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Daljit Kaur
Francis Marion University, USA

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Post-Positivist Approach to Factors that Influence K-12 Teachers' Use of iPads and Chromebooks

Daljit Kaur

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Abstract

This paper focuses on the factors that influence in-service teachers' use of Chromebooks and iPads in K-12 classrooms. Fifty-one participants enrolled in online education programs at a university in the south participated in the study. Data were collected using an online survey and analyzed using an inductive approach focusing on important patterns across the raw data to come up with the themes. The results indicated that there were four main factors that influenced in-service teachers' use of Chromebooks and iPads in their classrooms which were (a) Availability, (b) Familiarity, (c) Functionality, and (d) Targeted professional training. Implications for school administrators, teachers, and researchers are discussed.

Introduction

Rapid changes and advancements in technology have significantly influenced 21st century teaching and learning. Now, more than ever before, students have access to instant information both inside and outside of the classroom. "Technology is everywhere in education: Public schools in the United States now provide at least one computer for every five students. They spend more than $3 billion per year on digital content" (Herold, 2016, p. 1). In the past, technology in education was mostly limited to the use of computers in the classroom. With the changes in the requirements of technology skills in education, and development of innovative technological devices such as Chromebooks and iPads, use of technology in the classroom has come a long way. Schools are now being asked to help students develop 21st century skills "such as problem solving, critical thinking, communication, collaboration, and self-management" **(**Pellegrino & Hilton, 2012, p. 1). Students are expected to be knowledgeable about how to find, assess, and use digital content which is referred to as digital literacy (Freeman, Adams Becker, Cummins, Davis, & Hall Giesinger, 2017). Through technology, teachers have the ability to differentiate instruction, develop problem or project-based learning environments, and help students develop 21st century skills and digital literacy (Penuel, 2006). But, how prepared are K-12 teachers to embrace these rapidly changing technologies that can help students develop 21st century skills? What factors influence K-12 teachers' use of Chromebooks and iPads in the classroom? This study explored the factors that influenced K-12 teachers' use of such devices in the classroom.

Literature Review

Teacher and Technology

With the advancements in technology, more and more K-12 schools are adopting one-to-one technology allowing students to learn anywhere, anytime (Melhuish & Falloon, 2010; Sharples, Corlett, & Westmancott, 2002), making it easier for them to collaborate and have more access to peers and experts (Freeman et al., 2017). However, technology alone cannot improve education for students unless teachers use technology effectively with pedagogy (Currie, 2016). Teachers play a significant role in implementing technology in the classroom and directly affect the outcomes of technology usage. With technology continuously evolving, it is important for teachers to keep up with the change (Mishra & Koehler, 2006) because they are expected to be skillful in using technology to support student learning through content delivery and assessment (Freeman et al., 2017). There is

an important relationship between teachers' technology implementation and student-learning because the ways in which teachers incorporate technology directly affect their students (Liu et al., 2016). To prepare 21st century learners it is important to prepare teachers as well (Freeman et al., 2017; Smith & Greene, 2013) so that they can use technology effectively to promote student-learning.

Though technology is often viewed as an effective classroom tool, that does not imply that teachers and students are well-prepared to use it to its full potential (Barbour, Grzebyk, Grant, & Siko, 2017). Changes in classroom practices do not occur solely because of the availability of technology (Ertmer, Addison, Lane, Ross, & Woods, 1999). Teachers' technology use is influenced by internal factors such as their personal beliefs and commitment and external factors such as professional development and technology support that helps them shape their teaching (Ertmer, Ottenbreit-Leftwich, Sadik, Sendurur, & Sendurur, 2012). Teachers are more likely to use technology in their classrooms when they believe that they are proficient (Inan & Lowther, 2010; Petko, 2012**)** and their perceptions about the usefulness and importance of technology influences how they will use it (Liu et al., 2016). Teacher confidence is also an indicator of how likely teachers are to use technology in the classroom. The more confident the teachers are in their capabilities of using technology the more likely they are to use it in the classroom (Barbour et al., 2017).

While advancements in the mobile learning devices such as iPads and Chromebooks attract educational institutions to use new forms of technology to support 21st century teaching and learning, they also pose some challenges. To keep up with the new forms of technology, schools have to make sure that the teachers are skillful in using the technology by providing them ongoing support (Hosman & Cvetanoska, 2013) to keep up with the changes for effective pedagogy. To employ technology-enhanced pedagogy, teachers must also keep up with current research related to teaching and learning with technology (Brooks-Young, 2007). Professional development also plays an important role in helping teachers efficiently integrate technology in the classroom. Providing the needed support and training can help teachers develop technologically-enhanced teaching strategies (Young, 2016) and increase their likeliness of integrating technology in the classroom. Professional development must help teachers maximize the implementation of technology and improve their hopes to be successful because if teachers believe that they can succeed, they will be more willing to use a new technology and continue with it (Wozney, Venkatesh, & Abrami, 2006).

An important aspect of effective technology integration is the teacher's capability to create technology activities that can meet students' needs (Gorder, 2008). Therefore, professional development that supports teachers in meeting students' needs may result in increased use of technology in their classroom (Ottenbreit-Leftwich, Glazewski, Newby, & Ertmer, 2010**).** Professional development related to technology integration should also take into consideration contextual factors as opposed to having a "one that fits all perspective" because contextual factors influence technology integration as well (Palak & Walls, 2009; Sharples et al., 2002). With the rise in technological innovations and the increasing amount of money that is invested in these devices it is critical to find ways to use technology effectively in the classroom by providing teachers professional development opportunities that support successful technology integration.

Since teachers play an important role in implementing new technologies in the classroom, it is also necessary to study the factors that help and hinder their use of technology in the classroom (Drossel, Eickelmann, & Gerick, 2017). There are several factors that are associated with teachers' technology integration in the classroom. There are teacher factors such as teacher attitudes, beliefs, teaching experience, technology experience, and teacher preparedness to use technology, and school factors such as availability of technology, professional development, technology support, and student factors such as class sizes and student ability (Drossel et al., 2017; Ertmer et al. 2012; Howley, Wood, & Hough, 2011; Inan & Lowther, 2010; Palak & Walls, 2009; Sahin, Top, & Delen, 2016). Since these factors are significant determinants of teachers' technology integration in the classroom, they should be considered when focusing on what helps teachers decide to use technology in the classroom. These factors are mostly related to technology integration in general and perhaps not well-known for mobile devices such as iPads and Chromebooks. With the continuous evolvement of technology it becomes important to study how these factors influence the use of the innovative technologies as well.

Chromebooks and iPads in K-12 Classrooms

As school districts search for innovative ways to reach students through technology, Chromebooks seem to be a great fit especially for older students. Chromebooks are cost effective, easy to use, convenient (Schoenbart, 2015) and allow students to build keyboarding, research, and collaborating skills which are required by state standards (Fink, 2015). Chromebooks are also preferable because they allow students to access all their work

through Google Suite for Education (GSFE) through one login (Leary et al. 2016; Schoenbart, 2015). "Most of what can be achieved on a Chromebook is also possible with other devices" (Schoenbart, 2015, p. 32) but Chromebooks are specifically designed to access the internet for rich educational and collaborative resources and cloud storage capabilities such as Google drive (O'Donnell & Perry, 2013). Since the introduction of Chromebooks in education in 2012 (Mainelli & Marden, 2015) there has been some research related to the use of this device in education (Kimmons, Darragh, Haruch, & Clark, 2017; Leary et al., 2016; Sahin et al., 2016). Kimmons et al. (2017) compared 8th-grade student essays composed via Chromebooks versus handwritten and found that Chromebook essays had a greater complexity in word usage and sentence composition implying that the medium may have had an effect on the complexity of student writing. Shanin et al. (2016) in their research with teachers' first-year experience with Chromebooks found that teacher attitudes towards Chromebook changed from positive to negative over the year due to technical issues. It was noted that teachers' attitudes towards technology integration were not correlated with their comfort level of teaching with Chromebooks; however, the number of technological devices teachers had were significantly correlated with their comfort level of teaching with technology.

The iPad is a popular handheld interactive multimedia device with appealing and easy to use features that attract all stakeholders in education (Dhir, Gahwaji, & Nyman, 2013). It is portable and light weight with easy access to information and built-in features such as touch-screen, text enlargement, and sounds, (Koszalka & Ntloedibe-Kuswani, 2010; Prensky, 2010) making it easier to use for teaching and learning. Students can use various educational apps available on iPads through the app store to develop 21st century skills such as communication, collaboration, creativity, and critical thinking. Unlike Chromebooks, the use of iPads in education has been researched extensively. Existing research related to the use of iPads has focused on differentiation (Milman, Carlson-Bancroft, & Boogart, 2014; Powell, 2014), student engagement (Hutchison, Beschorner, & Schmidt-Crawford, 2012**)**, motivation, self-expression and independence (Ciampa, 2014; Flewitt, Kucirkova, & Messer, 2014) and fields such as STEM (Aronin & Floyd, 2013; Haydon et al., 2012; O'Malley et al., 2013), literacy (Beschorner & Hutchison, 2013; Getting & Swainey, 2012; Simpson, Walsh, & Rowsell, 2013), special education (Flower, 2014; Johnson, 2013; McClanahan, Williams, Kennedy, & Tate, 2012; O'Malley, Lewis, Donehower, & Stone, 2014), and math **(**Carr, 2012; Kiger, Herro, & Prunty, 2012**)**. Dhir et al., 2013, conducted a systematic literature review of studies related to the instructional benefits of using iPads in educational settings and found that iPads positively impact literacy skills, student performance, instruction, teaching skills and are supportive of mobile learning.

Although mobile devices such as iPads and other tablets are becoming famous in K-12 education, not much is known about how teachers use these devices effectively with pedagogy (Barbour et al., 2017; Liu et al., 2016; Smith & Santori, 2015). Research has yet to catch up with how teachers keep up with the increasing technological innovations and their use in education for effective pedagogy. With advancements in technology, the role of technology is being constantly redefined and expectations of how teachers should use technology with pedagogy keep changing. The ever-evolving nature of technological innovations makes it difficult for schools to balance pedagogy with technology and they "struggle with the establishment of high quality professional development plans geared towards the effective integration of instructional technology into teaching practices" (Gaytan & McEwen 2010, p. 78). Understanding the factors that influence teachers' use of innovative technological devices can better assist schools in developing quality professional development programs to prepare their teachers accordingly. When teachers know how to use technology effectively with pedagogy, both students and teachers benefit (Kaur, 2017).

Method

Research Design

This study employed a post-positivist research approach which helped the researcher to understand factors that influenced participants' decision of using iPads or Chromebooks, rather than predicting and limiting them to controlled choices. A post-positivistic approach assumes "reality is multiple, subjective, and mentally constructed by individuals" (Crossan, 2003, p. 54). The open-ended survey questions used for this study provided freedom to the participants to express their experiences or beliefs without being limited to predetermined or forced responses. Traditionally, surveys are conducted to draw conclusions about a population based on the sample that completes the survey. However, data from the open-ended survey questions used in this study were used to understand the participants' viewpoints regarding the use of iPads or Chromebooks as opposed to using the data to generalize the findings. Although the results cannot be generalized to a larger

population, they imply the importance of the post-positivistic philosophy to better understand and interpret the experiences or beliefs of the participants (Crossan, 2003; Gale & Beeftink, 2005).

Participants and Selection

Participants for this study were K-12 teachers enrolled in online graduate education programs at a university in the south. After obtaining approval from the IRB, 79 students (*N*= 79) were emailed the study details with the consent form and the link to the anonymous survey to participate in the study. Eligible participants had to be using digital technology such as iPads and or Chromebooks in K-12 classrooms. Sixty-five participants responded to the survey and 51 completed the survey, indicating 78% survey completion rate and 82% response rate. Most participants taught mathematics followed by English Language Arts (ELA), science, special needs, and social studies. The majority of the participants used iPads compared to Chromebooks in the classroom.

Data Collection

Since the participants were students in online education programs and were located all over the state, an online survey was more feasible for collecting data. The survey was designed based on a systematic review of literature regarding the use of technology in the classroom and creating technology enhanced learner-centered classrooms (An & Reigeluth, 2012; Elston, 2013). The survey included demographic, multiple-choice, likert-type, check all that apply, and open-ended questions. The findings for this report were based on the responses to the open-ended questions. At the time of the study, the participants already knew how to use laptops but were fairly new to using iPads in the classroom. Since laptops function similar to Chromebooks except that they are specifically designed to access the internet, the survey questions mostly focused on iPads. The three open-ended questions used in this study were as follows:

1. What would you prefer, if you have a choice between Chromebooks and iPads for your students and why?
2. What are the major weaknesses of the professional development programs related to iPads?
3. What will make you more confident in using iPads in the classroom?

Data Analysis

Data from the open-ended responses were copied and pasted into Microsoft Word and were read and reread for understanding. An inductive approach was used to analyze data to build themes by looking at individual responses that helped to detect patterns in the data (Trochim 2006; Creswell & Plano Clark, 2007). The responses were coded by looking for common words and phrases that implied the same meaning. For example, the responses such as "We don't have access to iPads for most students" and "If all my students had access to an iPad" were coded as "limited resources." The responses such as "More access to subject specific applications" and "There needs to be more subject-specific apps" were coded as "access to resources." The commonalities were then grouped together under relevant themes (Merriam, 1998). For example, the above mentioned codes were grouped under the theme "Availability. The process was repeated until all the responses were coded and grouped under relevant themes. At the end of the data analysis process, the following themes were derived based on the codes as shown in Table 1.

Table 1. Themes Derived based on the Codes

Themes	Codes
Availability	Limited resources and access to resources
Familiarity	Product knowledge and familiarity
Functionality	Functionality and user-friendly
Targeted Professional Training	Content-specific training and app-specific training

Here is a detailed example of one of the themes and codes developed during the analysis of the responses.

Theme-Familiarity *(codes: product knowledge and familiarity)*

1. iPads because students experience them more than Chromebooks in life, they are similar to iPhones, iPads and other tablets which many parents have rather than computers. *(product knowledge)*

2. iPads just because I know more about them and my school district uses mostly Apple products. *(product knowledge)*
3. iPads because I am more familiar with how they work. *(familiar)*
4. iPads serve my students much better as my students are familiar with them. *(familiar)*
5. I feel that iPads are easier to use and more students are familiar with iPads than Chromebooks. (*familiar*)
6. I would rather use a Chromebook because I have some knowledge of how it works and it is so closely related to a PC. (*product knowledge, familiar*)
7. Chromebooks because they are similar to the laptops. (*familiar*)
8. iPads are what I am used to. (*familiar*)
9. iPads I have knowledge of how it works (*product knowledge*)
10. The Chromebook is more accessible and more in-line with what students are used to using. (*familiar*)
11. iPads because I use apple products and most of my students do as well. (*product knowledge*)
12. Ipads, because I am familiar and have never used a Chromebook and I like Apple products. (*familiar, preference*)
13. I would prefer iPads because I have used them in the past. (*familiar, product knowledge*)
14. iPads because they operate similar to an iPhone. Also, most students have used an Ipad at least once or twice before so they are more familiar with them. (*familiar, product knowledge*)
15. Although, I really like Apple products and I think the use of iPads is very beneficial to the classroom, my school uses Chromebooks so I am more familiar with how to use them. (*familiar*)
16. Chromebooks are similar to laptops that students may use in college. *(product knowledge, familiar)*
17. iPads because I have interacted with an iPad more than Chromebooks. (*familiar*)
18. iPads because I have more experience with them and I could help the students and other teachers with learning about the use of it. (*familiar*)
19. iPads because I have my own and I am more familiar with the iPad's operating system. (*familiar*)
20. Either but I would be more familiar with chromebook because of the operating system. (*familiar*)

Trustworthiness

The credibility of this study was established by allowing participants' to express views regarding the use of iPads and Chromebooks from their perspectives (Trochim, 2006). The findings were confirmed by using direct quotes from the participants, keeping an audit trail documenting every aspect of the research from start to finish and providing a detailed explanation of the research procedure. The description of the data collection, analysis and the formation of the emerging patterns and themes also helped with transferability (Morrow, 2005; Trochim, 2006).

Findings

Based on the data analysis the following four themes influenced the participants' use of either iPads or Chromebooks in K-12 Classrooms.

Availability

Availability of technology or access to technology is an important determinant of technology integration in the classroom. Technology cannot be used, if it is not available to the students and teachers or if they have limited access. Lack of availability of enough devices whether it was Chromebooks or iPads was noted as an important factor that influenced the participants' use of technology in the classroom. Although most participants preferred iPads over Chromebooks, they expressed concerns about limited access to iPads. Access to technology is needed in order to implement it effectively. Responses such as "We don't have access to iPads for most students", "Insufficient supply of iPads for primary Special Ed classrooms." and "If I had access to an iPad for each of my students" implied that the student to iPad ratio was seen as an obstacle in integrating technology into the curriculum.

When asked what would make the participants more confident in using iPads they responded, "Having more iPads for me and my students," "Enough iPads for all students" and "1:1 supply of iPads to facilitate group activities." indicating a need for all students to have a device for successful implementation of technology. Some participants also expressed concerns regarding access to subject-specific apps to be able to use iPads

effectively with pedagogy. Responses such as "Learning about new apps that I can use with my students" "Specific content area apps," "More access to subject-specific applications" and "More experience and exposure to iPad apps and capabilities" indicated that to make teachers more comfortable using iPads in the classroom, they needed more access to the device, access to more subject-specific apps and practice on how to use the apps.

Familiarity

When using a device whether it is an iPad or a Chromebook, it is important to know how it works. When participants were asked about their preference regarding the device most of them preferred iPads over Chromebooks. In either case, they preferred the device because they were more familiar with how the device worked and its exposure to the users. Participants who preferred iPads indicated that considering the popularity of the apple products, most of them, their students, and parents had access to and had used some type of apple products. They felt connected with the technology and already knew the basics of how to use it which eased the integration of the device into the classroom. One of the participants commented: "iPads serve my students much better as my students are familiar with them." Another participant commented: "Students mostly have iPhones and iPads for personal use, so they would be more familiar with it in a school setting."

Participants who preferred Chromebooks also indicated that since Chromebooks closely resemble laptops, their students were familiar with using laptops and didn't have any difficulty using Chromebooks. One of the participants' commented: "I would rather [use] a Chromebook because I have some knowledge of how it works and it is so closely related to a PC that the students would easily understand the software." In both cases, familiarity with the device allowed for easy transition into the classroom without having to stress about teaching or learning how to use the device. The more familiar the participants were with the device the more confident they felt in using it in the classroom. It was clear that the participants were drawn to the device that they were more familiar with and felt more comfortable using.

Functionality

When deciding to introduce a new device into the classroom it is important to determine if the device has the ability to perform certain tasks often referred to as functionality. Participant responses indicated that functionality was also an important factor when it came to the choice between Chromebooks and iPads. They mentioned that iPads were light weight, easy to carry around, very user-friendly, and had access to a lot of applications in the app store that teachers could use with students. One of the participants commented: "iPads are easier to use, simple." Another participant commented: "they [iPads] are incredibly user-friendly for students as they mirror how most of their cell phones work." Another participant commented: "iPads are lighter, easier to store, won't take up as much room." This indicated that the physical aspects and the simplicity of the device were a major influence when deciding which device to choose.

Participants choosing Chromebooks believed that it was easier for them to monitor student work and that they resembled laptops which made it easier for their students to use. One participant commented: "Chromebooks are easier to monitor what the students are doing. I can see all of their computer screens at once and make sure they are on task." They also believed that since Chromebooks came with a keyboard and a mouse it helped their students to complete their tasks, helped them build keyboarding skills and prepared them with state testing. Another participant commented: "I prefer Chromebooks because standardized testing now requires students to type." Participants wanted their students to be able to use a device with ease without having to waste class time on teaching them how to use a complicated device when using technology is supposed to help make learning more efficient. A majority of the participants preferred iPads over Chromebooks, but each group favored the device based on the ease of use and user-friendliness.

Targeted Professional Training

Professional development should target every teacher's professional growth and achievement by providing ongoing, highly effective, subject and grade specific support which is referred to as targeted professional training. Many participants expressed the need for targeted professional training on how to find and use specific apps in different content areas. One of the participants commented: "I would like to know more about how iPads can be used in a math class and not just in the classroom in general." Another participant commented: "I am not seeking development on how to use an iPad, rather how to use specific apps in the classroom." The responses

indicated that the participants were familiar with Chromebooks or iPads and as such did not need any training on how to use the device but were not aware of what applications would provide the most enriching experience in their content area. Their responses indicated that this type of training would help them build the confidence that they needed to incorporate iPads into their lessons. Some participants wished they had information on how to use iPads to reach students at various levels, while others wanted development in a specific area in using iPads like math or special needs resources. Regardless of their needs, it was obvious that the participants' desired specific instruction on how to use apps for differentiated instruction. They knew how to implement technology but not how to reach different learners at different levels within different content areas.

Some participants also indicated the need for collaboration when learning how to successfully implement iPads into their classroom to best help their students. When asked about what would make them more confident in using iPads, one of the participants commented: "To observe a teacher who has a flipped classroom who used iPads. To be able to sit down and create a lesson with that teacher. Then to have that teacher come observe me teach that lesson and give me feedback on the lesson. To repeat this process several times until I am comfortable with the use of iPads in the classroom." Another participant commented: "Collaboration with other science teachers on what apps and sites they utilize on their iPads that are most effective and aligned to the state standards." These comments indicate that the participants did not want to use iPads just for the sake of using technology but to effectively use technology with pedagogy to promote student growth. Participants also expressed a need for having professional feedback to follow up after training to encourage teachers to use iPads more frequently in the classroom.

Discussion and Conclusions

Results of this study suggests that regardless of the type of device used in the classroom, availability of the device is very important in helping teachers decide whether or not to use it in the classroom. In order for the participants to effectively incorporate iPads in the classroom they needed more access to iPads, preferably enough to make the classroom one to one and access to content-specific apps. As indicated by the participants in this study and previous research, successful technology integration depends on the accessibility of the technology. Surely, technology will be of more advantage to the students and the teacher if they have access to it (Delgado, Wardlow, McKnight, & O'Malley, 2015; Norris, Sullivan, Poirot, & Soloway, 2003).

Participants also considered ease of use as an important factor when deciding on using either iPads or Chromebooks in the classroom. The majority of them leaned towards the easy to use interface of the device because they wanted their students to conveniently use technology without having to spend a considerable amount of class time to teach them how to use a complicated device when the purpose of using technology is to make learning more efficient. This finding aligns with previous research which suggests that iPads are user-friendly (Vedantham & Shanley, 2012; Wario, Ireri & De Wet, 2016).

Most participants in this study preferred iPads over Chromebooks because they were more familiar with the device. However, although the participants were familiar with the device that did not necessarily mean that they knew how to use the device to promote student learning. They knew how to use the device in general but were not confident enough to use it effectively with pedagogy. They wanted targeted professional training on how to incorporate content-specific apps into their lessons to support student learning, differentiate instruction, and collaborate with colleagues. This finding suggests that ongoing targeted professional development, planning, and practicing a new technology is crucial for effective use. This finding echoes that administrative support and continuous training with a focus on helping teachers to use technology effectively to support student-centered pedagogy are critical among other factors that affect the use of technology (Liu et al., 2016; Palak & Walls, 2009).

When students have access to technology and teachers are well-trained in using technology to support pedagogy, both, learning and teaching thrive. The more familiar, well-trained, supported, and confident teachers are with technology, more likely they are to use it in the classroom which corroborates the findings of the studies conducted by (Barbour et al., 2017; Hosman & Cvetanoska, 2013).

Recommendations

There is no doubt that there are real-world benefits of technology whether that it is iPads or Chromebooks. However, successful implementation depends on the adequate availability of the resources, familiarity with the

device and more support from the administration in the form of specific training on how to use the device effectively to support student learning. With the increased use of mobile technology in day-to-day life, most teachers own a device and are familiar with the device. But owning a device and knowing how to use it does not necessarily imply that they know how to use it in education.

Participants in the study did not have a problem using the iPads; however, they did express concerns about how to use iPads effectively with pedagogy. Ongoing professional development providing opportunities for thorough and practical experiences and access to the latest technology can help teachers learn how to effectively choose and integrate technology (Parikh, 2012). Providing training specifically aligned with how to use different apps with different subjects and how to differentiate instruction can help teachers better integrate iPads into their classroom. The focus of this paper is limited to whether the participants used Chromebooks or iPads with their students. Future studies related to how teachers use these devices with pedagogy and their influence on student learning can shed more light on their effectiveness in the classroom. Since technology is continuously evolving, there is a need to continuously conduct research to understand how the use of technology affects pedagogy.

Limitations

While this study only had 51 participants, there were some considerable findings, especially for schools trying to develop or planning to develop iPad professional development for teachers. However, there are some limitations to this study. Over 90% of the participants in this study were from Title 1 schools and hence the data more accurately represents the socio economic factors more closely related to the context of high-poverty schools. Also, this study only represents in-service teachers with different levels of teaching experience with iPads and Chromebooks in high-poverty schools and the results should be interpreted accordingly.

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Author Information

Daljit Kaur
Francis Marion University
4822 E. Palmetto Street, Florence, SC 29506
U.S.A.
Contact e-mail: *dkaur@fmarion.edu*