

Using tablet technologies to engage and motivate urban high school students

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ABSTRACT

In this two-year study, researchers examined the impact of using tablet technologies across content areas in an urban high school setting. Class observations provided notable examples of how student motivation and learning appeared to be enhanced by use of the iPads in conjunction with opportunities to collaborate and be creative in the context of their learning. Interviews from a set of teachers with a range of classroom teaching experience provided multiple perspectives of the program's impact. The opportunity for teachers and students to have the flexibility to select the apps they believe achieve curricular and/or learning goals supports the shift in educational settings to including teacher and student voice and choice for more collaborative blended learning (self-directed and self-paced) environments.

Introduction

Technology integration in K-12 education is rife with a history of allocating significant resources to acquire technology in the hope that providing such resources will result in increased learning for students. However, many well-documented barriers have hindered the effectiveness of such an approach, such as high costs, lack of vision and effective leadership, inefficient implementation plans, inadequate teacher preparation, and student behavior (Howard, 2012; Hew & Brush, 2007; Stanhope & Corn, 2014; Tomlinson, 2015). This history highlights the importance of evaluating technology rollouts to monitor the positive, and any potentially negative, impacts that the technology is having on learning. Despite the critics, tablet technologies have moved into K-12 classroom spaces shifting the dynamics of teaching and learning.

Although iPads are typically used in 1:1 environments, the researchers in this evaluation posit that teacher concerns about access and connectivity can potentially be addressed by empowering students with resources and apps for self-directed collaborative learning. Faculty and researchers partnered on this collaborative program evaluation in the form of an exploratory mixed methods study for a high school iPad rollout known as the Freshman Technology Academy. The initial three-phase approach was to include a pre-evaluation (Phase 1), impact assessment of incorporating the technology in various classrooms settings (Phase 2), and a configuration revision upon final reporting of the findings (Phase 3). Due to changes in the scope of the Freshman Technology Academy, Phase 3 was not completed.

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Theoretical Framework

Within the first year of production in 2010, 7.5 million iPads were sold and 22 million have already sold within the first two quarters of 2017 (Statista, n.d.). Educators soon found promise in the iPad which was evident through the 43% of garnered K-12 US market share across all brands and tablet computing devices (Winkler, 2014). Although the purchase of iPads in K-12 was steadily increasing, the usage of the iPads in the classroom ranged significantly. In a short amount of time, thousands of schools around the world have adopted and implemented various iPad programs to meet specific interests and objectives (Bebell & Pedulla, 2015). When it comes to teaching and learning, teachers and students have responded favorably to the use of iPads in the classroom (Clark & Luckin, 2013; Clarke & Svanaes, 2014; Heinrich, 2012). Despite the increase in interest and the numbers of school leaders and districts adopting iPads, one of the challenges with developing and implementing successful iPad programs is the scarce research focused on 1:1 iPad initiatives. Additionally, there is limited understanding about how teachers use iPads in their instruction (Liu et al., 2016).

According to the results of a study by Clariana (2009), students in 1:1 laptop settings relied less on teachers when it came to pacing learning activities and they demonstrated ownership of their learning within the classroom. Although the focus of Clariana's research was on 1:1 laptops, it can be argued that similar results may be discovered in a 1:1 iPad setting. In addition to students taking ownership of their learning in 1:1 environments, student engagement with content has been positively noted in prior research (Hutchinson et al., 2012). Several mixed methods studies during the first year of program implementations revealed that student engagement and motivation increased in classrooms at the onset of 1:1 programs (Mouza, 2008; Bebell & Kay, 2010).

Despite the positive findings related to student engagement and motivation, questions related to the actual use of the iPads in 1:1 settings persist. Key questions are related to classroom use and the challenges to the implementation of iPad programs. It is not uncommon for the use of devices in classrooms to be driven by the curricular and instructional goals of the teachers. Zucker and Hug (2008) studied the use of 1:1 devices in a high school science class and determined that the use of the devices was in fact determined by the teachers. Students reported they most frequently used their devices for web browsing and word processing. Although a crowded curriculum can be viewed as a hurdle in implementing iPad-use into classrooms, teachers' instructional approaches in 1:1 classrooms have been documented as more research-based, inclusive, and collaborative with greater levels of communication between students and teachers (Lowther, Inana, Ross, & Strahl, 2012; Rosen & Beck-Hill, 2012; Storz & Hoffman, 2013). According to prior research, positive collaborative tasks and teachers building social interactions among learners while promoting learning as a partnership are common in a learner-centered framework (APA, 1997; Darnon, Buterea, & Harackiewicz, 2007). Similar to prior studies (McKnight et al., 2016), the research in this study was guided by the learner-centered framework, as well as the systems framework. A systems approach centers on the culture of the school and community, as well as how teacher and student factors impact the success of technology.

Methods

In this study, researchers employed an exploratory mixed methods study with a Sequential Qual => Quan design. The researchers implemented qualitative (observations and interviews) and quantitative strands in sequence with the intention of using follow-up quantitative data (an online survey) to confirm initial results. Therefore, data collected from teachers in phase 1 (qualitative) informed the design of the survey (quantitative) administered to students in phase 2. The study was conducted over the span of two years as a district funded program, the Freshman Technology Academy, was rolled out to students in an urban high school setting in the southwestern part of the U.S.

Table 1: Evaluation Phases

Phase 1 (pre-evaluation)	<ul style="list-style-type: none"> Establish working configurations Assess and address implementation concerns Identify strengths of program and variables of interest
Phase 2 (measuring impact)	<ul style="list-style-type: none"> Measure impact on variables of interest Identify key factors for successes Identify areas of opportunity for improved implementation
Phase 3 (revise & report)	<ul style="list-style-type: none"> Routinize effective practices Make necessary revisions/updates to program Document lessons learned

Phase 1 Pre-Evaluation

In Phase 1, observations were scheduled with iPad-using teachers who volunteered to be a part of this study. The in-class observations were conducted with participating teachers over the course of two semesters of the study. Sixteen separate class periods were observed among six different teachers. The observations generally lasted the entire class period, and there were a total of 408 students (combined) present in these classrooms, or an average of 25.5 students per class. The class sizes ranged from 11 to 38 students and the observations occurred during periods 1 through 5. The majority of the students in the observed classes were ninth-graders, although three 10th grade classes, one 12th grade class, and two mixed grade classes were observed as well. The class subjects observed were Algebra, Anatomy and Physiology, Biology, Earth Science, Math Support, and World History.

All observations were conducted by one of two researchers. In each instance, the observer sat in the classroom being as unobtrusive as possible and did not interact with the students during the observed lessons. Each observer followed up with the teacher immediately after an observation was complete to clarify any activities that the observer had questions about. All of the teachers involved were extremely accommodating and helpful in conveying the details and intents surrounding the lessons observed. Each observer used a Wi-Fi enabled iPad to enter observation details into an online semi-structured observation protocol as the observations were taking place.

After the classroom observations were complete, each of the teachers was interviewed. These interviews were conducted using a semi-structured interview protocol and each lasted approximately 10-15 minutes. The interviews were conducted with six teachers who were observed using iPads in their classroom instruction. These interviews addressed background information on the teachers, as well as their perspectives on the use of iPads in their instruction. The teachers interviewed ranged in teaching experience from 5 to 34 years, with an average of 15.7 years in the teaching profession. Four of the six teachers had taught exclusively in the same district during their teaching careers. The conversations were recorded using a digital voice recorder and later transcribed. The observation data from the class observations and the transcribed recorded statements were entered into Nvivo software and coded to themes anticipated for this study. This program evaluation summarizes the findings identified by these two sources of qualitative data, as well as the quantitative data collected in Phase 2.

Phase 2 Assessing the Impact in Classroom Settings

In this phase, online surveys were taken by sixty students who had parental consent to participate in the study. Of the sixty students surveyed, one was in 9th grade, thirty-nine in 10th grade, ten in 11th, and ten in 12th. Approximately 49 of the 60 students surveyed were Latino/a which served as a representative sample of the population at this high school (81% Latino/a).

Phase 3 Final Report

Due to changes in the scope of the Freshman Technology Academy, Phase 3 was not completed. The changes in the program were made amid scrutiny about the Los Angeles Unified District (LAUSD) iPad rollout. Although the Technology Academy was not located in LAUSD, program leaders raised questions about the logistics and revised their initial rollout plan so iPads were no longer to be given to all 9th graders (to take home). Such scrutiny and concern highlighted the importance of this study. A final report of the findings was developed; however, revisions to the configuration of the plan were not made due to these program changes.

Evaluations and Results

Phase 1 consisted of classroom observations of teachers using iPads as part of their class sessions as well as interviews with teachers as to their experiences with the rollout thus far. In Phase 2, student surveys were conducted to assess the impact of iPads on the classroom setting.

Phase 1 Observations

During the observations, researchers noted that an iPad was available for each student in 13 of the 16 class periods observed. Two of the three remaining class periods used a partner system, and in the third, the teacher projected an iPad for the entire class. Each class was being instructed by one teacher of record, although two classes had an instructional aide present as well. The teacher's iPad was projected to an overhead screen in exactly half of the observed class periods.

A total of nine different iPad apps were used as part of the instruction in the 16 observed class sessions. The most frequently used app was Edmodo (six times), followed by Khan Academy (four times), Videolicious (3 times) and Study Mate (twice). Each of the other apps was observed once; those apps were Bookabi, Google Good Editor, Nearpod, Smart Response Notebook, and Socrative. The most frequent activities observed were math problem solving (five times) and video creation (three times). Other activities observed were presentation creation (twice), online current event search (twice), final exam review (twice), an interactive lesson on the kidney, and digitation and identification of fingerprints.

Notable Highlights

The observations revealed several instances of student motivation and engagement associated with activities involving the use of iPads in the classroom. For example, Khan Academy goals of 3000 points per student served as motivators as the program was used to complete assigned activities. Students were clearly aware of both their individual goals as well as the class goals with regard to total points. This application allowed the teacher the freedom to

walk around the classroom and provide individual attention to students as needed. This appeared to be an important quality for the math support class observed since students could work at their own pace on content that was specific to their individual needs. The teacher was also able to access a real-time graph which displayed the students' points over time so that periods of inactivity could be addressed as they occurred. Another application (observed in a different class) that provided similar advantages was Study Mate, which allowed students to study for an upcoming exam using content that was uploaded by the teacher specifically for that purpose.

The observation of mathematics lessons also provided some noteworthy highlights to using iPads in instruction. In one lesson, Nearpod was used to maintain whole-class focus on the material being covered. Each student worked on his or her individual iPad as the instructor walked them through a "box method" of factoring trinomials. Through the Nearpod interface, the instructor was able to demonstrate the method, allow each student to attempt the method, share a student's attempt with the class anonymously, and conduct a follow-up quiz of the material. The students appeared engaged and motivated throughout the lesson and worked right up until the ringing of the bell.

Another notable highlight was the level of collaboration observed with some uses of the iPads. This was particularly evident in the fingerprinting exercise observed in a biology class wherein students were required to work together to identify a set of fingerprints that belonged to one of their classmates. This assignment appeared to generate a great deal of discussion and suspense as the students worked to solve a common problem. Another example of collaboration involved students in an earth science class wherein they were required to comment on each other's work through the Edmodo app interface. Using the class Edmodo site, the teacher was able to facilitate peer-feedback in a secure environment and could provide her own feedback to the students in the same protected environment.

The observation of a special needs class provided a demonstration of how iPads can be used to foster creativity on the part of students. Using the app Bookabi, the instructor led the students through the process of creating a customized online book, adding text and objects of their choosing. He then allowed them multiple class sessions to create their own digital books on a world history topic of their choosing, using images and content they located themselves on the internet. The students appeared to be highly motivated and remained engaged throughout the process, which culminated in an opportunity to present their creations to the rest of the class. In another class, students were able to show off their creativity by compiling their own videos related to Earth Science by using the video app Videolicious. As with the Bookabi assignment, this task allowed students to be creative in the context of learning course content and appeared to enhance engagement and motivation in the process. Peer review was incorporated also as students were required to provide feedback to their classmates' video creations by entering comments in the Edmodo app.

An example of how a single iPad can be used as a presentation device was demonstrated in an Anatomy and Physiology teacher's lesson on the urinary system. Since the students did not have access to individual iPads in this classroom, the teacher used her iPad with a stylus pen to highlight, label, and color-code different parts of the kidney, which was projected to an overhead screen. The teacher utilized dual systems with this lesson as she also used a projected PC with the Smart Notebook program and individual input devices to get feedback from the students.

Potential Obstacles

The most prevalent possible obstacle to learning observed in iPad-using classes was the potential for students to engage in off-task activity, which can often be the case for classes not using iPads as well. There were limited examples of individual students engaging in off-task behavior in half of the class periods observed. These activities included accessing Facebook or other apps/websites not related to the lesson, watching unrelated videos, playing games, making faces into the camera app, taking random pictures or videos, searching the internet for answers they should be obtaining elsewhere, and random surfing of the internet. There were instances where students were reprimanded by the teacher for off-task activity and/or asked to return their individual iPads to the cart following inappropriate use. This is not only a potential obstacle to learning while the individual is off task, but also causes learning to stop once they are taken off of the devices altogether unless there is an alternative method of completing the task at hand. However, if teachers are required to create alternative methods for every iPad lesson in order to prepare for possible off-task behavior, it creates double work in lesson preparation using valuable teacher preparation time.

It should be noted that the teachers observed made diligent efforts to make sure that the students stayed on task as they worked through the various lessons. Nonetheless, monitoring the individual tablet-screens of a class full of students can be a daunting task without some sort of technology-based resource, such as Apple's Classroom App, to keep track of their activities. Even as teachers walked the classroom to make sure their students were on task, some students were observed playing games until the teacher approached, and then quickly switching to the lesson-related app as the teacher walked by, only to return to the games as the teacher walked out of view. We did not observe off-task behavior in lessons where the Nearpod app was utilized as it allows the teacher to control the content on the individual students' iPads, provided they are properly logged onto the app. However, even within that platform, keeping track of whether individual students have dropped off the app radar and teaching a lesson at the same time is still a challenging task.

Another possible obstacle related to iPad usage is the possibility of technical difficulties which, though not observed frequently, can take a lesson off-track momentarily. These issues range from minor annoyances such as the Nearpod teacher app not displaying the names of the students who are logged in, to the freezing of the Edmodo app requiring restart and login for each user. With regard to the Nearpod app, the website that recorded the grades did in fact record the names, even when the teacher iPad app did not; therefore, record keeping was not compromised by this issue. Infrastructure related issues such as the Wi-Fi going down have the potential to force the teacher to abandon a planned lesson for an alternative one. Issues related to Wi-Fi access and

strength also can occur in PC-based lessons, as we were reminded of when the PC-based Smart Response Notebook crashed momentarily during its use alongside an iPad lesson.

Transitions between assignments were sometimes subject to delays resulting from students not remembering their user names and passwords for a particular application. Although some class time was utilized in the process of distributing the iPads and returning them after class, these delays seemed to have been minimized by orderly procedures and by the speed at which the iPads start up.

Phase 1 Interviews

In the interviews, teachers indicated which apps they used on a regular basis when using iPads in their classrooms (Table 2). The table below indicates the range of iPad apps the interviewed teachers indicated they used on a regular basis when using iPads in their classrooms, along with the number of teachers that identified each. The most frequently used apps were Educreations and Edmodo.

Table 2: Frequently Used Apps

iPad App	# of Teachers Using	iPad App	# of Teachers Using
Blackboard	I	Nearpod	II
Bookabi	II	Physiology apps (var.)	I
Browser	II	Prezi	II
Dropbox	I	Smart Notebook	I
Edmodo	IIII	Smart Seat	I
Educreations	IIII	Socrative	I
Explain Everything	I	Study Mate	I
Google Docs	I	Timer (accessory app)	II
Grade Cam	I	Videolicious	I
Khan Academy	II		

It should be noted that the responses in Table 2 were compiled using impromptu responses recalled by teachers at the time of the interviews and may not represent the full spectrum of apps that may be used regularly. When the teachers were asked to identify their favorite iPad apps, Edmodo and Educreations again topped the list, each being listed three times. Khan Academy and the Timer app were each listed twice, and no other app was listed more than once among all of the teachers. When asked to identify the best iPad application or activity encountered thus far, almost every teacher had a different response. One teacher cited Nearpod as the top choice, noting its interactivity with quizzes and its ability to allow students to submit drawings or worked out problems as noteworthy advantages. Another identified a Videolicious project as the best activity, allowing students to be creative and engaged throughout the project. Yet another identified the use of the iPad's camera as her best activity, when she hovered over a live pig dissection being conducted by a student in the class and projected it for the rest of the class to follow along. For another teacher, it was the Khan Academy that was most helpful in that it allowed students to work on different topics depending on which areas they needed help in the most. Finally, two teachers identified Bookabi as their best application because it allows the students to express themselves as they create their own digital books to share with the rest of the class. When asked if there were apps they had heard of, but wanted to know more about, the teachers listed the following: Ask3, Sketchpad Explorer, Evernote, Socrative, Smart Recorder, Smart Notebook, Edmodo, Quizlet, and Prezi.

Learning and Motivation

Every teacher interviewed expressed a belief that the use of iPads in the classroom had increased student learning. One teacher noted in particular the ability it afforded the students to practice basic skills. Another noted the way an app allowed her to upload content specifically targeting benchmarks and standardized tests so that her students could prepare in a focused manner. Another identified the vast outside resources at the students' disposal as they completed projects that require research. Another teacher mentioned the enhancement opportunity iPads afforded students who are ahead of the rest of the class, given the flexibility to have students work at their own pace.

When asked if they thought using iPads in the classroom increased student motivation, each teacher indicated that they believed it did. One teacher cited the positive expressions on students' faces when they walked through the classroom door and saw that the iPads were out. Another noted the impact iPad

use had on the behavior of students as she used it as a “carrot” to get them to be quiet and pay attention. Another noted the 100% completion rate he observed whenever he assigned an iPad-based research project, indicating that he would not see that kind of completion rate on a research assignment in some other format. Yet another teacher described how she could see the excitement on her students’ faces and that she has heard from other teachers that they talk about their iPad assignments as they go into other classes.

Challenges and Concerns

When the teachers were asked to share some of the challenges that can arise from using iPads in the classroom, there were a variety of responses. Two teachers noted the limitations imposed by the iPad’s single-user intended operating system, which does not allow for multiple users to protect their own set of documents on the same device. This can expose student work files to other students for editing, copying, or even deletion. Along those same lines, one of the teachers indicated that finding a single platform to use for students to save their files to is a challenge. She indicated that a platform like Google Docs would be an option, except that some apps only allow students to save to Edmodo. Two teachers noted the school’s Wi-Fi strength as a challenge. In one class, all of the students tried to log on at the same time and apps froze as a result. The students needed to shut the app down and log on again in waves in order to distribute the impact on the network. Two teachers cited their limited access to hardware as a challenge to using the iPads. One of these teachers was using a single iPad to project to the classroom but did not have a class set; she indicated that this required her to “reinvent the wheel” in order to make use of the iPad’s interactive features, and even then, some uses seemed redundant to the capabilities of her SmartBoard. Another teacher indicated that he had to check the iPads out from the library, which he made a point of doing when he was able to make the time. However, he also indicated that a class set would enhance his ability to use them regularly. Finally, two teachers identified keeping students on task as a challenge to using iPads in the classroom, which they noted is also the case in a classroom without iPads.

The teachers were asked to share any concerns they had about how the iPads might affect their classroom environment and/or student learning. Half of the teachers indicated that they really didn’t have any concerns in this regard. Two teachers expressed concerns that the iPads could potentially open up a world of distractions for some students, but one of those teachers indicated that this highlights the importance of developing lessons that are engaging so that the students’ focus remains on the lesson. None of the teachers expressed concern that the iPads might negatively affect learning in the classroom; but rather, all of the teachers believed that using them had a positive influence on student learning.

Teachers’ Advice

The teachers were asked what advice they would give to another teacher who might be contemplating using iPads in the classroom, and they offered a litany of recommendations. One recommended having some flexibility as you start to use them in the classroom, noting that students may get distracted momentarily as they are becoming familiar with the devices. This teacher suggested that while taking the iPad away from a student for repeated off-task behavior was understandable, it’s not the end of the world if a student is momentarily distracted as long as they get right back on task. Another recommendation was that a teacher should spend time using the iPad in presentations first, before working with a classroom set. This will allow them to become comfortable working with the device as a teaching tool, and then they can build from there. Another teacher suggested being comfortable with the fact that sometimes the students will figure things out before the teacher, and that every lesson tried may not work exactly as planned. Two teachers advised being prepared with lots of activities and having a good distribution/management system in place. Finally, one teacher suggested accepting the fact that technology is ubiquitous and here to stay, and that the faster we can prepare our students to deal with it the better off they’ll be.

In closing comments, a couple of the teachers expressed how much they enjoyed having the iPads in their classrooms and another valued the school meetings that have been held to discuss which apps people were using in their respective classrooms. Another indicated a desire to continue the staff development opportunities, either through the district or at the school itself. Finally, one teacher mentioned that many students have expressed a desire to be able to take the iPads home to work with them.

Phase 2

For Phase 2, quantitative variables of interest were identified based on the information gathered in Phase 1. Sixty students completed an online follow-up survey with parent permission. Approximately half of the students surveyed indicated they were comfortable with the level of instruction received on how to use iPads and believe they are able to keep up with lessons when the iPad was used. When asked which apps the students utilized when using iPads in their classrooms, Edmodo and a browser app were the most used apps for students (Table 3). These particular apps allow for self-directed learning. When students were asked about their preferences on the level of use of the iPads in their classroom, 33 of the students indicated they would like to use the iPads “a little more” and 19 “a lot more”.

Table 3: Student Used Apps

iPad App	# of Students Using	iPad App	# of Students Using
Blackboard	36	Nearpod	9
Bookabi	24	Physiology apps (var.)	N/A
Browser	45	Prezi	35
Dropbox	7	Smart Notebook	6
Edmodo	53	Smart Seat	2
Educreations	17	Socrative	2
Explain Everything	1	Study Mate	9
Google Docs	40	Timer (accessory app)	7
Grade Cam	6	Videolicious	8
Khan Academy	25		

The survey results also revealed that more than half of the students (appx 61%) believed that using the iPads in class helped with their learning. There were 20 male and 40 female participants. A Mann-Whitney U test was run to determine if there were differences in beliefs about learning with the iPads between males and females. Distributions of the scores for males and females were similar, as assessed by visual inspection, and the difference in belief was not statistically significantly different between males (Mdn = 4.00) and females (Mdn = 4.00), $U = 386$, $z = -.224$, $p = .823$. These findings confirm that students' positive beliefs about learning with the iPads were sentiments shared similarly by both male and female students.

Discussion

Overall, the rollout of the iPads seems to have been a positive experience for the teachers and students. Most of the classrooms observed had iPads available for one-to-one use by the students. The most frequently used apps in the classrooms observed were Edmodo and Khan Academy, and the most frequent activity observed was mathematics problem solving; however, the frequency observed for each was likely influenced by the subject matter being taught in the classrooms where teachers volunteered for observations. The classes observed provided notable examples of how student motivation and learning appeared to be enhanced by use of the iPads in conjunction with lessons, such as having unique opportunities to collaborate and be creative in the context of their learning.

The observations also highlighted some potential obstacles and concerns to be aware of when rolling out such an ambitious program. For example, the use of technology during classes may support a constructivist approach to teaching and learning; however, Yelland (2006) contends that leaning with technology needs more than transforming everyday activities to digital format. Additionally, students and teachers are in need of support on 'how' to use iPads in the classroom (functionality). It is also important to note that the wealth of capabilities and features on an iPad can invite even well-intentioned students to become sidetracked. So as plans are made to rollout iPad programs, it may be just as important to share strategies for keeping students on task in the face of so many possible distractions. This particular concern may be remedied by addressing the students' interest in using self-directed/collaborative programs (like Edmodo) more often during lessons. Teachers noted other limitations to the iPad rollout, such as the inability to use the devices in a multi-user fashion that protects each individual's work from others. Perhaps one way to address this concern is through collaborative projects that are submitted by one user on behalf of a group. Concerns mentioned by teachers in the interviews also included Wi-Fi connectivity issues or limited access to iPads as potential impediments to classroom use. The offline features to apps, such as Google Apps for Education, are on the rise and may address the Wi-Fi connectivity concern while working collaboratively on projects may again be a response to limited iPad access. For example, instead of working 1:1 students may work 3:1 on collaborative projects using the iPads.

The teacher interviews provided multiple perspectives of the program from a set of teachers with a range of teaching and classroom experience. They cited Edmodo and Educreations as their favorite and most frequently used apps, although several other apps were mentioned as being used frequently when they taught with iPads. The lack of overall conformity as far as the use of apps can be viewed as both a strength and a possible concern. The opportunity for teachers to have the flexibility to select the apps that they believe best achieve their curricular aims draws on the professional strengths of the teachers to craft a curriculum that best benefits their students. Conversely, with so many varied apps in use, it can become more difficult to identify the most effective ones in order to establish best practices.

Teachers overwhelmingly felt that both student learning and motivation were enhanced as a result of using iPads in their instruction. They described various instances where students displayed evidence of increased motivation and engagement and had few concerns for any possibility of negative impacts arising from their incorporation of iPads in their classrooms. Consistent with research (Fullan, 2001; Niederhauser & Stoddart, 2001), teacher beliefs about technology are crucial as they are tied to the actual use of the tools in classrooms. The positive attitudes of the teachers throughout the adoption process noted in this evaluation, contributed to their willingness to integrate iPads into their classrooms.

Students shared in this sentiment and expressed a belief that the iPads helped them learn in class. The quantitative findings confirmed that students' positive beliefs about learning with the iPads were sentiments shared similarly by both male and female students. The results will hopefully help direct future research regarding the design and implementation of learning with iPads in secondary settings facing gender disparities related to the use of tablet technologies. In summary, the overall impression of the iPad rollout in this urban high school was positive from the information gathered in all Phases of this evaluation.

Conclusion and Future Directions

Nearly 7 years since the iPads were first introduced in classrooms, and investments are still being made in this device along with other tablet technologies. As previously noted, the adoption of tablet technologies by schools has not come without controversy. Consistent with prior research (Clark & Luckin, 2013; Clarke & Svanaes, 2014; Heinrich, 2012), the findings in this study revealed that when it comes to teaching and learning, teachers and students are generally positive about the use of iPads in the classroom. Teachers are allowed to enhance their pedagogy and students are motivated to learn in ways that were not previously possible.

For urban school districts and school leaders, there is the pressure to enhance learning and to stay ahead of the technology trends. Additionally funding in schools can fall under tight scrutiny; therefore, the high cost of rolling out 1:1 iPads calls for a particularly contentious decision-making process. Our findings support prior research related to the necessity for specific systems factors, such as leadership, frequent technology use, and clear instructional models, in order to make a difference in learning for students (Greaves, Hayes, Wilson, Gielniak, & Peterson, 2010; Levin & Schrum, 2013). Additionally, a clear rationale, infrastructure, and support system for teachers are essential prior to the adoption of tablet technologies in urban high schools where Title 1 funds are to be carefully spent. In conclusion, findings in this study are timely considering the increased interest in using tablet technologies to support student learning and motivation through collaborative projects. For future consideration, the researchers will examine the quantitative measures identified in order to assess the academic impact that the use of iPads has actually had on the performance of urban high school students.

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