Apples On! Exploring Mobile Device Learning in Schools

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Abstract: Mobile Device Learning (MDL), as a tool for student learning, is predicted by many scholars to be the transformational singularity forecasted to change traditional learning environments into student-centered, 21st Century classrooms. The literature is imbued with quantitative studies focused on teacher attitudes and teacher self-reported pedagogical practices regarding MDL. However, few qualitative studies exist in which lived experiences of teachers is revealed through rich, descriptive data to include self-reported data as well as actual observation. This qualitative case study sought to understand how teachers are using mobile learning in ways that put students in unique learning situations in which MDL is the learning tool. In presenting the analysis of this qualitative case study, the triangulation of data included a structured interview, lesson plan analysis, and observation as elements of a descriptive narrative process used to represent participants' understandings of the influence of MDL on their teaching practices. Constructivist learning theory and its relationship to MDL integration analyzed through the TPACK model of instruction was the underlying framework that helped to understand how teachers worked to infuse content, pedagogy, and technology into engaging, active learning.

Keywords: constructivism, Levels of Use, Mobile Device Learning (MDL), technology integration

1. INTRODUCTION

Technology has accelerated the proliferation of knowledge and has created unique pathways for communicating and accessing knowledge and information, spurring forward- thinking educators to design meaningful learning experiences using 21st Century technology. Technology as a tool for learning is a trend evolving at a "hyperchange" rate of which is predicted to bring about a "technological singularity" that is forecasted to change human history (Cornish, 2004, p. 12). The impact from this cultural technological evolution is that schools are implementing the use of mobile devices in classrooms. Statistics from the Piper Jaffray research firm reveal that in 2010, education purchases of iPads made up 60 percent of the total market with a prediction of iPads or some type of mobile device replacing classroom computers by the year 2015 (Gentile, 2012). Some countries already report 100% of students have at least one mobile or handheld device being used in the classroom to complement traditional instructional approaches to learning (Vogel, Kennedy, & Kwok, 2009). Consequently, this could mean that in the near future, 21st Century classrooms would become totally computerized: paper and pencil-less. This qualitative study explores the integration of mobile devices in k-12 classroom instruction and examines how the integration of technology is changing teaching practices.

As early as the 1980's, the first Logo environment organized, resulting in educators seeking to use computers as "objects-to-think" as opposed to use associated with storage and information retrieval (Papert, 1993, p.11). Additionally, these innovative environments were rooted in experiential philosophy reflected through Papert's description of technology integration as being "participatory," "varied," and "discovery-rich" (p. 179). More importantly, the study revealed the positive influences of experiential practice: the promotion of engaging, reflective learning demonstrated through instructional decisions utilizing technology as a tool for learning for the student and by the student to increase knowledge and enhance skill development.

Currently, technology is touted as being the catalyst for key reforms in educational instructional practices, predicated on its ability to transform traditional teacher-directed instruction to a more student-centered paradigm (Lang, 2011; Motiwalla, 2007). It is the transformative nature of learning with mobile technology that is explored in this qualitative study. An early study, completed by The New London Group (as cited in Cazden, Cope, Fairclough & Gee, 1996), asserts that digital pedagogy is transformative in nature: providing an "epistemology of pluralism that provides access without

people having to erase or leave behind different subjectivities…[but instead]…will be the basis of the new norm" (p. 66). Subsequently, a prediction might be that schools without adequate technology will fall behind, and as a result, the achievement gap will widen even more.

While much investment has been made in infrastructure that supports computer use in schools across the nation, education has been slow to institute change in policy and curriculum that supports the way teachers need to teach to create an empowering, multimodal learning environment. Laurillard (2002) argues that for change to occur stakeholders "must be capable of adaptive learning" adding that learning organizations must "conduct an internal conversation that allows for learning from experience and adapt to its environment" (p. 215). The literature repeatedly addresses the incompatibility of federal, state and institutional educational goals focusing on testing and accountability and the paradigm required to fully integrate technology. The consequence of such misalignment is the creation of a major barrier to full implementation; the requirement of student-centered pedagogy as well as retaining and refining the practice to effectively integrate technology (McKeachie & Svinicki, 2011; Welch & Brownell, 2000).

To create and implement a constructivist learning environment that uses mobile device learning (MDL) as a tool for student learning, teachers would require an expansive extent of autonomy in instructional decision-making. To change curriculum to fit technology would be beyond the authority of a teacher; however, teacher-designed activities that match mobile technology capabilities is not. Teacher training to develop an experiential approach to instruction that employs problem-solving or inquiry is argued by scholars to be the better approach to integrating technology. MDL is specifically designed for students to construct their own knowledge through individual endeavors or through collaboration. This student-centered approach is a radical shift away from traditional   essentialism. In a recent qualitative study conducted by Haines and Smith (2012), college level students, who are developmentally capable of abstract deductive reasoning, according to Piaget's Stages of Cognitive Development, repeatedly expressed desires during learning to "feel it, touch it, see it and experience it because that's how we learn best" (p. 363). If this is how older learners profess to learn best, then it is only logical to provide the same context of learning for elementary and secondary learners. The implication may be that it will be up to local learning institutions, faculty, and stakeholders to rethink education to fit 21st century learning and to repurpose these mobile devices to support student learning.

Halverson and Smith (2009) argue that while technology has been viewed as fundamentally changing schools, it has not been used to exact pedagogy change from "technologies for learning", which are directed by the teacher, to "technologies for learners", which are student-centered and require an experiential approach to teaching (p. 49). The result is that technologies for learning are used as supplemental resources, much like the use of desktop computers, or used for practice drills for skill remediation. Rather than fully integrate technology, surface learning for recall and other lower level cognitive processes is being developed through technological device applications. According to experimental research findings based on mathematics and reading interventions within classrooms, placing mobile devices, such as the iPad and iPod in the hands of students produced increases in achievement levels (Kiger, Herro, & Prunty, 2012; Lacina, 2008; & Sheppard, 2011); however, in all three studies, the teacher selected and controlled the content and the practice skill. Interestingly, all three teachers self-reported as student-centered instructors; but evidence of meaningful integration was missing from the lessons. Teachers allowed for the choice of only a few applications and did not ask that the devices be used for a task beyond what could be achieved with paper and pencil. Hence, in all three studies, only a minimal shift to a more experiential or constructivist pedagogy was achieved.

As the push to integrate new innovative mobile technologies becomes more voiced due to skyrocketing societal use of mobile devices, unprepared teachers are being charged with its implementation and challenged to fit mobile learning into standard-based learning. This contention is supported by Koehler and Mishra (2009) who assert that "Teachers often have inadequate (or inappropriate) experience with using digital technologies for teaching and learning" (p. 61). A framework for teacher knowledge related to technology integration developed by Koehler and Mishra will be discussed in depth later in the literature search. The development of an understanding of how to integrate content knowledge and past pedagogy with technology knowledge is the key to creating meaningful learning. Barriers to mobile device learning exist and some are not only institutional, but are related to teacher resistance. However, integration must be put forward as a 21st Century learning priority. Identifying successful innovative instructional strategies in which mobile devices are tools of learning has the potential to challenge the traditional educational paradigm while impacting teacher efficacy concerns. Collins and Halverson (2009) warn that if schools do not begin to use the technologies being used outside of school to think, communicate, and to learn independently then the consequence could be that mainstream society as

a majority may begin to view traditional schooling as obsolete.

Much of the blame for a slow start to providing access to MDL stems from budgetary cutbacks within many school districts and a bad economy as the result of economic failings of 2008. Cutbacks mean larger student-to-teacher ratio and fewer resources. To provide for a closer 1:1 ratio of student to Internet access would require rethinking the advantages the purchasing of these devices would provide to both students and teachers. Many schools realize that purchasing these devices for students or allowing students to bring their own devices provides a ubiquitous learning experience (Collins & Halverson, 2009, p. 112). The support for students bringing their own devices (BYOD) exists from a parental perspective. In a survey conducted by Speak Up (2010), 63 to 70 percent of parents of K-12 children polled reported that they would purchase a mobile device and a data plan to be used at school. It is interesting to note that K-6 parents were only slightly less likely to participate than parents of high school age learners. However, the use of the Smartphone in the classroom was supported by only 24 percent of polled administrators, while an overwhelming 62 percent of 6-12 grade learners believe Smart Phones to be a marker of an "ultimate school" (Speak Up 2010, p. 15).

As evidenced in the literature, certainly a gap exists in the vision espoused by schools as to why current technologies should be used to prepare students for college and career as opposed to how the latest technologies are being used in the classroom as reported by students. Over 70 percent of high school teachers and administrators reported that their schools do a "good job" of using current technology to add value to learning while only 42 percent of students agree that how technology is used by their schools actually enhances learning (p. 15). This data, among other research, supports this study's focus to explore how current technologies are being used for instruction that supports the development of 21st Century skills.

The Partnership for 21st Century Skills (2011) identify these skills to be mathematical and scientific problem solving, social skills involved with collaboration, the ability to identify and analyze information sources for their appropriateness, bias and authenticity, and finally, the ability to reflect what has been learned. Current technologies empower students to convey these competencies through their participation in learning environments that not only focus on core subjects, but also expand learning to propel students to higher levels of cognition. These classrooms are deliberate creations of educators who support learning in 21st Century context through access to current technologies and resources to include projects and other application based learning experiences (p.5).

Furthermore, these current technologies have the effect of creating a transitional link from school to home. Students can access help with assignments and with homework through the Internet. Additionally, peer suggestions or tutoring can be accessed through the use of social media as learning becomes collaborative as opposed to isolated (Brooks & Brooks, 1999). The goal of this research is to better understand the process of MDL implementation and how the integration of these devices is influencing instructional decisions.

2. QUALITATIVE STUDY

A. Problem Statement

The use of mobile devices in K-12 classrooms as an instructional practice is increasing without evidence of effective implementation. This contention is supported by Koehler and Mishra who assert that, "Teachers often have inadequate (or inappropriate) experience with using digital technologies for teaching and learning" (2009, p. 61). Teachers need to be taught how to apply what they have learned to create productive mobile device learning environments for their students in which students are actively engaged in intentional learning opportunities.

B. Purpose of the Study

The purpose of this research is to explore the contemporary event of how teachers integrate mobile device(s) within planned learning content to describe an in-depth analysis of teachers' level of use. Mobile device learning is defined as "any form of learning that is mediated through a mobile or, more precisely, mobile handheld, device" (Pegrum, Oakley, & Faulkner, 2013, p. 66). This definition, as proffered by Pegrum et al. (2013), excludes laptops as a category due to their size as compared to mobile devices that fit the hand and provide flexibility of use in supporting student learning. A secondary query is to examine the process of instructional decision-making as it relates to the influence mobile technology integration has in changing basic instructional practices. This study seeks to understand how teachers are using mobile learning in ways that put students in unique learning situations in which devices are used as computing and thinking tools that are used every day by learners outside of school, which precludes the need to teach how to use the device. This means that learning activities connected to content would be designed and implemented specifically using mobile applications that could not otherwise be executed; otherwise the same activity or assignment could be done using traditional paper and pencil or a basic word processor program (Cuban, 2001; Koehler & Mishra, 2009).

C. Research Questions

The following research questions guided this qualitative study:

1. How is mobile device learning implemented in a K-12 school?
2. What are the mobile device learning levels of use of trained teachers?
3. How does mobile device learning influence instructional practices?

D. Significance of the Study

This study examines the practices of teachers implementing mobile device(s) learning and how mobile device integration is influencing teaching pedagogy in K-12 classrooms. The data collected in this qualitative study provides information that might help schools move forward with mobile device integration as strategies are identified that produce effective and engaging learning for students.

In this case study, contributions to the field of educational practices is sought through developing a lesson in how successful teaching practices with technology can be developed through a constructivist framework. Technological pedagogical content knowledge or TPACK is relatively new to education and is emerging as a constructivist pedagogical framework designed to transform traditional practices (Koehler & Mishra, 2009). Its goal is to produce effective teaching with technology through teacher understanding of how educational technology and pedagogy and content and knowledge interact rather than how to use a specific technology as technology knowledge is in always in transit (Koehler & Mishra, 2009). Instead, the researchers assert the focus is on "ways of thinking about and working with technology [that] can apply to all technology tools and resources" (p. 64). In other words, understanding how the use of a mobile device might be valuable to a lesson, teachers would consider how well it represents content and opportunities for students to construct their own knowledge or create a product that could not have been done without the device. This study has potential to provide insight into the influence that mobile device learning could possibly have on transforming instruction to fit 21st Century learning through providing models of implementation that have been successful in the given settings.

E. Operational Definitions

Constructivism- A psychology theory that posits that learners are not "passive recipients of information, but actively connect it with previously assimilated knowledge to make it their own" (Ozmon, 2012, p. 204).

Levels of Use- (LoU) is a structured interview tool taken from Hall, Dirksen and George (2008), Concerns Based Adoption Model. This interview protocol is a validated process for evaluating levels of use of a new innovation and has the effect of ranking the degree of implementation along a continuum based on eight adoption levels of implementation ranging from 0 (Non-Use) to Level IV (Refinement).

Mobile Device Learning- "Any form of learning that is mediated through a mobile or, more precisely, mobile handheld, device" (Pegrum, Oakley, & Faulkner, 2013, p. 66).

Technology Integration- "The incorporation of technology resources and technology-based practices into the daily routines, work, and management of schools" to include teaching practices that encourage collaboration, communication, online research, and other methods that enhance and support school goals (Technology in Schools, 2002, chapter 7, para 1).

F. Limitations of the Study

The qualitative methodology of the study limits findings to participants' experiences and perceptions preferences related to mobile device learning that cannot be generalized. The study also examined only a small sample of participants from a southern, rural region of the United States.   Most importantly, this qualitative study seeks to explore behaviors and actions that support constructivist practices and did not collect data related to student achievement. It might be that future research will consider the use of mixed-methods to better support the value of mobile device learning in classrooms as it relates to practice and student achievement.

3. THEORETICAL FRAMEWORK

The use of mobile device learning in education can be linked to humanistic philosophy and constructivist learning theory from which experientialism pedagogy originates.   This assertion is supported through experientialism being pragmatic in its processes, which holds that learning is a cyclical process that begins with the student and the student's prior experience (Ozman, 2012). Subsequently, this study's pedagogical interest in how MDL is implemented into teaching practice and its influence on pedagogy and instructional decisions in K-12 schools is viewed through an experiential framework requiring a model of teaching that aligns with constructivist pedagogy. Considered in this model would be not only teacher knowledge associated with content and pedagogy, but also the understanding of the teacher as to how to best use technology as a student tool for learning: hence, the TPACK model of instruction.

Mobile device learning, through the constructivist paradigm, is a promise to students from teachers that learning will be tasked with expanding knowledge and enhancing the capacity to problem-solve. These are the skills needed to be competitive in the 21st century and are considered to be essential in the workings of a

democratic society (Ozman, 2012; Vaderboncoer, 2010, p. 761).

What this means for the experiential educator is that not only is knowledge acquisition important, but also the self-directed nature of experiential learning. Teachers who instruct from a student-centered, constructivist approach realize that their function is to direct learning and provide multiple ways and resources for students to experience learning. Brooks and Brooks (1999) assert "Constructivism now has a face and a name in education" wherein the student plays the central role in their own cognitive growth (p. 18). Teachers who ascribe to constructivist practices adapt resources and adjust lessons on the premise of student needs. The culmination of student-centered practice using mobile device learning is at its peak when prior beliefs are questioned through the gaining of new knowledge accessed through a ubiquitous learning platform, which provides a pathway for continued transformational learning.

Measuring innovation: LoU

To better understand the role of digital technologies in the development of instructional practices that will enable teachers to achieve greater utilization through an experiential/constructivist approach in the elementary classroom, a systematic tool that defines criteria that influence instructional practices is needed. According to Hall, Dirksen and George (2008) teacher efficacy utilizing mobile technology can be investigated using a Levels of Use (LoU) structured interview tool taken from their Concerns Based Adoption Model. This interview protocol is a validated process for evaluating levels of use producing reliability coefficients ranging from .78 to .86 (Thornton & West, 1999). The Concerns Based Adoption Model (CBAM), initially developed in the 1960's through research conducted by The Research and Development Center for Teacher Education at the University of Texas-Austin, is a stage based measurement tool that has the effect of ranking the degree of implementation of new innovations based on eight adoption levels of implementation ranging from 0 (Non-Use) to Level IV (Refinement).

According to Hall (2010), CBAM is applicable to the educational setting in its quest to "understand, facilitate, and evaluate the more complex effects entailed with introducing technology innovations in classrooms and schools" (p. 234). The Level of Use (LoU) component of the The Concerns Based Adoption Model is appropriate for use in this qualitative study as a ranking among the participants is not being sought; instead, how each teacher is implementing the mobile device learning program and where they are in the stages of implementation is being investigated. LoU focuses on behaviors and the subsequent actions of those tasked with change linked to constructivist practice. Instead of providing a ranking among the teachers, the CBAM Level of Use tool will provide a description of implementation that is focused on individual behaviors within a continuum thereby avoiding the dichotomy of use and nonuse. In this study, the teacher is challenged with dual concerns: to integrate the use of a mobile device to support student learning and to evolve teaching practices to accommodate the change. The LoU tool's importance in this study will be in its capacity to inform the evolving change process from each participant directly tasked with facilitating change and possibly reveal influences to link constructivist practices among those teachers using MDL in their classrooms.

4.   SYNTHESIS STATEMENT OF THE LITERATURE

The literature reveals that teachers who plan to integrate technology into teaching practices require more than just the desire: its success depends upon a willingness to change attitudes and beliefs about past practices as an overall strategy. Professional development and support from leadership is important, but research shows that unless teachers rethink instruction from a student perspective to design MDL that promotes problem solving, collaboration and opportunities for self-directed learning the use of handheld devices will not be of added value to students' learning.

5.   METHODOLOGY/RESEARCH DESIGN

The research design for this study is a qualitative case study to seek a more holistic impression of the cultural phenomenon of mobile device use in the classroom as cultural qualitative research intends to accrete a "social mosaic" for the purpose of "creating different social realities" (Marshall & Rossman, 2011, p. 24). In this study, trained mobile devices teachers' lived experiences within their classrooms were explored to determine user appropriation within the social "real life context" of a school (Yin, 2009, p. 18). The inquiry explored how teachers use new technological innovations, identify the degree to which the innovations are being used in the classroom, and illuminated how the use of these innovations influenced teaching practices.

An instrumental single case study approach used a private K-12 school site as its focus to explore the implementation of an education technology innovation for the purpose of adding to the literature strategies that promote learning through the use of mobile devices as it relates to instructional pedagogy as little is known about mobile device learning (Yin, p. 46). Six teachers, ranging in instructional levels 3-12, were interviewed and observed in an attempt to gain insights into how handheld devices or MDL are being used and how the device(s) use may be influencing teaching pedagogy. Through an eclectic approach to data collection and analysis using

both an instructive narrative (Lang, 2011) and a comparative strategy (Marshall & Rossman, 2011), the validity of teachers' self-reported perceptions is juxtaposed against observations and teacher artifacts.

In the use of a narrative, Lang (2011) asserts that the process of describing MDL implementation provides a rich, thick description, including the subjective experiences of the researcher and the recorded experiences of those involved in implementing the innovation. The researcher is free to select those pieces of the mosaic that will help to affirm grounding of theory or the drawing of conclusions. A continual comparing of observed behaviors against those reported in the structured interview provides insight into how instructional decisions are being made and how MDL influences these decisions. It also affords a critical look at the differences between reported behaviors and those observed as they relate to constructivist practices.

A. Target population

The target population is contrived of all mobile device learning teachers in private K-12 schools in Alabama. Schools identified as using iPads, iPods, and Smartphone or iPhones as instructional tools were targeted. In this case study, two delimiting variables which "specify the nature of a population or sample" (Vogt & Johnson, 2011, p. 101) were a) participants must have completed training in the implementation of MDL and b) teachers must have at least one year of experience of implementation.

B. Sampling method

A purposeful sampling method procedure was employed for selecting participants for this qualitative study. A purposeful sample is, according to Vogt and Johnson (2011) "a sample of subjects selected deliberately by researchers, usually because they think certain characteristics are typical or representative of the population (p. 310). According to Yin (2009), the defining of subjects also defines the case, setting boundaries for participation and exclusion of others. Participants were chosen from a K-12 private school based on training and their knowledge and experience of MDL from a minimum of one year of implementation which was needed for this study.

C. Setting

The setting for this study took place inside individual teacher classrooms within a rural private school in Alabama over a two month period. The school, for the purposes of this study will be named B Academy. The timeline for date collection and analysis was approximately three months. The school is privatized and is trailblazing 21st Century policy and instructional practices to support skills needed for students to be

relevant and successful in future career fields. The school has made changes to its technology policy to support mobile device learning integration/ implementation through filtering school purchased devices on campus. B Academy follows a traditional 55-minute schedule. Although B Academy has instituted the use of student-owned devices and provided funding to purchase iPads for the elementary, the school updates and maintains one computer lab for shared teacher use.

D. Data collection

Using a qualitative methodology, data was collected using two main sources: face-to-face interviews and video-taped observations. Field notes were also taken and used to score the TIOI and to develop the narrative. The focused interview protocol, a part of the CBAM, allowed for open-ended probing of questions that illuminated the progress made by each teacher to implementing change using MDL and how the integration of MDL influenced teaching practices. An observation protocol was used to guide observations and to provide insight into teachers' TPACK implementation. Because TPACK is a complex framework with several constructs often overlapping in relationship to each other within the seven identified domains, Harris et al. (2010) suggests using more than one data source to triangulate teacher self-reported data. The use of the TIOI helps to understand what a TPACK classroom looks like and pinpoints characteristics of constructivist practices through a researcher's subjective lens.

E. Data Analysis Procedures

A blended approach to data analysis is presented in this qualitative case study. After data was collected, a systematic analysis was conducted using a bottom to top, linear, hierarchical strategy designed by Creswell (2009). The initial step required raw interview and observation data to be transcribed. The second step required making sense of the data through several readings and note taking. Insight notes from original journal field-notes were added into each transcription as appropriate. Step three began a more detailed analysis as codes were created from the data to determine themes and teaching practices related to constructivism. Next, similarities among data were listed and codes were derived from these similar topics. These categories were then compared to themes that emerged from the literature search, focusing on keywords and phrases that linked with the theoretical framework of TPACK and its alignment to constructivist practices. Using these categories, nodes were created using QSR NVivo software program. Step four required using the NVivo program to help organize and store information. Each line of text in interview and observation data was analyzed and as a result, generated major themes that

were used as major findings. In this study, these findings provided insight into how teachers used MDL in their classrooms and provided a description of teaching practices that were used to validate self-reported data.

In step five, a descriptive narrative is presented in which each participate is treated individually. These descriptions relate to the "how" something happens "phenomenon" of this case study and can be explained through the building of a narrative (Yin, 2009, p. 141). Step six offers an analysis of interpretation. As an exploratory case study was used as a strategy to develop an understanding as to how MDL influences teaching practices through a theoretical lens, causal links were stipulated and from these, recommendations were made to accelerate the use of MDL. This data is presented in a narrative form and is found through-out the analysis as selected pieces are used to illuminate or present evidence to corroborate and affirm assertions made from the data.

6. SUMMARY: DATA ANALYSIS AND RESULTS

A. Description of the sample

The sample for this qualitative case study consisted of six private school teachers from a K-12 school site in a rural area in Alabama. Participants were trained MDL teachers with at least one year of experience implementing the use of handheld devices as a learning tool for students. All teachers were Caucasian. The sample reflected a total of seventy-five years of teaching experience across the grade levels representative of both the elementary and high school. Three teachers, Teachers A, B, and C, taught at the elementary level: grades three, four and six. The remaining teachers, Teachers D, E, and F, taught various subjects at the middle or high school level. One of the elementary teachers is retired from the military.

B. Research Question 1

How is mobile device learning implemented in a K-12 school?

This study's findings revealed a planned, whole school buy-in to implementing and developing MDL environments within the K-12 setting. A 1:1 ratio of student-to-device instructional platform was achieved two ways: a) through school purchase of devices and b) through a BYOD policy which allowed students to bring devices to school appropriate to learning outcomes based on classroom assignments. Professional development is sustained three ways: a) monthly technological meetings, b) on-going assistance, as requested by teachers for the school's IST expertise, and c) announced and unannounced observations that determine a need for assistance with lesson design, instructional delivery, and classroom management.

MDL teachers are supported by administration and a School Board of Education that understands change will happen only through experimentation of those working in the classroom. The effect of upper-level support encourages an active partnership between teachers and administrative school stakeholders and between the teachers. Teachers were tasked with rethinking pedagogy, content delivery, and assignments to better exploit MDL through individual and job embedded monthly collaborative discussion groups and on-the job experiences. These experiences were shared in monthly meetings. All stakeholders work together to analyze and evaluate feedback from classroom teachers; even students were invited to participate. In this third year of implementation, members continue to evaluate the effectiveness of device(s) and their functions, and the appropriateness of applications based on student use to achieve learning outcomes.

The investment to support a MDL environment at this K-12 school is paying off. Traditional classroom approaches have all but been abandoned by teachers using MDL. Teachers were trained mirroring the instructional expectations of a MDL classroom. Both theory and application were developed jointly, therein supporting a TPACK model of instruction. Efforts to change instructional strategies as a result of designing MDL lesson activities to fit a student-centered approach continue to be a collaborative endeavor. The impact of the IST position being held by a peer helped teachers to change from traditional instructional methods to more student-centered practices. While teachers were exposed to the theoretical constructivist framework required to implement MDL, the actual learning phases were designed and implemented using experiential instructional methods. The workshops began with what teachers knew about mobile technology and how it fit into their current practice. Teachers experimented with new instructional procedures using MDL. Instructional changes were based first on past lesson designs and content in which they were the most comfortable with to change that reflected an understanding of technology, content, and pedagogy integration. Collaborative, inquiry-based discussions and individual teacher reflection helped to facilitate the first MDL integrated lesson plans. The MDL environment change facilitated at B Academy is collaborative with the greatest emphasis of instruction focused on student needs. In this study, teachers demonstrated a solid understanding of how student-centered instructional practices using MDL as a tool for student learning supports, enhances, and/or extends learning.

C. Research Question 2

What are the mobile device learning levels of use of trained teachers?

All trained teachers are identified as users of the MDL innovation. An analysis of teachers A, B, C, D, E, and F revealed instruction planned to promote high

student engagement with content and collaboration. The lessons afforded interactive collaboration and timely feedback. In these classrooms, there is evidence of reported functional change that is related to authentic learning. Additionally, teachers' instructional strategies are revealed to be mainly student-centered with students having a personal stake in work quality. Processes of learning include reciprocal sharing and accountability for activity or project completion for the purpose of developing responsibility and promoting MDL classroom community. Differences in LoU use did exist. Two main differences emerged from the data: elementary teachers provided more scaffolding opportunities using MDL for drill or practice and did not collaborate among themselves as much as the high school teachers.

In teachers D, E, and F's classrooms, the focus of instruction is raised to changing the way students think through reflection, questioning, and integrating content into the lives of students. Device use, applications, communication and to some degree, content, is a decision made by students. Students use MDL as a tool for accessing information, storing information, real-time communication, and reflecting knowledge through project based learning. Experiential instruction optimized the learning experiences of students as the teachers took on facilitator roles and encouraged active learning designed to impact how students perceive an event through authentic, real-time sharing of understandings and project based learning.

The use of real-world models, like the Morning Show and commercial advertisement accessed through MDL offer authentic learning resources other than the teacher. In teachers D and E classrooms, students worked collaboratively and cooperatively to create models of real-life products (board game) and a televised entertainment show (Morning Show). Teacher D allowed students to use communication modes via devices that were familiar to them to discuss literature elements and to reflect on instruction.

Additionally, examples of shared leadership among students emerged. An exemplar: student collaboration to produce and present a daily, student-owned television program. Student roles related to real-life examples and were developed through shared leadership. Furthermore, student discoveries related to the connectedness of learned content from discipline to discipline was developed allowing students to evaluate learning based on application and generalization.

Collaboration or sharing with colleagues for the purpose of refining instruction to impact student learning is identifiably a major LoU element dividing participant responses. To move beyond routine use, a user must actively seek out ways to share and to learn about an innovation beyond behaviors set my administration. Although Teacher E is the school's integrationist,

wherein sharing and modeling is part of her job description, she actively seeks out examples and troubleshoots issues on campus as well as researching new apps that might be beneficial to teachers. Teacher E seeks out ways to collaborate. Her door is open to teachers who want to observe her teaching strategies, even if the time was not pre-planned.

While teachers E and F seek out opportunities to collaborate in meaningful ways beyond participation in monthly tech meetings, the remaining four teachers only collaborate as part of administrative expectations or when asked. For example, Teacher A planned with a resource teacher to integrate mathematical applications for differentiated instruction at the beginning of the school year, but evidence of thoughtful selection based on student needs or reflecting on the impact of student learning was not present. Teacher A stated, "We put that in our plans at the beginning of the school year so she could differentiate her group without a lot of problems with noise and movement". Teacher C shared a link to a Web site, but did not offer to explain how the site integrated science content or impacted student learning. These responses clearly represent routine use. The reason for sharing was to lessen his work load. He stated, "I've shared the site (CastScienceWriter) with…fourth and fifth grade teachers because…they (students) seldom could recall the steps. I had to do all that re-teaching".

Teacher B is an MDL user, but is identified through self-belief to be mechanical in use. The teacher reported concerns related to classroom management and test preparation that is pencil and paper. Teacher B's reported focus is testing; therefore, the teacher follows a restrictive skills-based pacing chart. On specific days, iPads are used and other days, it is not. Students are not required to use the iPad, but most do and bring their own device to class on a daily basis. A basal textbook is available for student use. The iPad is used to instruct students on content through reading and highlight specific portions of eText and to deliver practice with a reading skill by students highlighting teacher-made Power Points. Teacher B explained that a great deal of instructional time is spent teaching students to highlight text and monitoring appropriate use. Teacher B reveals that in her planning, most of the activities could be done without the use of the device, and she reported not seeing a difference in learning when students use the iPad. Although her instructional methods include inquiry and collaborative work when iPads are the tool for learning, she remains in control of content and activities.

The table below summarizes the LoU ratings of participants.

Table 1. Overall Participant LoU Rating Sheet

LoU		TA	TB	TC	TD	TE	TF
	Knowledge	IVA	III	IVA	IVB	V	IVA
	Acquiring Information	IVA	II	IVA	IVB	V	III
	Sharing	III	III	IVA	IVA	VI	IVA
	Assessing	III	III	IVA	IVB	V	IVA
	Planning	IVA	III	IVA	IVB	VI	IVA
	Status Reporting	IVA	III	IVA	IVB	V	IVA
	Perfoming	IVA	IVA	IVA	IVB	V	IVA
	Overall LoU	IVA	III	IVA	IVB	V	IVA
	Overall Site LoU						IVA

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In summary, as long as the user is implementing MDL mechanically, the power of MDL is lost in teacher control because students are not using the device for learning. Its use, when identified as mechanical, was mainly to deliver content and to manage classroom administrative duties. Conversely, teachers who used MDL to develop a collaborative, experiential learning environment put the device(s) into the hands of students. Students had control of pacing and product quality through the use of teacher-designed rubrics. Because these environments encouraged collaboration to problem-solve and/or project-based learning teachers were free to monitored progress. MDL allowed student and teacher to exchange comments related to learning that was used to improve quality of work. Teachers who effectively implemented instruction with MDL were actively engaged in monitoring behavior.

Classroom management strategies included location monitoring when devices were in use and verbal commands to conduct quick checks on screens. Teachers who were beyond mechanical use seemed to be comfortable with the use of any device as long as the use was assignment related. Also, students worked in small groups for majority of class time, although students could choose to work independently.   Management of small groups in the elementary classrooms was facilitated through cooperative structures where each member had a role to play. The group leader reported issues to the teacher. In two of the three classrooms, leadership within the teams seemed more shared because the teachers had taught discussion formats that demanded respect for all

learners and the teachers remained engaged in the learning progression through location monitoring and/or by verbal commands. Only one elementary classroom had an issue with behavior and the behavior was not addressed by the teacher in a timely manner because she was detached from the learning activity.

D. Research Question 3

How does mobile device learning influence instructional practices?

Teachers implementing an MDL environment did so by designing lessons and subsequent activities that align with constructivist, student-centered pedagogy. Mishra and Koehler (2006) convey the importance of teachers knowing how to integrate content, pedagogy, and technology into meaningful learning opportunities that represent constructivist practices that are the theoretical unpinning of the TPACK model of instruction. The framework of TPACK, as a model of instruction, is representative of the complex process of designing lessons that integrate the instructional use of technology into existing curriculum. Findings indicate that participants demonstrated an understanding between each component as each teacher reached a TPACK model of instruction. In this study, observations of teachers' classroom practices demonstrated a solid understanding of how student-centered instructional practices using MDL as a tool for student learning supports, enhances, and/or extends learning.

E. Discussion of the Results

Findings indicate that teachers whose level of use of MDL exceeds mechanical use adopted more constructivist practices to implement student-centered learning. These teachers did not place constraints on device type, and in many instances, the choice of application was also a student choice. Teacher design of lesson activities exploited MDL to facilitate real time communication used to share learning and to generate evaluative feedback during and after instruction. Teachers also designed research projects that fostered Internet and Web exploration to support and enhance learning. The willingness of teachers to be an example of live-long learning is revealed in how teachers encourage students to seek and validate Web sources as part of student accountability for learning. The collaborative nature of instruction facilitates a cooperative learning community in which all students participate using MDL to learn in class and beyond the walls of the classroom.

However, classroom management was an issue in one of the three elementary classrooms, but not due to the device diminishing teacher authority as reported in literature. Instead, the issue was that the teacher multi-tasked when devices were in use and did not monitor student progress, relying heavily upon the leadership structure of cooperative learning to monitor and solve behavior issues. Misuse of the device or any other misbehavior during MDL designated time resulted in the loss of use of the device. Although the IST suggested linking use of devices to the classroom behavioral plan, this teacher used MDL as a conditional reward. Technology is not a replacement for teacher guidance.

F. Conclusions

Triangulation of interviews, lesson plans, and observations revealed participants to practice more experiential instructional approaches as opposed to traditional essentialism. Levels of use of the MDL innovation indicated that all teachers are users of mobile device learning as a tool for student learning. Four of the six teachers' lesson design and implementation demonstrated a LoU reflecting mechanical and/or routine use. However, LoU revealed that two of the six teachers' instructional strategies focused on changes to MDL lesson design as needed based on student need and student achievement. Collaboration and the willingness to research and play with innovation to test its fit set these teachers apart from the others.

In determining the influences of MDL on pedagogy, the TPACK model of instruction provided a framework in which teachers' observed behaviors could be categorized as being student-centered based on constructivist components. This study found that all teachers met the TPACK model of instruction, each employing various experiential strategies that aligned with the components described in TPACK. While elementary teachers had to provide more support for learning through scaffolding learning phases, teachers observed in grades 3, 4, and 6 facilitated integrating the use of mobile devices by designing lessons that generated active student engagement through small group collaboration and opportunities to reflect on learning. High school teachers facilitated more student-directed learning where student choice of learning strategy, appropriate technology, and at times, content was an element by design.   Learning was student-driven, supported through the use of mobile devices. Overall, the findings of this study indicate the importance of MDL professional development as it relates to developing and better understanding the paradigm of student-centered instruction that places the technology tool(s) and other decisions for learning into the hands of the learner.

7.   RECOMMENDATIONS

Teachers are playing a major role in changes to content and designing activities that engage, support and enhance learning using MDL. This study provides a only a snapshot of the practices of MDL teachers over a short two month period of time in a private school where federal and state laws do not necessarily govern school policy. Recommendations to conduct a mixed-methods study to include a longer study period with attention to lesson design and its impact on student achievement in a public school district would further validate MDL and lend quantitative data to determine the significance of the relationship between TPACK pedagogy and student achievement across the disciplines. Educational funding and institutional change to integrate innovation is often rewarded only after statistical proof exists showing a positive correlation between the innovation and student test scores. The future use of technology as a valuable asset of education is contingent upon effective integration practices which produces significant student achievement over traditional methodology.

REFERENCES

Brooks, M.G. & Brooks, J.G. (1999, November). *The courage to be constructivist.* Retrieved from ASCD: http://www.ascd.org

Cazden, C., Cope, B., Fairclough, N, & Gee, J. (1996). A pedagogy of multiliteracies: Designing social futures. *Harvard Educational Review, 66*(1), 66-92.

Collins, A., & Halverson, R. (2009). *Rethinking education in the age of technology: The digital revolution and schooling in America.* New York, NY: Teachers College Press.

Cornish, E. (2004). *Futuring: The exploration of the future.* Bethesda, MD: World Future Society.

Cresswell, J. W. (2009). *Research design: Qualitative, quantitative, and mixed methods approaches.* Thousand Oaks , CA: Sage.

Cuban, L. (2001). *Oversold and underused: Computers in the classroom.* Cambridge, MA: Harvard University Press.

Gentile, M. (2012, November). *The importance of managing iPads in the classroom.* Retrieved from eddigest .

Haines, B.J., & Smith, B. (2012). Student-centered course design: Empowering students to become self-directed learners. *Journal of Experiential Education, 35*(2), 357-374.

Hall, G. (2010). Technology's Achilles heel: Achieving high-quality implementation. *Journal of Research on Technology in Education, 42*(3), 231-253. Retrieved from http://www.iste.org/learn/publication/journals/jrte

Hall, G.E., Dirksen, D.J. & George, A. (2006). *Mearsuring Implementation in Schools: Levels of Use.* Austin, TX: SEDL.

Halverson, R. & Smith, A. (2009). How new technologies have (and have not) changed teaching and learning in schools. *Journal of Computing in Teacher Education, 26*(2), 49-54.

Kiger, D., Herro, D., & Prunty, D. (2012). Examining the influence of a mobile learning intervention on third grade math achievement. Journal of Research on Technology in Education. 45(1), 61-82.

Koehler, M.J., & Mishra, P. (2009). What is technological pedagogical content knowledge. *Contemporary Issues in Technology and Teacher Education, 9*(1), 60-70.

Lacina, R. (2008). Technology in the classroom: Learning English with IPods. *Childhood Education, 84*(1), 247-259.

Lang, P. (2011). *Researching mobile learning: Frameworks, tools and research designs.* New York , NY: International Academic Publishers.

Laurillard, D. (2002). *Rethinking university teaching: A conversational framework for the effective use of learning technologies* (2 ed.). London: Routledge.

Marshall, C. & Rossman, G.B. (2011). *Designing qualitative research* (5th ed.). Thousand Oaks, CA: Sage.

McKeachie, W.J., & Svinicki. (2011). *McKeachie's teaching tips: Strategies, research, and theory for college and university teachers* (13th ed.). Boston, MA: Houghton Mifflin.

Mishra, P., & Koehler, M.J. (2006). Technological pedagogical content knowledge: A framework for teacher knowledge. *Teachers College Record, 108*(6), 1017-1054.

Motiwalla, L. (2007). Mobile learning: A framework and evaluation. *Computers & Education, 49*, 581-596.

Ozmon, H. (2012). *Philosophical foundations of education* (ninth ed.). Upper Saddle River, NJ: Pearson.

Papert, S. (1993). *Mindstorms* (2nd ed.). New York: Basic Books.

Pegrum, M., Oakely, G., & Faulkner, R. . (2013). Schools going mobile: A study of the adoption of mobile handheld technologies in Australian independent schools. *The University of Western Australiea, Australia, 29*(1), 66-81.

Project Tomorrow. (2010). Retrieved 01 10, 2013, from Blackboard K-12: http://www.tomorrow.org

Sheppard, D. (2011). Reading with iPads-the difference makes a difference. *Education Today*, 3, 12-15.

Speak up 2010 . (2011, April). Retrieved from The New 3 Es of Education: Enabled, Engaged, Empowered: http://tomorrow.org/speakup/pdfs/SU10_3EofEducation_Students.pdf.

Technology in Schools. (2002, November). Retrieved April 2014, from National Center for Educational Statistics: http://nces.ed.gov/pubs2003/tech_schools/chapter7.asp#4

The Partnership for 21st Century Skills. (2011). Retrieved from The Framework for 21st Century Skills: http://www.p21.org

Thornton, E., & West, C.E. (1999). Extend of teacher use of a mathematics curriculum innovation in one district: Years 1 and 2 Levels of Use (LoU). *Journal of Classroom Interaction, 34*(1), 9-17.

Vadeboncoeur, J. (2002). Experiential education. In J. W. Guthrie (Ed.), *Encyclopedia of Education* (2nd ed., Vol. 2, pp. 760-763). New York: Macmillan Reference.

Vogel, D., Kennedy, D., & Kwok, R. (2009). Does using mobile device applications lead to learning. *Journal of Interactiive Learning Research, 20*(4), 469-485.

Vogt, W.P., & Johnson, R.B. (2011). *Dictionary of statistics & methodology: A nontechnical guide for the social sciences* (4th ed.). Thousand Oaks, CA: Sage.

Welch, M., & Brownell, K. (2000). The development and evaluation of a multimedia course on educational collaboration. *Journal of Educatinal Multimedia and Hypermedia, 9*, 169-194.

Yin, R. (2009). *Case study research design and methods* (4th ed.). Thousand Oaks, CA: Sage.