

The Value of iPads for Instruction and Learning: A Grounded Theory Study

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Abstract

This qualitative grounded theory study investigated the value of iPads in K-12 schools when used in one-to-one ratios. The purpose of the study was to understand the perspectives of teachers using iPads in one-to-one ratios for teaching and learning in the classroom and administrators responsible for the implementation of these devices. The problem was that little was known about the value iPads bring to teaching and learning when used in one-to-one configurations. Two research questions guided this study: From the viewpoint of a teacher, what is the perceived value of iPads when used in one-to-one settings for learning and instruction? and: From the viewpoint of an administrator, what is the perceived value of iPads when used in one-to-one settings for learning and instruction? In one phase, phenomenological interviews captured the lived experiences of 16 teachers using iPads to implement instruction. In a separate phase, a focus group with five administrators discussed their perceptions of the educational value of iPads. The findings of this study were uncovered through the analysis of transcripts of the interviews with teachers and two focus group sessions. The data were analyzed and coded to better understand the phenomenon. Through this analysis, five themes and related sub-themes were discovered. These themes were (1) ease of use, (2) district support, (3) teacher mindset, (4) student-centered learning, and (5) evidence of the SAMR model of technology use. These findings may be useful for teachers who use the devices and administrators in school districts considering the adoption of the devices.

Introduction

Since the introduction of the iPad in 2010, a growing number of school districts in the United States and around the world have adopted the device for use by students and teachers. This increased usage has provoked the need for research on the value of iPads for teaching and learning (Auguilla and Urgilés 710). Despite the invention of competing products, the iPad remains the most popular tablet device (Rosignol, par. 1).

The iPad was not initially intended for use in education and is primarily a consumption device (Murphy 21). The proliferation of such devices for instructional use has led to a new definition of literacy. Literacy includes the use of multimedia such as computer-based print, as well as the use of digital tools and apps (Beschorner and Hutchinson 16). Intuitive devices with interactive touch screens have become a pervasive part of everyday life (Geer 490). But as an educational tool, unless pedagogy changes, they will not have the transformational results people have been calling for (Geer 490). According to Hilton, research on the benefits of iPads for instruction is limited (145).

In classrooms with one-to-one ratios of iPad devices to students, all students have an Internet-capable iPad they can use anywhere and at any time (Costa 54; Crompton et al. 17). The term “ubiquitous computing,” coined in 1991 by Mark Weiser, refers to technologies that become part of everyday existence and whose use becomes invisible (Van ‘t Hooft and Swan 99). The concept moves away from one device for many people to the idea of many devices for many people. The benefit to ubiquitous access to technology is that students have access to materials wherever and whenever needed, thereby extending learning opportunities outside the classroom and school day. This allows for a more student-centered approach to learning with the educator serving as collaborator rather than the keeper of knowledge (Costa 54).

Statement of the Problem

Believing that investment in technology will have a transformational effect, district leaders have spent billions of dollars on educational technologies (Bebell et al. 30). The problem is that district leaders who implement a one-to-one iPad program lack the data necessary to determine the extent to which they have educational value for teachers and students. Too often, school leaders acquire digital learning devices without considering how the tools might alter teaching and learning or without explicit goals for their use (Fredrickson et al. 2). Lack of professional development and lack of administrative support are impediments to change (Fredrickson et al. 2).

Teachers are often not considered in the decision-making process and are left to adjust their teaching practice to make use of the new technology. Administrators must consider the physical space of the classroom when implementing a new device. The physical space of the classroom may change with the introduction of technology to maximize its affordances (Jahnke 4). A student-centered approach to learning that encourages inquiry, critical thinking, and collaboration to create real world artifacts is considered ideal by many educators, but changes to teacher-centered learning are difficult to enact (Steege et al. 58). Research should focus on how learning can be used effectively to empower learners (Melhuish & Falloon 13).

The exponential development of technology results in the need for teachers to continually upgrade their skills in incorporating mobile technologies in their curriculum (Hu and Garimella

52). Effective mobile learning requires strong support by the school administration (Melhuish and Falloon 10). Teachers need to transform their teaching skills to make use of the affordances of the iPad; however, a high percentage of teachers do not know how to incorporate educational technology into their curriculum (Hu and Garimella 52). High quality professional development is necessary for teachers to learn best practices for the use of such devices (Melhuish and Falloon 8). The increase in implementations has intensified the need for more research into the relevance of the use of iPads for teaching and learning. To date, there is a lack of research on the value of the iPad for instruction (Thieman and Cevallos par. 12).

Research Questions

Two research questions guided this study: From the viewpoint of a teacher, what is the perceived value of iPads when used in one-to-one settings for learning and instruction? and: From the viewpoint of an administrator, what is the perceived value of iPads when used in one-to-one settings for learning and instruction? In one phase, phenomenological interviews captured the lived experiences of 16 teachers using iPads to implement instruction. In a separate phase, a focus group with five administrators discussed their perceptions of the educational value of iPads.

Significance of the Study

The iPad is a relatively new device with little empirical evidence to support assertions of learning gains (Geer 487). The expense of providing each student an iPad for an entire school is daunting and deserves evidence of its ability to support innovative instructional practices. Tay (2016) conducted a longitudinal study of both teachers and students that demonstrated an increased level of engagement in students when using the iPad. The study found use of the iPad for instruction tapered for some teachers, suggesting its perceived value by teachers may be significant in determining its use in the classroom. This study fills the gaps left by previous studies by drawing from analysis of the perceptions of both teachers and administrators of the value of using iPads for learning, and by drawing connections between the perceived value and the amount and type of use of the iPad for instruction. This research provides the evidence that stakeholders may need so that they may form decisions about whether this device meets the needs of both students and teachers.

Historical Background

Computing technology has changed drastically since the invention of the mainframe computer in the 1950s. With each change came new expectations of the ability of technology to transform society. Aslan and Reigeluth traced the history of educational technology from the mainframe era, to the microcomputer era, to the Internet era and concurrent era of personalized computing (5). As the tools changed, the expectations of benefits to learning increased (McFarlane 1691).

In fewer than 20 years, technology went from desktop computer as the primary device to a post-computer world where many people have more capability in their handheld device than their parents did with the desktop computer (Murphy 19). In the years from 2000 to 2014, there have been even more drastic changes in educational technology. District leadership must determine how they will react to this ever-changing landscape (Park and Lumadue par. 1). Teachers are no longer the owners of content, the number of devices available to students has

skyrocketed, and constructivism is replacing behaviorism in the classroom (Aslan and Reigeluth 9).

Immediately upon the release of the iPad in 2010, there was speculation about the potential use in schools. The iPad was predicted to have a significant role education because of the potential apps that might be developed (Banister 130). The multi-touch features of the iPad and its lack of keyboard were predicted to transform education in the future (Meurant 58). The extended battery life and quick startup time added to its desirability for instructional use (Tay 2). The ease of use of the iPad would ensure its use by both students and teachers in the classroom. With the introduction of the iPad, educators could capitalize on access to more apps, increased screen size, and larger computing power. These improvements allow educators to make greater use of this device for teaching and learning.

Reasons to Use or Not Use a Device

Pelton and Pelton created an equation to determine the motivation level of teachers to use a device based on three factors: uncertainty, threshold, and friction (4273). Pelton and Pelton found that the more uncertain a teacher is about the value of a device, the less likely the teacher will be to use it (4274). Threshold is the amount of difficulty in learning to use a device. Friction refers to how difficult it is to remember how to use a device or program from one time to the next. Teachers will be more motivated to use a device if they perceive it has high educational benefits, has low friction (is easy to use and to remember to how to use) and has low threshold (is quick to set up and get started in the classroom). The harder a device is to use, the greater the perceived benefits must be for a teacher to even try to use it (Pelton & Pelton, 4275). Because it is an intuitive tool, the iPad may be a device that leads to greater motivation for teachers to use.

Method and Design

This was a qualitative research study. A grounded theory approach was chosen to study the research problem because it met the goals of the study to generate a theory of value of iPads based on the examination of the lived experiences of educators using iPads in educational settings and the experiences of administrators responsible for their implementation. To best meet these goals, the study was structured to gather as much information as possible from those who have the most to offer. It was determined that two populations should be included in this study: teachers who make instructional decisions regarding the one-to-one use and administrators responsible for the implementation of iPads in schools.

The study design was a two-phase approach to data collection with multiple phases of analysis. In one phase, phenomenological interviews were conducted to capture the lived experiences of teachers using the iPads to implement instruction. In the other, separate, phase a focus group was conducted with willing administrators to discuss their perceptions of the educational value of the iPads.

For the interview phase of the study, there were five questions related to the research question used in the interviews. For this focus group phase of the study, the research question was: From the viewpoint of an administrator, what is the perceived value of using iPads for learning and instruction? There were nine questions that were used to further the understanding of this research question in the focus group sessions.

Setting, Population, and Sample

This phase of the study took place in a metro area of the Upper Midwestern United States of about half a million people. The schools in the study were chosen because they fit the parameters of the study as having implemented iPads in ratios of one-to-one devices to students and allowing students access to these devices outside of school. There were two school districts involved in this study. District One is a first ring suburb of a major Midwestern US city. It has 4,800 students from seven communities. Three schools were included in this study from within this district. They will be referred to as Harmony Middle School, Pioneer Middle School, and Hillside Elementary School. District Two is a second ring suburb outside of a major Midwestern US city. It has a population of 18,000 students from seven communities. Three schools were included in this study from within this district. They will be referred to as Buena Vista Elementary School, New Hope Elementary School, and Sage Middle School.

The sample population in the study was teachers and administrators who worked in public schools with one-to-one implementations of iPads. The schools were three elementary and three middle schools. Schools ranged in access to iPads from six years to schools in the first year of implementation. The sample size was 16 teachers for the one-on-one interviews and five administrators for the focus groups. Teachers ranged in experience from being first year teachers to those having more than 20 years of teaching experience. From this list, school principals were contacted based on their proximity to the researcher.

Materials and Instruments

The study design was a two-phase approach to data collection with multiple phases of analysis. In one phase, phenomenological interviews were conducted to capture the lived experiences of 16 teachers using the iPads to implement instruction. Narratives were collected from teachers to understand their interactions with students when using the device.

The second phase consisted of a focus group was conducted with five willing administrators to discuss their perceptions of the educational value of the iPads. Focus group conversations were collected to understand how administrators contributed to the use of iPads for instruction. The role of administrators was perceived to be very different from the role of the teacher in the classroom.

Trustworthiness of the Study

There are many aspects of trustworthiness that were considered for this study: dependability, credibility, confirmability, transferability, and researcher bias. These factors provide measures of validity of a study. Each of these aspects was addressed to conduct a trustworthy study.

The issue of credibility was addressed through member-checking and the use of multiple methods of data collection. Credibility was also addressed by choosing participants who met the criteria of experience in schools with one-to-one implementations of iPads, and by keeping exact records of participant responses to ensure transparency in every aspect of the study. A thorough review of the literature also added to the credibility of the study. an audit trail was included to add dependability. Confirmability was addressed by having experts in the field of education read

through the transcripts of memos to check the patterns and themes that had been identified and verify that the interpretations made sense. Transferability was addressed through multiple methods of data collection, using both focus groups and interviews to create a comprehensive picture of iPad use in K-12 settings.

Data Collection and Analysis

Data collection was conducted through in-person focus group discussions and face-to-face interviews. Data analysis followed a systematic approach in which existing data were compared with new data and the emerging concepts. It began with open coding of the data, followed by conceptualization of the data, the creation of categories, axial coding, and selective coding.

As part of the coding process, memos were created to detail the thought process, elaborate on concepts, track direct quotes, and key vocabulary usage. These memos were used throughout the data collection and analysis phases to keep track of observations and anomalies that occurred to the researcher as well as interesting anomalies that occurred. These memos were referred to continually throughout the process to develop sensitivity between the collected data and existing literature, which assisted in grounding the theory in the data.

The final step of this grounded theory study was to generate a quantifiably testable theory of the educational value of using iPads in K-12 settings. A visual model that fit the data was accompanied by a written description that explained the categories and relationships in the model.

Results

The study design was a two-phase approach to data collection with multiple phases of analysis. In one phase, phenomenological interviews were conducted to capture the lived experiences of 16 teachers using the iPads to implement instruction. Narratives were collected from teachers to understand their interactions with students when using the device.

For phase one, the research question was:

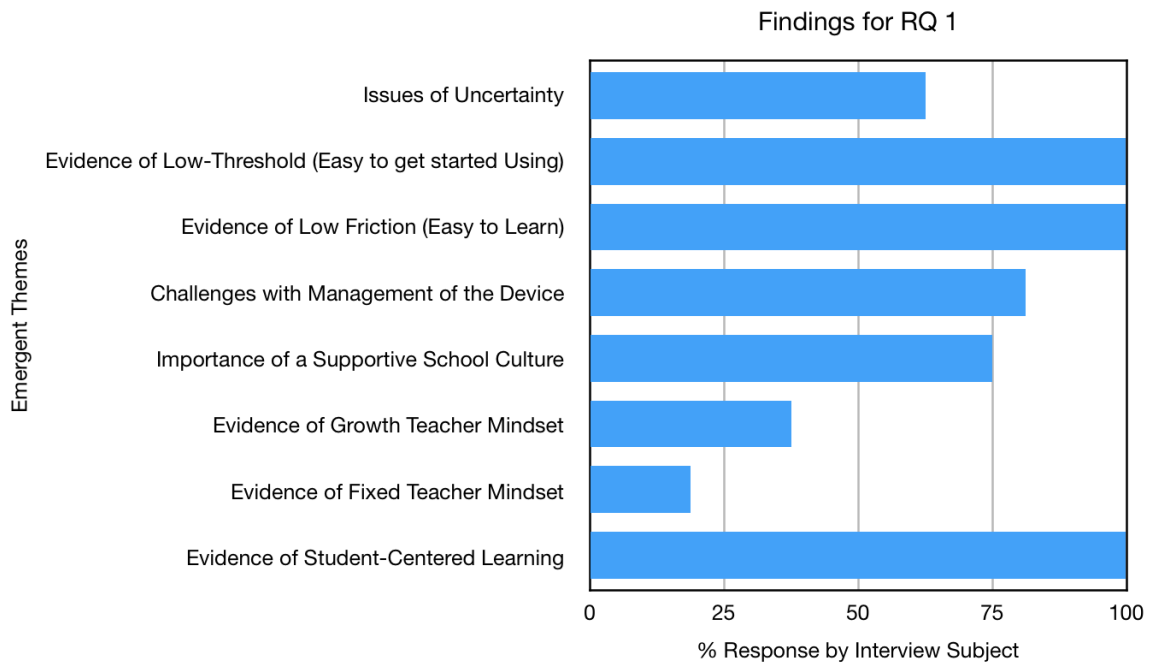
RQ1: From the viewpoint of a teacher, what is the perceived value of using iPads for learning and instruction?

For the interviews, there were six questions that corresponded to the research question. These questions are provided in Appendix A. These six questions were part of semi-structured interviews in which the subjects were allowed to respond to the questions as each saw fit. Subjects were encouraged to share their perceptions and experiences without being locked into precise responses to each question. Therefore, many of the responses touched on a variety of topics, some of which were related to other questions in the interview.

Findings for RQ1

Seven themes emerged through the analysis of the interviews. These themes were: (1) uncertainty, (2) threshold, (3) friction, (4) management of the device, (5) supportive school culture, (6) teacher mindset, and (7) student-centered learning. The percentages of responses are provided in Figure 1 Below. Detailed results from these themes are described in Appendix B.

Figure 1



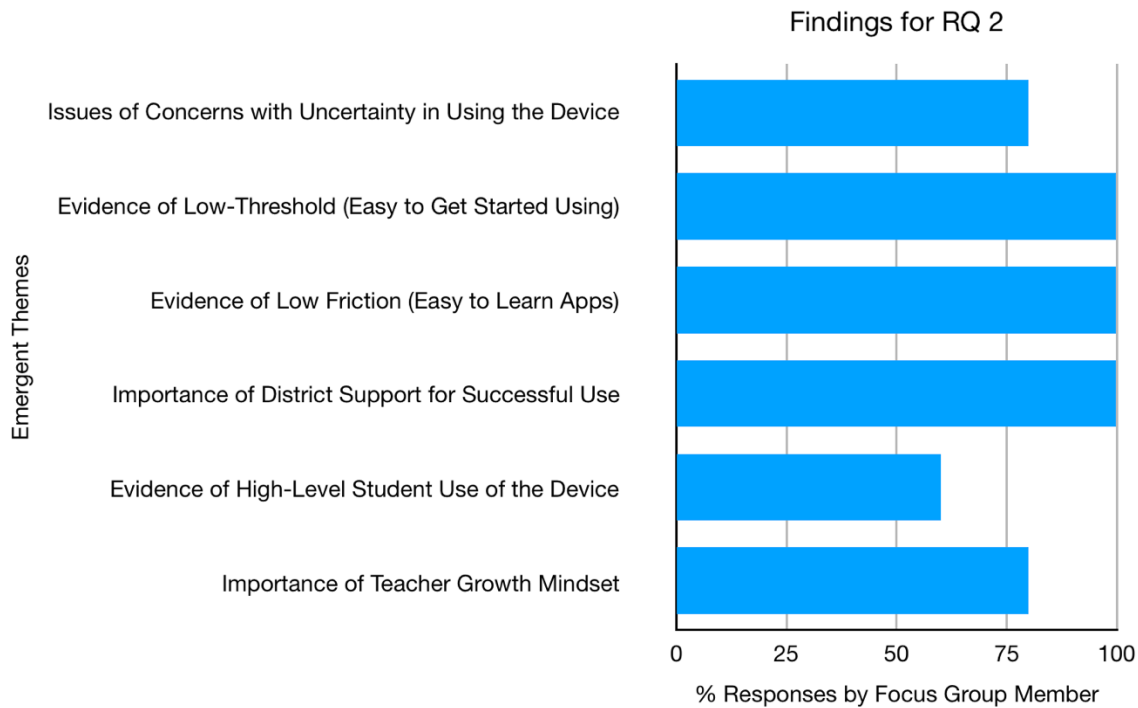
Phase Two: Focus Group

For the second phase of the study, the research question was: From the viewpoint of an administrator, what is the perceived value of using iPads for learning and instruction? There were nine questions that were used to further the understanding of this research question in the focus group sessions. These questions are provided in Appendix C.

Phase Two Findings

There were several key findings that emerged from the focus group sessions. They were: 1) uncertainty, 2) low-threshold, 3) low-friction, 4) district support, 5) student use of the device, and evidence of teacher growth mindset. The percentages of responses are shown in Figure 2 below. Summaries of the responses are described fully in Appendix D.

Figure 2



Comparison of the Study to the Theoretical Framework

The theoretical framework used for the creation of a grounded theory of the value of iPads was based on three education technology models. These models were: Activity theory (Cheung and Hew 166), TPACK (Harris and Hofer 211), and the SAMR model (Puentedura 4). These models were combined with research completed by Pelton and Pelton (4273) regarding the technology threshold that prevents teachers from effectively using a device for instruction, and the Concerns-Based Adoption model (Loucks and Hall 4) and this combination led to the creation of grounded theory in the form of an Innovation Configuration Map as described by Hall and George (4).

Activity theory is a framework based on increasing motivation through critical thinking and reflection rather than through stimulus and response conditioning (Mwanza-Simwami & Engeström, 2009). Linkages to Activity Theory were related to teacher mindset and ease of use. Linkages to TPACK were related to teacher confidence and competence in using the device. The SAMR model had the strongest linkages to the value of iPads. Examples of each of the components: Substitution, Augmentation, Modification, and Redefinition were found across all cases.

The educational technology-use frameworks are compared to the themes of value of the iPads when used in one-to-one instruction as identified in this study. Although each model was useful in identifying patterns in the study, the models most used were the Innovation Configuration Map and the SAMR model. See Appendix F for table.

Creation of Grounded Theory

The final step in this grounded theory study of the value of iPads in one-to-one settings in K-12 schools was the generation of a testable, grounded theory. The grounded theory is presented in the form of an Innovation Configuration Map. The innovation configuration map follows the guidelines established by Hall and George (4) as a means of examining how an innovation has been implemented across a group of people. The creation of the Innovation Configuration Map in this study was the final step in the generation of the grounded theory and is provided in Appendix F. Use of this grounded theory to assess the teacher and administrator needs may assist in creating guided conversations about the implementation and integration process and school as a whole as well as each individual teacher's place on the Innovation Configuration Map.

Implications

Several important conclusions were identified as part of this study. Ease of use of the iPad is contingent on adequate training and support for instructional-use of the device. Instructional-use training should include training on management of student behavior, use of a learning management system, and specific apps for instructional purpose. Teachers who feel supported in their learning to use the device are more likely to continue using it and to try new things.

District support is key to the successful implementation of the device. District support requires establishment of a culture of growth, just-in-time professional development, and a balance between freedom of students and teachers to use the device and control over how much and in what ways the device is used.

Student-centered learning with the device includes the ability to personalize the device, access to formative assessments, ability to learn anywhere and at any time, and greater individualization and choice in their learning. Students must be trained to see the device as a tool for learning and not as a toy, and this includes trainings on the proper use of social media and appropriate ways to personalize the device.

Limitations

There were two limitations to this study. Because one of the school officials from one of the districts identified for this study failed to find any participants, the study was limited to two districts rather than the three districts as initially planned. This action limited the sample size significantly from possibly up to 12 schools to only six schools. Another principal from one of the districts opted not to participate in the study. This further limited the study population to only middle and elementary schools. No high school teachers were included.

Another limitation of the study was the number of participants for the focus group. The initial plan for the focus groups was to have at least eight attendees. However only six attendees were able to make the first session and of these, only four ultimately attended. A second session yielded only one additional participant. Based on findings from a study of focus groups conducted by Carlsen and Glenton (5) this was determined to be a sufficient number for the focus group phase as the transcripts illustrated overlap in the findings.

Future Studies

This grounded theory study uncovered many findings that could be tested in further research. Using the grounded theory as an assessment tool for school officials to determine how well teachers and students are implementing the device as well as how far along the SAMR model or how much change has there been from teacher-directed to student-directed instruction. In addition, school populations that were not included could be studied using the grounded theory. Other topics that could be investigated are the comparison of generic or other brand tablets to iPads or schools that allow students to bring their own devices. BYOD programs are increasing in popularity with school districts around the United States as school districts opt out of large purchases of devices and instead rely on parents to provide the device (Kiger and Herro, 51). Studies that examine the achievement gap in schools with one to one iPads may add to the understanding of the return on investment that school officials desire. Changes in school culture that occur through the reliance on iPads for instruction could be another topic of study.

Conclusion

The purpose of this grounded theory study was to generate a substantive theory of the perceived educational value of iPad use in schools by examining the perceptions of their value from the perspectives of two groups: administrators responsible for their implementation and the teachers who use them for teaching and learning in the classroom. This study supports the findings by Tay (2016) that the whether the device is used as a substitution or to redefine learning is what matters for its value as an instructional device. The specific problem is that districts that implement a one-to-one iPad program lack the data necessary to determine the extent that they have educational value. These data are needed by area stakeholders, parents, and members of the school board to justify continued implementation of the devices (Bebell et al. 30). This theory effort may fill a gap in the literature about the value of using iPads in one-to-one implementations that may be applicable to a wider population and testable through future research. This theory could potentially benefit teachers who desire to know more about the educational affordances of iPads and could inform the decision-making process for educational leaders when conducting future one-to-one iPad implementations in schools as called for by Montrieux et al. (487).

The iPad is a high-end device that allows for the transformation of instruction and learning if it is used with this in mind. School districts that intend the use of technology to be merely for lower level aspects of the SAMR model such as substitution through the use of Google Apps would not see the value of iPads for instruction and learning. The value of the iPad for instruction increases when teachers feel supported, when they have a growth mindset, when they have access to frequent, just-in-time professional development. The value of iPads for student learning increases when students see the iPad as tool for learning, when their learning is student-centered, and when the activities they are expected to do are modified or entirely redefined to maximize the affordances of the iPad.

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Appendix A
Phase One Questions

1. Can you describe in as much detail as possible, a situation in which you used the iPads for instruction and learning in the classroom?
2. Has your experience using the iPads changed your perception of their value?
3. Can you describe in as much detail as possible a situation in which you used the iPads for teaching and learning?
4. What changes have you made to your instruction to incorporate the use of iPads?
5. What professional development did you receive that allows you to maximize the use of the iPad?
6. Is there anything else you would like to add?

Appendix B Teacher Interview Findings

Seven themes emerged through the analysis of the interviews. These themes were: (1) uncertainty, (2) threshold, (3) friction, (4) management of the device, (5) supportive school culture, (6) teacher mindset, and (7) student-centered learning.

Uncertainty about how to use a device, their own ability to use a device, and the reliability of the device can lead to a teacher not using the device for instruction in the classroom (Pelton & Pelton, 2008). Responses dealing with uncertainty involved how teachers felt when first handed the iPads. Most subjects described the moment of being told they would be using the iPads as stressful.

Threshold may be summarized as the number of steps or the amount of time it takes to get started using an app or a device. Waiting for the network or programs to load, having to create an account, to remember a password, or to click through several steps to gain access to the tech are all examples of high threshold and the time-consuming processes that delay learning in time-crunched classrooms. The interviews highlighted low threshold aspects of the iPad.

Low friction aspects of the iPad were factors that dealt with how quickly teachers could make use of the device in their classroom, how quickly students could use the device to create high quality products, how efficient the device was in helping teachers accomplish daily tasks, and how much time a teacher had to spend managing the device (Pelton & Pelton). Several teachers expressed their appreciation for how the device or specific apps on the device made it easier to differentiate instruction, communicate with students, and organize their teaching materials.

Management of the device was viewed both positively and negatively by teachers. Teachers valued student ability to add apps onto their devices quickly and easily. There were negative aspects of dealing with the device as well. Teachers mentioned the frustrations of student misuse of the device. Another issue was the student perception that the device was theirs and not the property of the school district. Teaching students that the device was a tool and not a toy was a common problem as well.

Supportive school culture was also viewed as an important factor in the value of the iPads. Several teachers described the need to try and fail when learning new technology. Teachers also expressed enjoyment in learning from other teachers. One aspect of a supportive school is a collaborative environment among teachers. Teachers described collaborating with others outside of their department. Another aspect of supportive culture was the consistent policies for managing student behavior.

Teacher mindset toward the device and toward learning new things in general was a factor that contributed to the value of the iPads. Teachers with a frame of mind that perceives technology as a disruption in the classroom are overwhelmed by the amount of options there are available, or who are afraid of making a mistake in their classrooms, are less likely to value iPads for instruction. Teachers who frame the experience of using iPads as one of growth and learning new things will be less afraid of using the device in class.

Student-Centered learning was another factor that determined the value of the iPads for instruction and learning. There are four factors that were identified as aspects of the category student-centered learning and m-learning, described by Romrell, Kidder, and Wood (2014) as being personalized devices that can be used anywhere and at any time for learning. These four factors are formative assessment, personalization, individualization and differentiation, and use anytime, anywhere. In a possible unintended consequence of m-learning, students' ability to personalize their devices was one factor that led to management issues and problems of student misuse of the devices.

Appendix C
Phase Two Questions

1. What changes in the school culture or students have you observed since the one-to-one implementation of the iPads?
2. How does the use of iPads fit with the mission and vision statement of your school?
3. How has the use of the iPad affected student knowledge, performance, and skills?
4. How have you been able to measure changes in student learning?
5. What educational return on investment do you believe using the iPads brings to your school?
6. In what ways are iPads used in and out of school for teaching and learning?
7. What changes have been made to maximize the potential of this device?
8. What has been your role in implementing the iPads in your school?
9. What factor has most influenced the success or lack of success of the implementation in your school?

Appendix D Focus Group Findings

There were several key findings that emerged from the focus group sessions. They were: 1) uncertainty, 2) low-threshold, 3) low-friction, 4) district support, 5) student use of the device, and teacher mindset.

Responses to the focus group involved how administrators dealt with the uncertainty of implementation when teachers and students were first handed the iPads. Responses centered on minimizing the uncertainty and commotion when the devices were handed out to students, communicating with parents about the device and its purpose, and creating processes of managing student behavior. Responses from focus group participants centered on helping teachers achieve their goals of using the devices in the classroom. Administrators also discussed their own learning process in dealing with the iPads.

Focus group participants provided several examples of quickly and easily students could begin using the device or an app on the device. When getting the devices out to students, administrators acknowledged being mindful of how quickly students could begin using them.

Responses to the focus group questions highlighted the low friction aspects of the iPad for instruction. Nearpod was an example of low friction because students and teachers could use it with ease. Another aspect of ease of use for teachers was increased efficiency even when the teacher was absent.

Factors that were identified as related to district support were professional development opportunities, supportive culture, and trustworthy and consistent management systems. These elements are presented in the paragraphs below. Professional development training and support also contribute to a low threshold. The more teachers practice how to access apps, how to set up learning management systems, and grading systems, the more comfortable they will be with using them. Administrators acknowledged the need to support teachers in their efforts to increase the use of iPads in their classrooms. They described the need to allow teachers the room to try and to meet the needs of the teachers wherever they are at and to allow teachers to move at their own pace.

Administrators discussed the problems of misuse of the device among students at length. Interventions included locking the iPad down using Guided Access, monitoring the use of the device using the Apple Classroom app, and taking the device away from students. Teaching students to not share the device or their Apple ID with others and conversations with students about the ownership of the device were also described. The focus group members also discussed the problems of figuring out how to balance student and teacher freedom with control of the devices.

Administrators seemed to understand that mindset was an important factor in the adoption of or rejection of technology in the classroom. They also appreciated the fact that teachers were trying new things that might be stressful or challenging, and they wanted to be supportive. Teacher buy-in and allowing teachers to opt-in was a repeated theme. Focus group participants described how they wanted to support teachers to have a growth mindset.

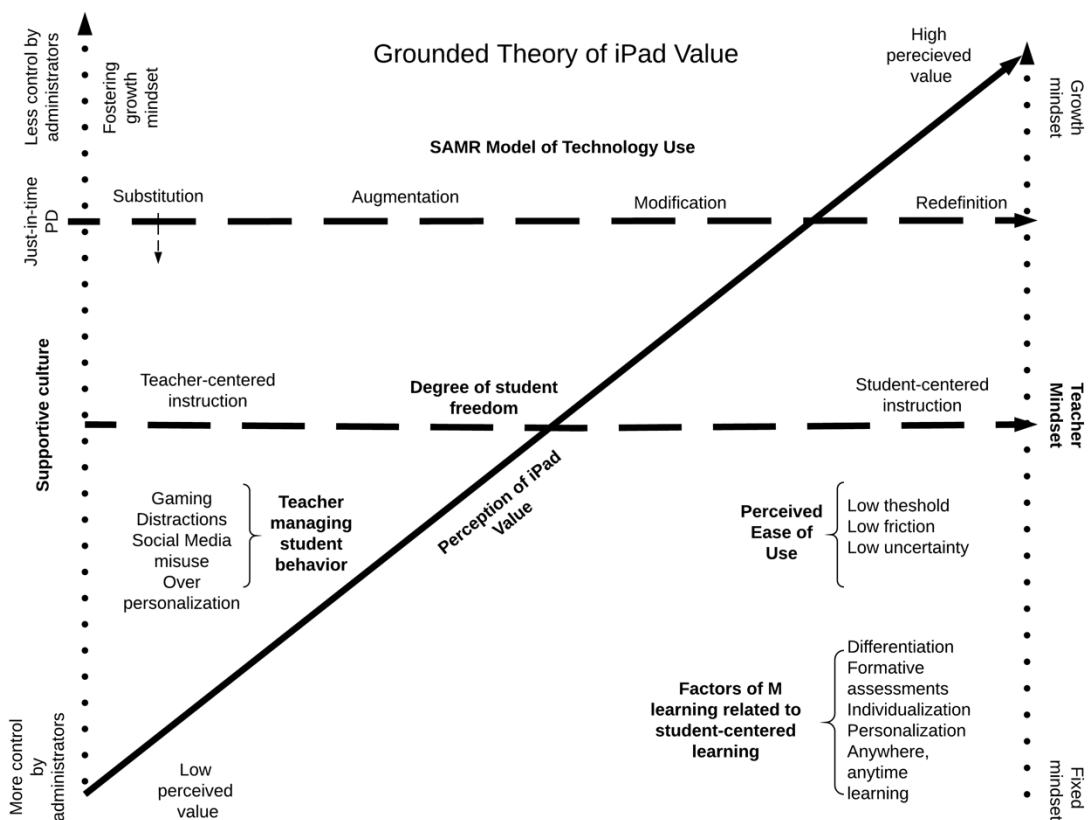
Appendix E Theoretical Framework

Comparison of Educational Technology Use Frameworks and Identified Themes of iPad value

Authors	Model	Frameworks	
		Theoretical Base	Identified Themes of iPad Value
Cheung & Hew (2009)	Activity Theory	Used to study how technology is adopted in educational settings by examining the social structure rather than the individual. The gap between motivation and action is the focus.	Related to fixed and growth mindset (Dweck, 2015). Related to District Support, Just-in-Time Professional Development.
Mishra & Koehler (2008)	TPACK	Evaluate how well teachers understand how to use the technology tool, the pedagogy involved, and their knowledge of the content for instruction.	Related to ease of use: Threshold and Friction (Romrell, Kidder, & Wood, 2014)
Hall & George (2000)	Innovation Configuration Mapping	Used to analyze the scale of an implementation before assessing the outcomes. Involves systematic analysis of the extent of the implementation. The IC Map presents a description of the components of the innovation in the form of a word-picture.	Related to ease of use: Threshold and Friction (Romrell, Kidder, & Wood, 2014) Related to fixed and growth mindset (Dweck, 2015). Related to the SAMR model (Puentedura, 2006)
Hall & Hord (2001)	Concerns-Based Adoption Model	Used to understand the culture where changes are taking place by examining the effects of change on the individuals and identify new behaviors brought about by the innovation. Based on the Innovation Configuration Map	Related to District Support, Just-in-Time Professional Development. Related to student-centered and M-Learning (Romrell, Kidder, & Wood, 2014) Related to mindset (Dweck, 2015)
Puentedura (2006)	SAMR model	Evaluate how well teachers modify their instruction to incorporate technology from substitution, augmentation, modification, and redefinition.	Related to ease of use (Romrell, Kidder, & Wood, 2014) Related to the SAMR Model (Puentedura, 2006) as practiced in K-12 schools.

Appendix F Innovation Configuration Map

Grounded Theory of iPad Value



Grounded Theory of iPad Value

It is theorized that Perception of Value will increase as teachers and administrators move along the continuums of Supportive Culture, SAMR Model Use, Degree of Student Freedom, and Teacher Mindset.

Perception of iPad Value is contingent on the factors of:

- Fostering a Culture of Support not Control of Teacher Use of the device
- How the iPad is used according to the SAMR model
- The Degree of Freedom students have in their learning
- Teacher Mindset toward Growth and perceptions of the device and apps as easy to use.

Perceptions of value increase when teachers receive Just-in-Time PD, feel supported in taking risks, and the creation of a growth mindset. Perception of value increases as teachers use the iPad more for modification and redefinition of learning activities. As teachers create learning activities that redefine how students learn, there is a tendency toward student-centered learning. Student-centered learning includes factors of M-learning: use of formative assessments, individualization, personalization, and anywhere, anytime learning

For teachers to make this shift from Teacher-Centered Instruction to Student-Centered Instruction, a capacity for growth must be instilled in the culture of the school, and teachers must perceive the iPad and related apps as easy to use. Ease of Use includes aspects of Threshold, Friction, and Uncertainty that must be addressed.

In this ICM, the perception of iPad value is theorized to increase as teachers move along the line from teacher-centered instruction toward more student-centered instruction. These changes lead to increased student freedom, an increase in the amount of m-learning and a movement along the SAMR model of educational technology use toward more modification and

redefinition of activities and away from the use of iPads for merely substitution and augmentation of a lesson. These changes are nurtured by a supportive culture in the school that encourages and creates opportunities for teacher-learning on the device. Such a supportive culture includes just-in-time PD offerings, the creation of collaborative structures for teachers, the support of growth mindset in teachers and students that allow for teachers to try new and innovative uses of the iPad and risk failure in doing so.

The perception of the iPad as easy to use is contingent upon the frequent use of the device, trainings on specific apps, learning management systems, classroom management techniques, and sustainable networks. Sustainable networks include the WiFi as well as support and maintenance of the device inside and outside of school. Parents must be involved in the process to ensure consistent use of the device as a tool for learning.