.50(.85)	3.70(.80)	3.83(.89)
Factor 3 – FXC									
Q4	Used as a classroom discussion tool	3.80(.81)	22	3.75(.83)	3.80(.79)	3.85(.81)	3.55(.72)	3.73(.85)	3.98(.77)
Q5	Allows discussions w/o limits of time/space	3.78(.77)	37	3.82(.72)	3.70(.85)	3.80(.76)	3.47(.74)	3.81(.72)	3.87(.81)
Q18	Convenient to share with colleagues	3.78(.80)	23	3.84(.70)	3.67(.82)	3.81(.87)	3.28(.84)	3.74(.72)	4.04(.77)
Q14	Provides access to content related materials	3.70(1.02)	20	3.66(1.14)	3.60(.96)	3.82(.93)	3.39(.93)	3.63(.99)	3.89(1.05)
Q1	Removes traditional limitations of time/space	3.61(.90)	23	3.57(.86)	3.72(.96)	3.55(.89)	3.41(.76)	3.46(.90)	3.84(.91)
Q19	Materials could be sent out in many ways	3.61(.93)	19	3.52(.99)	3.63(.96)	3.69(.85)	3.28(.95)	3.55(.94)	3.83(.87)
Total Factor 3		3.71(.88)		3.70(.89)	3.69(.89)	3.75(.85)	3.40(.82)	3.65(.87)	3.91(.87)

Note: DK = Don't Know Responses; ES = Elementary Level Teachers; MS = Middle Level Teachers; HS = High School Level Teachers; N/B = Novice and Beginner; C = Competent, P/E = Proficient and Expert proficient/expert teachers and 2.71(.83) for novice/beginner. The proficient/expert teachers had two items with a mean above 4.00 (Q13 and Q21) and they had no items with a mean below 3.17. The novice/beginner teachers did not have any items with a mean above 3.79 (Q13) and they had five items with means below 3.00. The overall mean difference for Factor 1 between proficient/expert teachers and novice/beginner teachers was .52.

For Factor 3, the self-reported proficient/expert teachers had an overall factor mean and standard deviation of 3.91(.87) as compared to the self-reported novice/beginner teachers who had an overall mean and standard deviation of 3.40(.82). All six means were higher for the proficient/expert skilled teachers than those for the novice/beginner skilled teachers. The greatest difference between the means was .76 (Q18 – M-learning techniques are convenient to share my specialized knowledge/information with my colleagues). Q18 had a mean and standard deviation of 4.04(.77) for proficient/expert teachers and 3.28(.84) for novice/beginner. The proficient/expert teachers had one item with a mean above 4.00 (Q18) and they had no items with a mean below 3.83. The novice/beginner teachers did not have any items with a mean above 3.55 (Q4) and they did not have items with means below 3.00. The overall mean difference for Factor 3 was .51 between the proficient/expert teachers and novice/beginner teachers.

Research Question Four: *Is there a relationship between school level and self-reported technology skill level and the use of specific technology resources?*

Table 10 presents the percentage of "yes" responses for each of the three technology component areas for the total sample and then separately by school level and skill level by component. Six specific technology components were used in over 50% of the 224 classrooms on a weekly basis. For hardware components, 78% of the teachers were allowing students to use school purchased computers (laptops, desktops, iPads and/or tablets) on a weekly basis and 54% were using interactive Smart board lessons. For software components, 78% of the teachers were using PowerPoint or another lecture-type presentation program with their students on a weekly basis. Internet-based resources produced three results above 50%: on-line resources directly connected to content and material (75%), streaming videos from websites like Discovery Education, YouTube and BrainPop (75%), and the use of a classroom webpage with student and parent access (64%).

Five of the specific technology components listed for participants to respond to were used less than 15% of the time in the classroom on a weekly basis. Only one of the five items below 15% was a hardware component: student use of classroom response unit (clickers) or video games (13%). Software components had no items below 15%. Specific Internet resources showed four items below 15%: student use of creation and production websites like Animoto and Xtranormal (9%), social media websites like Twitter, Facebook, and MySpace (7%), Podcasting (5%), and use of Skype or other video conferencing (5%).

A Chi square test was then performed for each of the specific technology components to determine whether significant relationships existed between the school level and self-reported technology skill level and reported usage of specific technologies in the classroom. For school level, five specific technologies were found to show a significant relationship: (a) use of student personal mobile devices ($p < .01$), (b) on-line curriculum purchased by the district ($p < .01$), (c) content or subject programs ($p < .05$), (d) classroom wiki, blog, discussion board ($p < .05$), and (e) instant feedback websites ($p < .01$). Elementary teachers reported more frequent use of

Table 10

Use of Specific Technology Components in the Classroom on a Weekly Basis by School Level and Self-Reported Skill Level (n = 224)

Brief Description of Item	Total % Yes	School Level - % Yes				Self-Reported Skill Level - % Yes			
		ES (n=80)	MS (n=64)	HS (n=80)	X^2	N/B (n=40)	C (n=93)	P/E (n=91)	X^2
Use of Specific Tech- Hardware Components									
Student Use of school computers	70	78	59	73	5.97	55	68	80	2.68
Interactive Smart board lessons	54	69	42	49	5.28	40	53	62	2.44
Student use of school devices	27	31	22	28	1.15	23	24	33	1.86
Use of student personal mobile devices	23	16	14	38	11.01^{**}	10	25	27	3.81
Classroom response units or video games	13	11	17	14	.91	8	8	23	9.45^{**}
Use of Specific Tech – Software Components									
PowerPoint and presentation/lecture programs	78	65	78	91	3.53	63	74	89	2.81
On-line curriculum purchased by the district	34	51	28	23	10.64^{**}	18	35	41	4.39
Graphic organizers	22	28	19	19	1.80	8	20	30	1.86
Content or subject programs	20	14	13	31	8.56^{*}	5	16	30	3.81
Technology to support students w/ disabilities	16	15	22	11	2.60	13	14	19	9.45^{**}

	Total % Yes	ES (n=80)	MS (n=64)	HS (n=80)	X^2	N/B (n=40)	C (n=93)	P/E (n=91)	X^2
Use of Specific Tech – Internet Resources									
On-line resources connected to content/material	75	75	74	78	.08	60	72	86	2.70
Streaming videos	75	80	70	74	..47	55	76	82	2.82
Classroom webpage	64	58	59	74	1.93	40	59	79	7.21*
Google documents and programs	46	46	34	53	2.63	33	40	56	4.41
On-line textbooks, novels and articles	45	36	50	55	3.19	35	45	54	2.21
Classroom wiki, blog, discussion board	34	26	25	50	8.85*	8	27	54	19.96***
iTunes university, TED or other audio files	18	13	19	23	2.28	3	19	23	6.79*
Instant feedback websites	18	9	13	31	12.78**	10	11	29	9.86**
Student creation / production websites	9	4	9	13	3.69	0	12	9	13.02**
Social media websites	7	5	3	11	4.04	8	1	12	8.38*
Podcasting	5	3	3	9	3.76	0	3	9	5.29
Skype or Video Conference	5	8	2	5	2.55	0	4	8	3.47

Note. ES = Elementary Level Teachers; MS = Middle Level Teachers; HS = High School Level Teachers; X^2 = Chi Square Value; N/B = Novice and Beginner; C = Competent; P/E = Proficient and Expert

*$p < .05$, ** $p < .01$, *** $p < .001$

on-line curriculum purchased by the district than the middle and high school teachers. However, just the opposite was found for the four other technologies in which the high school teachers reported more frequent use than the other two levels of teachers.

For skill level, eight specific technologies were found to show a significant relationship: (a) classroom response units or video games (p < .01), (b) assistive technology programs to support students with disabilities (p < .01), (c) classroom webpage (p < .05), (d) classroom wiki, blog, discussion board (p < .001), (e) iTunes university, TED or other audio files (p < .05), (f) instant feedback websites (p < .01), (g) student creation / production websites (p < .01), and (h) social media websites (p < .05). The self-reported competent teachers reported more frequent use of student creation and production websites like Animoto and Xtranormal than the novice/beginner and proficient/expert teacher levels. However, the opposite relationship was found for the seven other technologies in which the proficient/expert teachers reported more frequent use than the other two self-reported skill level groups.

CHAPTER FOUR

DISCUSSION

Suitability of the MLPS for a U.S. Sample

The MLPS with only minor wording modifications to be more meaningful to an American sample appeared to be a valid and reliable instrument for use with U.S. teachers (K – 12). The factor structure for the U.S. sample produced a similar three-factor solution to Uzunboylu and Ozdamli's (2011) study with acceptable reliability coefficients for all three factors. Only one of the original 26 survey items failed to meet the criteria (factor loading $\geq .40$) to be included in the factor structure. Although both studies found three factors, the survey items in each factor differed slightly from each other. The realignment of the survey items in the three factors may be the result of differences in the sample and the translation of the questions for the U.S. teachers. Furthermore, Uzunboylu and Ozdamli's survey did not include elementary teachers. According to von Eschenbach and Ley (1984), elementary and secondary teachers differ significantly in their implementation of certain instructional practices. In addition, this study separated secondary teachers into two levels (middle school and high school) to create a three level independent variable. Teachers in Uzunboylu and Ozdamli's study also participated in a pre-survey website tutorial providing beneficial information about m-learning, its advantages and limitations. The participants in this study did not participate in any pre-survey tutorial or common experience and may have responded differently if they had participated in such a tutorial. In fact, three of the 18 teachers who participated in the pilot of the MLPS indicated that they would have liked more information about m-learning prior to taking the survey. All 26 survey items in the MLPS had at least 12 "Don't Know" responses including two survey items with 37 “Don’t Know” responses. Uzunboylu and Ozdamli’s study did not offer a “Don’t Know” response choice as a part of the scale for the survey. A pre-survey tutorial similar to the original administration may have reduced the number of “Don’t Know” responses found in this study. Finally, Uzunboylu and Ozdamli’s research examined teacher’s perceptions of m-learning as it relates to gender and branch (subject area). The variables of gender and branch were not examined in this study and were replaced with the variables of school level and self-reported technology skill level. The results from Uzuuboylu and Ozdamil and this study appeared to indicate that the instrument whether in its original or modified forms basically measured similar constructs and that both samples of teachers showed above medium/neutral levels of perception toward m-learning.

Current status of U.S. teachers’ perceptions of m-learning

School Level – The only significant result related to school level in this study was the more negative perception held by high school teachers in comparison to the elementary teachers towards m-learning as it relates to Factor 1 – Classroom Strategies and Techniques. The dummy variable High_school produced a negative beta value (-.15) that was significant ($p < .05$). The inspection of the means for school level showed that in Factor 1 – CST, the high school teachers had six of the 11 lowest means of all three subsamples and two items below a mean of 3.00. The two items with means below 3.00 were Q8, can be used for e-mailing lecture notes and materials and Q7, most activities can be realized with m-learning techniques and strategies.

Three intertwining reasons may explain the more negative perceptions of m-learning by high school teachers compared to elementary teachers: student motivation, student engagement while in the classroom and a lack of teacher professional development resulting in fear and uncertainty on the teachers' part of using m-learning techniques. In general, when discussing the three main school level designations, the high school level is usually set apart from both the elementary school and middle school levels (Sanders & Simon, 2002). First, according to the data, Q13 – utilization of m-learning technology increases student motivation had the largest difference between the means of the elementary and high school teachers (.62). The next largest mean difference in order of magnitude was also found in Factor 1 (Q8 - .26) that was a much smaller difference than that found for Q13. For Q13, elementary teachers had a mean of 4.39 and represented the highest mean score for all 26 survey items whereas the mean of high school teachers for the same question was 3.77. Of the 80 elementary teachers, no one responded to Q13 with disagree or strongly disagree responses and only four teachers responded with a neutral response. Of the 80 high school teachers, four teachers responded to Q13 with disagree and strongly disagree and 17 teachers responded with a neutral response. The means indicated that both levels agree with the statement on student motivation but the difference between the means indicates that the elementary school teachers agree or strongly agree to a greater extent with the student motivation statement than high school teachers.

Elementary teachers may have rated Q13 much higher than the high school teachers due to their current experience in working with the students using technology and the structure of an elementary school day versus the structure of a high school day. The elementary teachers in this study were all current classroom teachers using some level of technology in the classroom on a weekly basis that included 78% using school computers on a weekly basis and 51% using on-line curriculum purchased by the district. In comparison, 73% of the high school teachers reported using school computers and 23% reported using on-line curriculum purchased by the school district on a weekly basis. According to a research project sponsored by the U.S. Department of

Education, elementary teachers reported an increase in student motivation due to the immediate results students receive when using technology, the equality each student feels with regard to their classmates as it provides each student an equal voice and the positive impact on students' self-esteem and self-confidence (Singh & Means, 1997). Student motivation is extremely important at the elementary school level as the classroom teacher spends the majority of the instructional day with the same students and teaches most of the classroom lessons. At the high school level, teachers will traditionally teach between three to six different sets of students each day and the students are switching classes after each period. Due to the longer contact time between the teacher and specific students, student age and the attention spans of elementary students, elementary teachers may require many motivational and inspirational tools to maximize the students' achievement.

Second, the high school teachers' lower ratings may be the result of the high school teachers believing that m-learning may reduce the levels of student engagement in their classroom. Q8 - an effective learning environment could be produced by sending lecture notes via m-learning tools such as e-mail had the next largest difference among all three factors between the means for elementary teachers and high school teachers (.26). Q8 was an original survey item from Uzunboylu and Ozdamil's survey that included only secondary teachers in the sample and remained unedited during the pilot process for this study. The mean and standard deviation for high school teachers was 2.88(1.09). The results indicate the high school teachers were below neutral and tending to disagree with the statement. The mean and standard deviation for the elementary school teachers for Q8 was 3.14(.94) basically a neutral response to the statement and tending to agreement. In fact, 17 out of the 80 elementary teachers responded to Q8 with a Don't Know response.

Lecturing and the need for lecture notes by elementary students would be low because teachers do not often lecture nor require students to take traditional notes for lessons. Elementary teachers may have responded to Q8 with more frequent agreement rating than high school teachers because they thought sending notes home to the students will allow them to be better prepared for future classroom lessons and materials. At the high school level, teachers may provide an outline of an upcoming lecture or post a presentation on a webpage following a lecture but would hesitate to provide lecture notes to all students. In a recent blog, Williams (2013), posted a question "Do you share teaching materials on-line with students?" The responses revealed many different reasons for not posting teaching materials. Although the teachers who responded to the blog were from higher education institutions, the reasons for not sending lecture notes apply to the high school level because high school teachers strive to not only teach the material that is required of them in the course but also want to develop responsibility and the necessary skill for success in either college or a career pathway. The reoccurring comments in the blog were not necessarily about using m-leaning techniques to e-mail students but more focused on the concept of providing lecture notes or other supporting materials in general. The major themes stated that students who have lecture notes or know they will get the lecture notes would pay less attention and would sit passively without being engaged during the class. In addition, several comments in the blog stated that teachers who provided lecture notes were not teaching the skills of note taking and understanding how to use a textbook because they provided the material directly to the students. One comment stated that the lecture notes or presentation slides do not cover the entire chapter or material that students need to know. By providing them, students can be misled concerning the main points of a lesson if they only follow the lecture notes.

Third, the lack of professional development training on both m-learning techniques and the various devices that students have in the classroom may have had an impact on the perception of m-learning by the high school teachers. Although the types and quality of training on m-learning techniques and on student PEMDs will most likely be the same in a given district for all teachers K-12, the differences may occur because of the age level of the student. Regardless of any school policy on PEMDs in school, more high school students than both elementary and middle school students have PEMDs with them during the school day and use PEMDs more frequently (Lenhart, Ling, Campbell, & Purcell, 2010). However, high school teachers may be reluctant to use PEMDs because of their lack of familiarity with the technology in comparison to their students along with their beliefs about the potential misuse of PEMDs in the classroom (Spencer, 2011). If no clear technology expectations are set for all teachers in terms of using m-learning techniques or strategies in the classroom, teachers will continue to make decisions that are least risky for both the students and themselves. Although no single reason can explain the results that high school teachers showed a more negative perception of m-leaning as compared to elementary school teachers, a combination of teachers' beliefs of classroom strategies that technology may influence student motivation to engage in the classroom and may be related to teachers' lack of confidence in using technology due to little or inadequate professional development may each play a large role in explaining the results.

Skill Level – Looking at the sample of 224 teachers, 91 self-reported as proficient/expert (40.6%) while 93 teachers reported competent (41.5%) and 40 teachers reported novice/beginner (17.9%). The self-reported proficient/expert teachers had a more positive perception of the items for Factor 1 ($p < .01$) and for Factor 3 ($p < .001$). The means for skill level showed that for Factor 1 – CST, the proficient/expert group had nine of the eleven mean values at or above 3.50

including two means above 4.00 (Q13 & Q 21). For both the novice/beginner and competent groups only four of the twenty-two means were above 3.50. In Factor 3, all six item means for the proficient/expert were at or above 3.83 including Q18 with a mean of 4.04. In comparison, the six novice/beginner means were all at or below 3.50 including Q18 with a mean of 3.28 and the six competent means were all at or below 3.81 including Q1 (m – learning tools remove the limitation of time and space from traditional resources) with a mean of 3.46.

Three reasons may explain the more positive perception of m-learning by the proficient/expert teachers as compared to the novice/beginner teachers: confidence with technology integration, teacher beliefs in classroom strategies, and a desire to motive and engage students in the classroom. In examining all nine of the survey items with a mean difference equal to or exceeding .50 between the proficient/experts and the novice/beginners, the theme of the items focused on professional development of classroom strategies and understanding the positives of using m-leaning techniques in the classroom. Although teachers are presented new ideas and skills at in-service workshops and professional development sessions, teachers who are not using the technology in the classroom or do not consider themselves to be above the novice/beginner group in terms of technology in the classroom may lack the confidence to create technology-based lesson plans and engage students with the technology available to them (Spencer, 2011). Administrators and principals need to plan and provide professional development opportunities to all teachers at their specific skill level. Teachers moving along the technology skill continuum (novice/beginner, competent and proficient/expert) need specific skills and competencies at each level. Whole group professional development sessions that are the same for all teachers do not support individualized and targeted skill building and may be detrimental to supporting teacher professional growth. Similar to differentiated instruction for students, some teachers may require an individualized approach to their training and professional growth. Targeted professional development in technology integration may increase the confidence in teachers to move toward using m-leaning strategies in the classroom (Russell &Bradley, 1997).

Ironically, Q15, - m-learning techniques are reliable for personal use of learning, had a mean difference of .07 between the proficient/expert teachers and the novice/beginner teachers and the biggest mean difference for Q15 was between the proficient/expert and the competent teachers (.13). The results from Q15 dispel the notion that teachers' use of technology in the classroom is tied to their perceptions of the reliability of PEMDs for personal use. These results also raise a question about the connection of the proficient/expert and novice/beginner teachers having a similar response to Q15 but different results about the use of PEMDs in the classroom. The novice/beginner teachers may feel comfortable in using a PEMD for their personal use because they have complete control of the device and can learn and use it at their comfort level. They may not feel comfortable with transferring their personal skills with using their PEMD to classroom lessons because the technology might not support their specific lesson/content or the current strategy of teaching a lesson is still successful with students. The proficient/expert teachers may not be deterred from using technology in the classroom for any of these reasons and are willing to spend the additional time to integrate technology into the lesson plan while working with the students to address any complications that might arise during the instructional time.

The second reason for the differences between the proficient/experts and the novice/beginners may be that many teachers are not necessarily intrinsically motivated to integrate technology into their lessons unless they understand the vision of how various technology options will improve classroom instruction and student achievement (Office of Educational Research and Improvement, 1993; Protheroe, 2005). If teachers do not believe that a change in instructional practice such as integrating technology in the classroom is the best way to teach their lessons and make connections to students, they may resist using technological innovations (Ertmer, 2005). A major change in instructional practice can be difficult for teachers because they are conflicted between their training and the everyday routine that have been effective in their view and the fundamental changes in approach that technology may offer.

Waters, Marzano and McNulty (2003) described change in terms of first-order and second-order. First-order refers to change that is incremental that does not change existing structures or beliefs. Second-order change is thought to be permanent and will eventually lead to new routines and daily habits (Brownlee, 2000). Technology integration should be considered as a second-order change. Teachers understand that once they embrace second-order change, they cannot revert to previous strategies because students, parents and administration will expect new instructional behaviors (Ertmer, 2005). When a second-order change is completed, the teacher's belief system should be altered to accept the change and a new normal will be formed.

The two previous reasons are more focused on the novice/beginner teachers in terms of a lack of confidence and teacher beliefs in classroom strategies. However, the results also support the notion that the proficient/expert teachers may have a more positive perception of using technology to motivate students in order to increase their engagement in the classroom. All teachers want to motivate and engage students in the classroom but the results showed that the proficient/expert teachers rated the items associated with technology affecting motivation and increased engagement higher than the novice/beginner teachers. In reviewing all 26 survey items, several items stood out that connect directly with student motivation and engagement (Q4, Q 12, Q13, Q 17 and Q 24). In comparing the proficient/expert teachers to the novice/beginner teachers, the five survey items had mean differences of .43, .38, .26, .79 and .68, respectively. The proficient/expert teachers who are using technology in the classroom were experiencing positive results for both the students and themselves. These teachers also perceived technology as both a motivator and a way to increase student engagement. Such results may have a self-reinforcing effect that transforms the use of technology into a second-order change.

Specific Technology Resources - A total of 13 significant relationships were found between school level and self-reported skill level for the 22 items of technology use. The 13 significant relationships were found using a Chi Square analysis that compares the actual responses to the expected responses based upon the population and levels of a sample. A significant relationship does not necessarily indicate a significant or high use of a specific technology but rather a significant difference from the use as compared to the other level(s) in the sample. The specific technology resources were divided into three types: hardware, software and Internet-based resources. The first two types (hardware and software) were difficult to compare because the study included 16 school districts, each of which may have purchased different hardware and software programs. Furthermore, teachers may not have equal access to all the same technologies that may have affected the strength of the results using only hardware and software type data. Thus, the third type, Internet-based resources, provided a better comparison among the districts. Most of the resources listed should be easily accessible and/or free for teachers because they are available on the Internet.

For school level, five significant relationships were found. Four of the five relationships showed that the high school teachers used a specific technology more frequently than elementary or middle school teachers: (a) use of student PEMDs – hardware, (b) software programs focused on content or subject specific programs – software, (c) use of a classroom wiki, blog or discussion board – Internet resource, and (d) use of instant feedback websites – Internet resource. The fifth significant relationships showed that the elementary teachers use on-line curriculum purchased by the district (software) more frequently than the middle and high school teachers.

Two reasons for the significant relationships at the high school level may be the total number of students having PEMDs at the high school level and the nature of the specific resources being designed more for high school students. At the high school level, reports indicate that between 85% – 95% of the students have their own cell phones (University of Haifa, 2012). In looking at the four items, the first asked about allowing students to use their PEMDs in the classroom. High school teachers may be more willing to allow students to use their PEMDs in the classroom because PEMDs are readily available with the students at all times and almost the entire class can access the technology at the same time. For high school teachers, allowing the students to use their PEMDs in the classroom is an easy way to engage most students in the learning process. No additional training is needed because the students are using their personal device.

The next item was the use of software programs focused on content or subject specific programs. High school teachers work in departmentalized settings teaching one specific content area (branch) per class period. Thirty-one percent of the high school teachers reported using content specific programs on a weekly basis. High school teachers used software programs to supplement their direct instruction as well as a part of their lecture and or laboratory lessons. Recently, the push for a state and national common curriculum has introduced teachers to hundreds of content and subject specific software programs. Although many similar programs have been developed for middle school and elementary school content, high school teachers tend to have more flexibility with the materials and resources used to cover the class curriculum than do middle and elementary school teachers.

The last two items, the use of a classroom wiki, blog or discussion board and the use of instant feedback websites, require consistent access to the Internet and a higher skill set and maturity level for proper use. High school teachers may use a classroom wiki or blog to help stimulate learning and engagement about the material when the students are not in school. The students need to have Internet access to connect to a wiki or blog as well as possess the skills necessary to log-in, post a comment, reply to a post and actively participate on a consistent basis. Of the three levels of students, high school students are best able to have consistent access to the Internet outside of school because a greater number of high school students own a PEMD and are more mature and trusted with the Internet than younger students. Instant feedback websites are similar to blogs or wikis because students need to have Internet access to respond and participate as well as possess the maturity and skills to send messages to the correct address/number. Middle school and elementary school teachers may not feel their students have the same level of access to either PEMDs or the Internet to participate or they may not feel their students are ready to participate in a blog, wiki or instant feedback website.

The final significant relationship regarding school level found elementary teachers (51%) using on-line curriculum purchased by the school district on a weekly basis more frequently than the middle school teachers (28%) and high school teachers (23%). Similar to purchasing textbooks at the middle and high school levels, many school districts purchase online programs to help supplement the traditional teacher-led instruction at the elementary level. Elementary school teachers are responsible for teaching all major content areas (Language Arts, Reading, Math, Science and Social Studies) each week and online curriculum programs provide additional resources for the teacher and students. For school districts that have multiple elementary schools, the on-line curriculum may help to maintain fidelity and consistency of content from classroom to classroom and from building to building. Using on-line curriculum may also help to ensure that each student in the district will receive the same experience regardless of school and teacher as they move through the elementary grades. On-line curriculum is marketed to schools stating that it will provide individualized student learning and increased achievement while boosted student confidence in school (for example, Achieve 3000, 2013, Compass Odyessy, 2013, & Dreambox, 2013).

For skill level, eight significant relationships were found. Seven of the eight significant relationships showed that the self-reported proficient/expert teachers used the following technology more frequently than the competent or novice/beginner teachers: (a) use of classroom response units or video games – hardware, (b) technology to support students with disabilities – software, (c) classroom webpage – Internet resource, (d) use of a classroom wiki, blog or discussion board – Internet resource, (e) iTunes university, TED or other video/audio files – Internet resource, (f) instant feedback websites – Internet resource, and (g) social media websites – Internet resource. The eighth significant relationships showed that the competent teachers used student creation and production websites (Internet resource) more frequently than the novice/beginner and proficient expert teachers.

One reason for the seven significant relationships at the proficient/expert level may be that those teachers' skill level with technology supported more technology integration in the classroom. Inspecting the results for the hardware and software resources, all 10 resources listed show a higher usage by the proficient/expert level teachers. Looking more closely, the basic technology resources of student use of school computers and teacher use of PowerPoint and other presentation programs weekly are at least 12% higher by the proficient/expert teachers as compared to the other two levels. If teachers in the proficient/expert level were more frequently using the basic set of technology resources that are most likely available in schools, the same teachers may possess the confidence and willingness to stretch beyond the basic resources to include many other more sophisticated resources. Each of these seven significant relationships found for skill level appeared to have a strong technology foundation and the ability to transfer skills to a new technology resource. Many of these technologies will unlikely become part of a formal training program for all teachers but can easily be self-taught or shared in small groups for individualized supports.

The final significant relationship regarding self-reported skill level found competent teachers (12%) and proficient/expert teachers (9%) using student creation and production websites on a weekly basis more frequently than novice/beginner (0%). Examples in the survey items for student creation and production websites were Animoto and Xtranormal which allow students to import text and pictures to create a video or dialogue between characters for classroom presentations or projects. Although 12% of the competent teachers and 9% of the proficient/expert teachers reported using this resource on a weekly basis, none of the novice/beginner level teachers indicated using this resource at all which created the disparity. One reason competent teachers may have used this resource more frequently than novices and slightly more than the proficient/experts was that these and similar websites are very student-friendly and can easily be used for both individual and group presentations. Teachers who use student production websites in the classroom only require a basic understanding of the website as the students quickly transition to the websites and either self-teach or support each other with questions and sharing best practices.

All three major technology types (hardware, software and Internet-based resources) had specific technologies with single digit percentage use. Internet-based resources had three technologies with zero use for the novice/beginner group and even the proficient/expert level had three technologies with single digits. In looking at the specific technologies, some may not be feasible or practical for weekly use in the classroom (student creation/production websites, social media websites, and podcasting and Skype/video conferencing). The fact that eight significant relationships exist for self-reported skill level may be due to the low percentage of teachers using the specific technology, either the teachers were not familiar or comfortable using the technology or the technology is not appropriate for a specific class or on a weekly basis. Not every technology component can be used on a weekly basis.

Recommendations for practice and future research

School communities, parents and students expect schools to integrate technology as a part of the K-12 education experience (Sheehy, 2012). This study confirmed that schools and teachers are using technology in the classroom and many teachers are integrating technology in the classroom on a weekly and daily basis. In addition, it confirmed that a variety of technology resources are being used at all school levels and by all self-rated technology skill level teachers. However, m-learning is not a singular concept that teachers perceived uniformly. As a result, strategic planning with targeted professional development is essential (Hulser, 1998). Although many teachers appear to be using basic technology, the major challenge is to implement the ever-changing and more sophisticated technology improvements. In order to do so, teachers' belief systems in classroom strategies and understanding about technology must be changed to accept technology integration as the new norm and expectation (Ertmer, 2005).

The first step in this change process is to identify the current technology skill level of each teacher and their perceptions toward integrating technology in the classroom on a weekly basis. Knowing teachers' skill level will help to develop professional development training sessions that will benefit each teacher at their specific skill level. Understanding teachers' current perceptions of technology integration provides invaluable strategic information to administration about the teachers' beliefs about technology integration. The MLPS with the added questions related to the use of specific technology components has been found to be an appropriate instrument for this purpose. Next, administrators in partnership with the teachers need to provide targeted professional development based upon the teachers' current practices in the classroom and their skill level in using the available technology resources. Teachers need to gain confidence in using new strategies to integrate technology in the classroom (Guskey, 1986). Following professional development, support should be available to teachers as they practice what they learned and refine the new skills to fit their classroom instruction. Professional development for technology integration must be continuous over several in-service and other professional days.

If other researchers or practitioners consider using the modified MLPS, several additional variables should be included as a part of the survey to provide a more comprehensive prediction model of teachers' attitudes toward m-learning. In this study, two of the R^2 values (Table 8) were significant but all three of the R^2 values were low and non-significant (MacDonell, 2010). For this study, only two predictor variables were examined: school level and self-reported technology skill level. Additional variables may include subject or specific content area teaching (Uzunboylu & Ozdamli, 2011), years of teaching experience (Baek, Jung & Kim, 2008), age, gender (Uzunboylu & Ozdamli), number of formal technology classes completed(pre-teacher training, graduate level and district offered) and current access and availability of each of the hardware and software components. The results from this study only indicated which teachers used a specific technology on a weekly basis. The survey did not ask teachers to identify if they had access to the specific technology. Access and availability to reliable technology resources can have a direct impact on the frequency and consistency of use. In some cases, school districts receive technology donations or grant funds to purchase specific technologies that do not match the needs or direction of the district. In these situations, teachers are challenged to quickly adjust or may choose to avoid using these resources. Teachers may use some hardware and software components on a weekly basis if they had access to reliable and useful technology as well as appropriate training. Although adding new items to the MLPS may increase the prediction about what relates to teachers' perceptions of m-learning, qualitative studies may provide important information about what promotes or hinders teacher use of m-learning strategies and techniques. Future researchers or practitioners should consider including a qualitative investigation into the types and frequency of use of technology in the classroom based upon the availability of technology resources in each school or classroom.

The overall means and standard deviations by school level were very close to one another: elementary – 3.65(.89), middle – 3.59(.93) and high school – 3.60(.93). These results indicated that the teachers in the sample have a somewhat positive perception of m-learning. For districts and schools looking to improve strategically, the specific components in each category (hardware, software and Internet-based resources) can be adjusted to fit the technology in a specific district or school. Districts can easily customize the technology resources to exclusively list the hardware, software and Internet-based resources that are germane to the district or a specific school to target the data and monitor teacher usage. Furthermore, discussions with teachers should be conducted about what should be the expected amount of use per technology per week or per month. If technology integration remains optional, it is difficult for teachers to know what is important and valued; that may lead to conflict between teachers and principals as various technologies begin to be implemented (Spencer, 2011). The MLPS can also be used as a needs assessment to identify areas for professional development and budgeting. Results from the MLPS can help to prioritize the specific areas of need in preparing training and justification for funding specific technology costs. In addition, districts and schools can use the MLPS as both a pre and post assessment to help determine the attitudes of teachers toward specific technology and their use.

Several other limitations of this study provide opportunities for future research on teachers' perceptions of m-learning. The sample was limited to public schools in one county in Pennsylvania. Although the demographics of Montgomery County are similar to those of the United States as a whole, generalizations from this study must be done cautiously. Public school districts across the United States vary in culture, leadership, resources, access to technology and parent/student expectations. Variations in these areas may significantly impact teachers' perceptions both positively and negatively toward m-learning in the classroom. Charter, cyber-charter, private, parochial and alternative school teachers may provide different perceptions of m-learning in the classroom based upon their unique circumstances and expectations. Further investigation of the MLPS and teachers' perceptions of m-learning in different areas of the U.S. and with non-traditional public schools may provide a more comprehensive assessment of the instrument.

Finally, this study mainly presented teachers' perceptions toward m-learning in the classroom. Although this information is helpful in understanding the starting and ending point for teachers as it relates to m-learning, teaching in the classroom is more than just technology integration and the use of PEMDS. Absent from this study is any discussion of the quality of teacher-student relationships and the connections that are made in the classroom that support student engagement and achievement. Teachers who build positive relationships with students while making relevant connections between the material and the students have a significant impact on both student achievement and student growth. It is possible for a teacher to use technology and m-learning activities in every aspect of the classroom and still be considered an ineffective teacher. The personal and emotional connections that teachers make with students cannot be ignored in the overall technology integration initiative. Additional research could include a survey asking students to indicate their use of technology in the classroom and the quality of their relationship with their teacher.

Conclusion

Technology and PEMDs are changing instruction in classrooms at an exponential rate because as they are helping teachers and students with easier and seemingly unlimited access to information in every subject matter area (Swan, van 'tHooft, Kratcoski & Schneker, 2007). A major variable in the change process is the classroom teachers' willingness to embrace the technology as well as their current skill level with technology and technology integration into the classroom. This study found that the MLPS is a valid instrument that can be used with U.S. teachers to determine their perceptions about m-learning in the classroom. Results from the instruments such as the MLPS are critical because school administrators can use the data to establish expectations for technology integration in the classroom. In addition, school administrators can use the data to strategically plan and budget appropriately for successful professional development to help teachers meet those expectations. I predict that as technology advances and teachers continue to be challenged with increased expectations from parents, students and administration, using a tool like MLPS will help to streamline the data collection process and can be used to support the current instructional practices in the classroom.

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APPENDIX A

Letter of Invitation

Date

Superintendent's Name
School District
School Address Line 1
School Address Line 2

Dear *Superintendent:*

By way of introduction, my name is Allyn Roche and I am the Assistant Superintendent at Spring-Ford Area School District. I am also currently a doctoral student at Lehigh University, under the advisement of Dr. Ron Yoshida.

Technology in our schools is here to stay. Each year you are asked to add more technology or resources in support of instruction such as iPads, tablets, laptops, and other wireless devices. In these challenging financial times, what information do you need to make good decisions in prioritizing budget requests and in planning for effective professional development?

In my search of the research and in talking about this topic among other administrators in Montgomery County and elsewhere, we may have a "feeling" about what teachers are doing and thinking, but we really don't have valid and reliable information upon which to make decisions.

<u>My dissertation study proposes to ask teachers in Montgomery County: (1) How frequently do teachers use technology in their classrooms and (2) what kinds of technology are they comfortable in using</u>.

Will you please help me to complete this study? Your role in this study will be to grant me permission to e-mail some of your teachers (based upon a stratified random sampling process) to invite them to participate in the study. Teachers' participation will be voluntary and will require approximately ten minutes time to complete the questionnaire. I will collect the teacher's e-mail addresses from your school district website or, if possible, I would welcome access to a list of teacher's e-mail addresses in your district separated by elementary, middle, and high school level. I will compile a master list of Montgomery County teachers in order to randomly sample the population. I will email selected teachers with directions for participation and an Internet link to access the on-line survey. I know how busy you and your staff members are and I greatly appreciate your consideration of my request.

Strict confidentiality will be maintained throughout this study in accordance with the *Federal Policy for the Protection of Human Subjects* (Federal Register, 1991) and the *Ethical Principles in the Conduct of Research with Human Participants* (APA, 1982). Data will be reported with no identification of individuals or schools. Your participation is strictly voluntary, as is the participation of each of your teachers. The only risk to you and your teachers is the potential breach of confidentiality, which I am taking specific steps to avoid. For example, data will be stored in a separate folder of the computer from the listing of participating school districts and teacher emails with a password only known to me.

To indicate your willingness to participate in the study, please email me at ajr207@lehigh.edu . Your positive response via email will serve as your permission for me to conduct the study in your school district. If you are able to provide a list of teacher e-mail addresses, please let me know who I need to contact in your district to secure the list. Please retain this letter for your reference and information about informed consent.

If you have any questions about the study, please contact me directly at my office at the Spring-Ford Area School District - 610.705.6202 or on my cell phone - 215.416.7512. You may also contact my advisor Dr. Ron Yoshida at Lehigh University – 610.758.6249. If you have any questions or concerns regarding this study and would like to talk to someone other than the researcher(s), **you are encouraged** to contact Susan E. Disidore at (610)758-3020 (email: sus5@lehigh.edu) or Troy Boni at (610)758-2985 (email: tdb308@lehigh.edu) of Lehigh University's Office of Research and Sponsored Programs. All reports or correspondence will be kept confidential.

With sincere appreciation,

Allyn J. Roche
Assistant Superintendent
Spring-Ford Area School District

Ron Yoshida
Professor of Education
Lehigh University

APPENDIX B

Letter of Invitation (second letter sent via e-mail)

Dear *Superintendent:*

By way of introduction, my name is Allyn Roche and I am the Assistant Superintendent at Spring-Ford Area School District. I am also currently a doctoral student at Lehigh University, under the advisement of Dr. Ron Yoshida.

I recently sent you a letter requesting your permission to include your school district's teacher's participation in my dissertation study. My dissertation study proposes to ask teachers in Montgomery County: (1) How frequently do teachers use technology in their classrooms and (2) what kinds of technology are they comfortable in using.

Technology in our schools is here to stay. In these challenging financial times, what information do you need to make good decisions in prioritizing budget requests and in planning for effective professional development? In my search of the research and in talking about this topic among other administrators in Montgomery County and elsewhere, we may have a "feeling" about what teachers are doing and thinking, but we really don't have valid and reliable information upon which to make decisions.

Will you please help me to complete this study? Your role in this study will be to grant me permission to e-mail some of your teachers (based upon a stratified random sampling process) to invite them to participate in the study. Teachers' participation will be voluntary and will require approximately ten minutes time to complete the questionnaire. I will collect the teacher's e-mail addresses from your school district website or, if possible, I would welcome access to a list of teacher's e-mail addresses in your district separated by elementary, middle, and high school level. I will email selected teachers with directions for participation and an Internet link to access the on-line survey. I know how busy you and your staff members are and I greatly appreciate your consideration of my request.

Strict confidentiality will be maintained throughout this study in accordance with the *Federal Policy for the Protection of Human Subjects* (Federal Register, 1991) and the *Ethical Principles in the Conduct of Research with Human Participants* (APA, 1982). Data will be reported with no identification of individuals or schools. Your participation is strictly voluntary, as is the participation of each of your teachers. The only risk to you and your teachers is the potential breach of confidentiality, which I am taking specific steps to avoid. For example, data will be stored in a separate locked location from the listing of participating school districts. If anyone should come in contact with the data, they would be unable to determine from which school or individuals it originated.

To indicate your willingness to participate in the study, please reply to this email (ajr207@lehigh.edu). Your positive response via email will serve as your permission for me to conduct the study in your school district. If you are able to provide a list of teacher e-mail addresses, please let me know who I need to contact in your district to secure the list. Please retain this e-mail for your reference and information about informed consent.

If you have any questions about the study, please contact me directly at my office at the Spring-Ford Area School District - 610.705.6202 or on my cell phone - 215.416.7512. You may also contact my advisor Dr. Ron Yoshida at Lehigh University – 610.758.6249. If you have any questions or concerns regarding this study and would like to talk to someone other than the researcher(s), **you are encouraged** to contact Susan E. Disidore at (610)758-3020 (email: sus5@lehigh.edu) or Troy Boni at (610)758-2985 (email: tdb308@lehigh.edu) of Lehigh University's Office of Research and Sponsored Programs. All reports or correspondence will be kept confidential.

With sincere appreciation,

Allyn J. Roche
Assistant Superintendent
Spring-Ford Area School District

Ron Yoshida
Professor of Education
Lehigh University

APPENDIX C

Invitation Letter to Teachers

Dear Teacher:

My name is Allyn Roche. I am the Assistant Superintendent at Spring-Ford Area School District and also I am currently a doctoral student at Lehigh University, under the advisement of Dr. Ron Yoshida.

Why this request? Technology in our schools is here to stay. Parents, students and school administrators each have expectations of teachers to integrate and include more technology-based instructional strategies. In my search of the research and in talking about this topic among administrators, we may have a "feeling" about how frequently teachers use technology in the classroom, but we really don't have valid and reliable information upon which to plan trainings and budget for future technology purchases.

My dissertation study proposes to ask teachers in Montgomery County: (1) How frequently do you use technology in your classroom and (2) what kinds of technology (including mobile technology) are you comfortable in using. I am interested in your opinions.

Insert Superintendent Name has approved this research in your school district and you have been randomly selected to participate. Your role in this study will be to complete one on-line survey. The first section of the survey focuses on identifying your frequency of technology use in the classroom with specific examples and your overall personal assessment of your knowledge and comfort with technology in the classroom. The second section of the survey measures your perceptions on 26 statements about Mobile learning. Mobile Learning specifically focuses on the use of both school purchased and student-owned mobile devices and wireless hand-held computers in the classroom. Your participation will require approximately 10 minutes time to complete the questionnaire.

You will not receive any compensation for participating in this study. However, at the conclusion of the study, as a "thank you", I will randomly select four participants to receive a $50.00 gift card. If you'd like to be among the subjects randomly selected to receive a gift card as a thank you, please provide your e-mail address at the end of the survey. I know how busy you are and appreciate your participation.

Data gathered will be completely confidential. Your participation in this study is strictly voluntary and should you choose not to participate for any reason, your relationship with your school district and/or Lehigh University will not be affected. The Human Subjects Review Board at Lehigh University has approved the procedures to insure confidentiality of all participants. If you have any questions or concerns regarding this study and would like to talk to someone other than the researcher(s), **you are encouraged** to contact Susan E. Disidore at (610)758-3020 (email: sus5@lehigh.edu) or Troy Boni at (610)758-2985 (email: tdb308@lehigh.edu) of Lehigh University's Office of Research and Sponsored Programs. All reports or correspondence will be kept confidential.

By clicking on the following link and through completion of this electronic survey, you give your consent for the data to be used as part of the study. If you have trouble accessing the survey through the link, please copy it into your Internet browser: https://www.surveymonkey.com/s/V6HG23B

If you have any questions or concerns, please contact Allyn Roche at 215.529.0494 (home) or 215.416.7512 (cell) or email: ajr207@lehigh.edu .

With sincere appreciation,

Allyn J. Roche
Assistant Superintendent
Spring-Ford Area School District

APPENDIX D

Mobile Learning Perception Survey

Allyn J. Roche, Lehigh University, ajr207@lehigh.edu

In this questionnaire, you are asked to participate in series of 32 questions that include 26 statements directly associated with Mobile Learning (M-Learning). Mobile Learning specifically focuses on the use of both school purchased and student-owned mobile devices (for example, cell phones, Smartphones, iPods, iPads, Kindle) and wireless hand-held computers in the classroom. Please respond to each statement as a single item and not in conjunction with another statement as each statement is designed to focus on a specific aspect of m-learning.

After reading each statement, please choose the best response from the scale provided. The scale is a traditional 5 point scale, ranging from 1 to 5. Selecting a **1** means that you Strongly Disagree with the statement; a **2** on the scale corresponds to Disagree, a **3** corresponds to a Neutral response on the statement, a **4** corresponds to Agree with the statement followed by a **5** on the scale to corresponding to Strongly Agree with the statement. In addition to the **1-5** scale, each statement will have an option of "Don't Know" which can be used if you do not understand the statement or do not understand this aspect of m-Learning.

Specifically, **I am interested in your perception of each statement as it pertains to your classroom and current teaching assignment.** In addition, the remaining six questions focus on identifying your school district, current teaching assignment level (elementary, middle or high school) and your frequency of use of technology in your classroom including specific examples.

Please be advised that your response to this questionnaire is provided anonymously. No attempt will be made to connect your responses to you or your school. Only group data will be reported.

SECTION 1: Types of Technology Used in the Classroom

A. Hardware Component - Do you currently use the listed technology component in your classroom on a consistent (weekly) basis? From the list provided, please use the drop down menu under "Use of Specific Technology." Please answer with either a Yes or No to each specific component.

Student Use of School Purchased Laptops/Desktops/iPads/Tablets	Yes/No
Interactive Smartboard Lessons (not just for projection of material)	Yes/No
Student Use of Devices (i.e. - Wireless Keyboards, Interactive Slates, Document Cameras, Digital Cameras)	Yes/No
Classroom Response Units (clickers) or Video Games	Yes/No
Use of Student Personal Mobile Devices (i.e. - cell phones, smartphones, iPad, Kindle)	Yes/No
Other – please list additional hardware components	Text Box

B. Software Component - Do you currently use the listed technology component in your classroom on a consistent (weekly) basis? From the list provided, please use the drop down menu under "Use of Specific Technology." Please answer with either a Yes or No to each specific component.

PowerPoint and Presentation/Lecture-type Programs	Yes/No
On-line Curriculum Purchased by the District (i.e. - Read 180, Compass Odyssey, Achieve 300)	Yes/No
Graphic Organizers (i.e. - Inspiration, Kidspiration)	Yes/No
Content or Subject Programs (i.e. – Geometer's Sketchpad, Catastrophic Events)	Yes/No
Assistive Technology Programs to Support Students with Disabilities	Yes/No
Other – please list additional software components	Text Box

C. Internet-based Resources - Do you currently use the listed technology component in your classroom on a consistent (weekly) basis? From the list provided, please use the drop down menu under "Use of Specific Technology." Please answer with either a Yes or No to each specific resource.

Classroom Wiki, Blog, Discussion Board	Yes/No
Classroom Webpage (either on the district website or other – Edmodo, Blackboard)	Yes/No
On-line Textbooks, Novels, Graphic Novels, and Articles	Yes/No
On-line Resources Directly Connected to Content and Material	Yes/No
Google Documents, Google Earth or any of the supports from Google	Yes/No
iTunes University, TED or other audio files related to content	Yes/No
Streaming Videos (i.e. - Discovery Education, Youtube, BrainPop)	Yes/No
Instant Feedback Websites (i.e. - polleverywhere.com, on-line quizzes)	Yes/No
Podcasting	Yes/No
Skype or Video Conference (or similar program to connect with someone outside the classroom)	Yes/No
Social Media Websites (i.e. – Twitter, Facebook, MySpace)	Yes/No
Student Creation / Production Websites (i.e. – animoto, xtranormal)	Yes/No
Other – please list additional Internet-based resources	Text Box

D. Frequency of Technology Use in the Classroom - For this study, use of technology refers to planned instructional strategies or assessment methods by either teachers or students. Use of technology in the classroom does NOT refer to updating grades in an electronic grade book, posting homework for parents, answer e-mails or other daily tasks. Please indicate the frequency that you use technology in the classroom for instruction and assessment on a weekly basis (assume a full 5-day week as 100% of the time

- 0% of classroom time during the week
- 1% - 10% of classroom time during the week
- 11% - 25% of classroom time during the week
- 26% - 50% of classroom time during the week
- 51% - 74% of classroom time during the week
- 75% - 89% of classroom time during the week
- 90% - 100% of classroom time during the week

E. Personal Skill Level - Using the scale below, please rate your personal knowledge and comfort level with technology in the classroom.

- o Novice - Minimal knowledge without connecting it to practice
- o Beginner – Working knowledge of key aspects of practice
- o Competent – Good working and background knowledge of area of practice
- o Proficient – Depth of understanding of discipline and area of practice
- o Expert – Authoritative knowledge and deep understanding across area of practice

SECTION 2: Mobile Learning Perception Scale

Mobile Learning specifically focuses on the use of both school purchased and student-owned mobile devices (for example, cell phones, Smartphones, iPods, iPads, Kindle) and wireless hand-held computers in the classroom.

Please respond to each statement as a single item and not in conjunction with another statement as each statement is designed to focus on a specific aspect of m-learning. After reading each statement, please choose the best response from the scale provided.

The scale is a traditional 5 point scale, ranging from 1 to 5. Selecting a 1 means that you Strongly Disagree with the statement; a 2 on the scale corresponds to Disagree, a 3 corresponds to a Neutral response on the statement, a 4 corresponds to Agree with the statement followed by a 5 on the scale to corresponding to Strongly Agree with the statement. In addition to the 1-5 scale, each statement will have an option of "Don't Know" which can be used if you do not understand the statement or do not understand this aspect of m-Learning.

Specifically, respond to each statement as it pertains to your classroom and current teaching assignment.

Strongly Disagree 1	Disagree 2	Neutral 3	Agree 4	Strongly Agree 5	Don't Know
○	○	○	○	○	○

1.	M-learning tools remove the limitation of time and space from traditional resources
2.	M-learning techniques do not generate effective learning-teaching environments
3.	The Teaching-Learning process (planned interaction that promotes behavioral change that is not a result of coincidence) should be performed with M-learning technologies.
4.	I can use M-learning techniques as a good discussion tool with my students in the learning activities
5.	Programs such as Messenger and Skype which are used through M-learning tools, provide opportunity for discussions on subjects without the limitations of time and space
6.	M-learning techniques can be used to supplement or in place of the traditional education
7.	Most learning activities can be realized by means of M-learning techniques and strategies

8.	An effective learning environment could be produced by sending lecture notes via M-learning tools such as e-mail
9.	M-learning techniques facilitate teaching the subjects in my content/grade level
10.	M-learning techniques provide an effective method in learning my specialized content/classroom
11.	M-learning technologies provide effective methods for exact transmission of knowledge in learning activities
12.	Teacher-student communication is facilitated by means of M-learning tools
13.	Utilization of M-learning technologies increases students' motivation
14.	I can have prompt access to needed materials that are related to my content/grade level by means of mobile technologies
15.	M-learning techniques are reliable for personal use of learning
16.	Communication is possible in chat programs by means of mobile technologies
17.	M-learning techniques are a good method for the necessary interaction in my class
18.	M-learning techniques are convenient to share my specialized knowledge/information with my colleagues
19.	Course materials could be sent to students via text, video or picture messages
20.	M-learning methods enhance the quality of lessons
21.	I would like to supplement my classes in the future with M-learning methods
22.	Student-student communication is facilitated by means of M-learning tools
23.	M-learning technologies can be used as a supplement in all classes on all subjects
24.	M-learning techniques provide a convenient environment to hold discussions on my specialized content/classroom
25	Learners can access instructional websites with mobile technologies
26.	Students can have more effective communication with mobile technologies than traditional methods

SECTION 3 - Demographics

		Response (Drop Down Menu)
F.	**School District** Please select your school district	List of All Montgomery County Public Schools
G.	**Current Teaching Level** Please select the level of your current teaching assignment. If you are split across levels, please select the level where you teach the majority of the time (only select one choice)	Elementary School Middle School High School
Optional	*As a "Thank You", four randomly selected subjects will receive a $50.00 gift card. If you'd like to be among the subjects randomly selected, please enter your e-mail address below and hit the DONE button.* *If you are not interested in the drawing, please leave the textbox blank and hit the DONE button.*	Text Box

APPENDIX E

Mobile Learning Perception Survey – Paper Copy

Allyn J. Roche, Lehigh University, ajr207@lehigh.edu

In this questionnaire, you are asked to participate in series of 32 questions that include 26 statements directly associated with Mobile Learning (M-Learning). Mobile Learning specifically focuses on the use of both school purchased and student-owned mobile devices (for example, cell phones, Smartphones, iPods, iPads, Kindle) and wireless hand-held computers in the classroom. Please respond to each statement as a single item and not in conjunction with another statement as each statement is designed to focus on a specific aspect of m-learning.

After reading each statement, please choose the best response from the scale provided. The scale is a traditional 5 point scale, ranging from 1 to 5. Selecting a **1** means that you Strongly Disagree with the statement; a **2** on the scale corresponds to Disagree, a **3** corresponds to a Neutral response on the statement, a **4** corresponds to Agree with the statement followed by a **5** on the scale to corresponding to Strongly Agree with the statement. In addition to the **1-5** scale, each statement will have an option of "Don't Know" which can be used if you do not understand the statement or do not understand this aspect of m-Learning.

Specifically, **I am interested in your perception of each statement as it pertains to your classroom and current teaching assignment.** In addition, the remaining six questions focus on identifying your school district, current teaching assignment level (elementary, middle or high school) and your frequency of use of technology in your classroom including specific examples.

Please be advised that your response to this questionnaire is provided anonymously. No attempt will be made to connect your responses to you or your school. Only group data will be reported.

SECTION 1: Types of Technology Used in the Classroom

A. **Hardware Component -** Do you currently use the listed technology component in your classroom on a consistent (weekly) basis? From the list provided, please use the drop down menu under "Use of Specific Technology." Please answer with either a Yes or No to each specific component.

Student Use of School Purchased Laptops/Desktops/iPads/Tablets	Yes/No
Interactive Smartboard Lessons (not just for projection of material)	Yes/No
Student Use of Devices (i.e. - Wireless Keyboards, Interactive Slates, Document Cameras, Digital Cameras)	Yes/No
Classroom Response Units (clickers) or Video Games	Yes/No
Use of Student Personal Mobile Devices (i.e. - cell phones, smartphones, iPad, Kindle)	Yes/No
Other – please list additional hardware components	Text Box

B. Software Component - Do you currently use the listed technology component in your classroom on a consistent (weekly) basis? From the list provided, please use the drop down menu under "Use of Specific Technology." Please answer with either a Yes or No to each specific component.

PowerPoint and Presentation/Lecture-type Programs	Yes/No
On-line Curriculum Purchased by the District (i.e. - Read 180, Compass Odyssey, Achieve 300)	Yes/No
Graphic Organizers (i.e. - Inspiration, Kidspiration)	Yes/No
Content or Subject Programs (i.e. – Geometer's Sketchpad, Catastrophic Events)	Yes/No
Assistive Technology Programs to Support Students with Disabilities	Yes/No
Other – please list additional software components	Text Box

C. Internet-based Resources - Do you currently use the listed technology component in your classroom on a consistent (weekly) basis? From the list provided, please use the drop down menu under "Use of Specific Technology." Please answer with either a Yes or No to each specific resource.

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Classroom Webpage (either on the district website or other – Edmodo, Blackboard)	Yes/No
On-line Textbooks, Novels, Graphic Novels, and Articles	Yes/No
On-line Resources Directly Connected to Content and Material	Yes/No
Google Documents, Google Earth or any of the supports from Google	Yes/No
iTunes University, TED or other audio files related to content	Yes/No
Streaming Videos (i.e. - Discovery Education, Youtube, BrainPop)	Yes/No
Instant Feedback Websites (i.e. - polleverywhere.com, on-line quizzes)	Yes/No
Podcasting	Yes/No
Skype or Video Conference (or similar program to connect with someone outside the classroom)	Yes/No
Social Media Websites (i.e. – Twitter, Facebook, MySpace)	Yes/No
Student Creation / Production Websites (i.e. – animoto, xtranormal)	Yes/No
Other – please list additional Internet-based resources	Text Box

D. Frequency of Technology Use in the Classroom - For this study, use of technology refers to planned instructional strategies or assessment methods by either teachers or students. Use of technology in the classroom does NOT refer to updating grades in an electronic grade book, posting homework for parents, answer e-mails or other daily tasks. Please indicate the frequency that you use technology in the classroom for instruction and assessment on a weekly basis (assume a full 5-day week as 100% of the time

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- 11% - 25% of classroom time during the week
- 26% - 50% of classroom time during the week
- 51% - 74% of classroom time during the week
- 75% - 89% of classroom time during the week
- 90% - 100% of classroom time during the week

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- ○ Beginner – Working knowledge of key aspects of practice
- ○ Competent – Good working and background knowledge of area of practice
- ○ Proficient – Depth of understanding of discipline and area of practice
- ○ Expert – Authoritative knowledge and deep understanding across area of practice

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1.	M-learning tools remove the limitation of time and space from traditional resources				
Strongly Disagree 1	Disagree 2	Neutral 3	Agree 4	Strongly Agree 5	Don't Know / No Opinion
○	○	○	○	○	○
2.	M-learning techniques do not generate effective learning-teaching environments				
Strongly Disagree 1	Disagree 2	Neutral 3	Agree 4	Strongly Agree 5	Don't Know
○	○	○	○	○	○
3	The Teaching-Learning process (planned interaction that promotes behavioral change that is not a result of coincidence) should be performed with M-learning technologies.				
Strongly Disagree 1	Disagree 2	Neutral 3	Agree 4	Strongly Agree 5	Don't Know
○	○	○	○	○	○

4	I can use M-learning techniques as a good discussion tool with my students in the learning activities				
Strongly Disagree 1	Disagree 2	Neutral 3	Agree 4	Strongly Agree 5	Don't Know
○	○	○	○	○	○
5	Programs such as Messenger and Skype which are used through M-learning tools, provide opportunity for discussions on subjects without the limitations of time and space				
Strongly Disagree 1	Disagree 2	Neutral 3	Agree 4	Strongly Agree 5	Don't Know
○	○	○	○	○	○
6	M-learning techniques can be used to supplement or in place of the traditional education				
Strongly Disagree 1	Disagree 2	Neutral 3	Agree 4	Strongly Agree 5	Don't Know
○	○	○	○	○	○
7	Most learning activities can be realized by means of M-learning techniques and strategies				
Strongly Disagree 1	Disagree 2	Neutral 3	Agree 4	Strongly Agree 5	Don't Know
○	○	○	○	○	○
8	An effective learning environment could be produced by sending lecture notes via M-learning tools such as e-mail				
Strongly Disagree 1	Disagree 2	Neutral 3	Agree 4	Strongly Agree 5	Don't Know
○	○	○	○	○	○
9	M-learning techniques facilitate teaching the subjects in my content/grade level				
Strongly Disagree 1	Disagree 2	Neutral 3	Agree 4	Strongly Agree 5	Don't Know
○	○	○	○	○	○
10	M-learning techniques provide an effective method in learning my specialized content/classroom				
Strongly Disagree 1	Disagree 2	Neutral 3	Agree 4	Strongly Agree 5	Don't Know
○	○	○	○	○	○
11	M-learning technologies provide effective methods for exact transmission of knowledge in learning activities				
Strongly Disagree 1	Disagree 2	Neutral 3	Agree 4	Strongly Agree 5	Don't Know
○	○	○	○	○	○

12	Teacher-student communication is facilitated by means of M-learning tools				
Strongly Disagree 1	Disagree 2	Neutral 3	Agree 4	Strongly Agree 5	Don't Know
○	○	○	○	○	○
13	Utilization of M-learning technologies increases students' motivation				
Strongly Disagree 1	Disagree 2	Neutral 3	Agree 4	Strongly Agree 5	Don't Know
○	○	○	○	○	○
14	I can have prompt access to needed materials that are related to my content/grade level by means of mobile technologies				
Strongly Disagree 1	Disagree 2	Neutral 3	Agree 4	Strongly Agree 5	Don't Know
○	○	○	○	○	○
15	M-learning techniques are reliable for personal use of learning				
Strongly Disagree 1	Disagree 2	Neutral 3	Agree 4	Strongly Agree 5	Don't Know
○	○	○	○	○	○
16	Communication is possible in chat programs by means of mobile technologies				
Strongly Disagree 1	Disagree 2	Neutral 3	Agree 4	Strongly Agree 5	Don't Know
○	○	○	○	○	○
17	M-learning techniques are a good method for the necessary interaction in my class				
Strongly Disagree 1	Disagree 2	Neutral 3	Agree 4	Strongly Agree 5	Don't Know
○	○	○	○	○	○
18	M-learning techniques are convenient to share my specialized knowledge/information with my colleagues				
Strongly Disagree 1	Disagree 2	Neutral 3	Agree 4	Strongly Agree 5	Don't Know
○	○	○	○	○	○
19	Course materials could be sent to students via text, video or picture messages				
Strongly Disagree 1	Disagree 2	Neutral 3	Agree 4	Strongly Agree 5	Don't Know
○	○	○	○	○	○

20	M-learning methods enhance the quality of lessons				
Strongly Disagree 1	Disagree 2	Neutral 3	Agree 4	Strongly Agree 5	Don’t Know
○	○	○	○	○	○

21	I would like to supplement my classes in the future with M-learning methods				
Strongly Disagree 1	Disagree 2	Neutral 3	Agree 4	Strongly Agree 5	Don’t Know
○	○	○	○	○	○

22	Student-student communication is facilitated by means of M-learning tools				
Strongly Disagree 1	Disagree 2	Neutral 3	Agree 4	Strongly Agree 5	Don’t Know
○	○	○	○	○	○

23	M-learning technologies can be used as a supplement in all classes on all subjects				
Strongly Disagree 1	Disagree 2	Neutral 3	Agree 4	Strongly Agree 5	Don’t Know
○	○	○	○	○	○

24	M-learning techniques provide a convenient environment to hold discussions on my specialized content/classroom				
Strongly Disagree 1	Disagree 2	Neutral 3	Agree 4	Strongly Agree 5	Don’t Know
○	○	○	○	○	○

25	Learners can access instructional websites with mobile technologies				
Strongly Disagree 1	Disagree 2	Neutral 3	Agree 4	Strongly Agree 5	Don’t Know
○	○	○	○	○	○

26	Students can have more effective communication with mobile technologies than traditional methods				
Strongly Disagree 1	Disagree 2	Neutral 3	Agree 4	Strongly Agree 5	Don’t Know
○	○	○	○	○	○

SECTION 3 - Demographics

		Response
F.	**School District** Please list your school district – Montgomery County (P.A.)	
G.	**Current Teaching Level** Please select the level of your current teaching assignment. If you are split across levels, please select the level where you teach the majority of the time (only select one choice)	Elementary School Middle School High School
Optional	*As a "Thank You", four randomly selected subjects will receive a $50.00 gift card. If you'd like to be among the subjects randomly selected, please enter your e-mail address below and hit the DONE button.* *If you are not interested in the drawing, please leave the textbox blank and hit the DONE button.*	

VITA

Allyn Joseph Roche was born in Livingston, New Jersey, on January 26, 1972, the son of Shirley Rosetta Roche and James Charles Roche. After graduating from West Essex Regional High School, North Caldwell, New Jersey, he entered Temple University, Philadelphia, PA, receiving the degree of Bachelor of Science in August, 1990. He entered the work force for a few years as an entrepreneur and in restaurant management and found his way to graduate school at Villanova University. He received his Master of Art in Educational Leadership from Villanova University in May, 2001. Prior, during and following his stay at Villanova University, he was served as the head cheerleading coach leading several nationally ranked co-ed cheerleading squads as well as support the overall university. In 1999, his teaching career began at Monsignor Bonner High School in Upper Darby, PA, teaching Physical Science, Chemistry and AP Biology. In 2001, he moved to Pennbrook Middle School in North Wales, PA (North Penn School District) as a middle school science teacher. In 2004, Allyn was promoted to assistant principal at Pennbrook Middle School and due to a retirement, he was promoted to principal at Pennbrook Middle School in 2006. As principal at Pennbrook Middle School, PSSA test scores increased to over 90% proficiency in Math, Reading and Writing. At the request of the superintendent, he accepted a new assignment and moved to the district office in November, 2008, as the Director of Secondary Education and Professional Development. During the spring semester of 2007, Allyn enrolled at Lehigh University in a Doctorate of Educational Leadership program. In October 2011, he was offered and accepted the position of Assistant Superintendent at the Spring-Ford Area School District in Royersford, PA.