

# Teachers' First-Year Experience with Chromebook Laptops and Their Attitudes Towards Technology Integration

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**Abstract** Because mobile technology has become so obvious in a child's life, use of it for teaching and learning has become a necessity. This study investigates use of Chromebook laptops in 6–12 grade classrooms in relation to teachers' experience. We employ a mixed method approach. First, we study how teachers' years of teaching and numbers of technological tools they have are related to their comfort of teaching with Chromebook laptops, as well as their attitudes change towards technology after teaching with a Chromebook for a year. Second, to have more specific thoughts about teachers' Chromebook experience, we conducted qualitative analyses to hear teachers' voices. Of the 658 6–12 grade Mathematics and English teachers from 30 schools invited to be part of the study, 553 teachers completed the survey. We utilized Pearson Product correlation for the first question. A paired-sample *t* test was run to examine whether teachers' attitudes towards technology use changed after teaching with Chromebooks for a year. For the qualitative part, we used a Phenomenological approach to analyze what teachers felt about their experience with Chromebooks. We found that teachers' comfort of teaching is not significantly correlated with their years of experience. As expected, there was a statistically significant relationship between the number of technological tools they had and their comfort of teaching with technology. Teachers' attitudes significantly decreased after teaching with Chromebooks for a year. Teachers complained about excessive blocking and lack of tech support, along with some suggestions including filtering and proper training, both for teachers and students that is for a smoother transition from traditional teaching to Chromebook-integrated

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teaching. Findings and implications are presented to help schools improve technology integration in the discussion and conclusion parts.

**Keywords** Teacher experience · Attitudes · Chromebook · Technology · Laptop

## 1 Introduction

New technologies have been used more often in education in the last decade (Li 2007). Although various types of technologies take place in K-12 schools (Beeland 2002), computers are the most popular and useful device used for instruction. Computers are used for many purposes in schools by various user groups, including administrators, teachers, and students (Ekmekci and Gulacar 2015; Li 2007). Schools' approaches to technology use may differ when seeking best ways of using it (Baylor and Ritchie 2002). For example, some schools prefer to place computers into a lab, while others use them in classroom settings (Baylor and Ritchie 2002).

In addition, mobile technologies, such as laptop computers or tablets, are now also being used in schools. When mobile devices are used for instruction, mobility provides numerous advantages. For instance, a student can easily use the same laptop in a science lab while writing an experiment report and in a classroom to complete classwork (Windschitl and Sahl 2002). Additionally, laptops can be used by multiple users in different settings, which also creates a collaborative context in schools (Cervantes et al. 2011). Laptop use also provides students flexibility to work on school works and projects in learning environments without being dependent on a location (Demb et al. 2004).

It is important to note that teachers have an important role in schools when laptop computers and related technologies are integrated in learning (Ertmer 2005; Eteokleous 2008; Zhao et al. 2001). In other words, teachers' attitudes towards technology use affect the quality of instruction (Atkins and Vasu 2000; Milbrath and Kinzie 2000; Yusuf and Balogun 2011). Hence, teachers are supposed to improve themselves in terms of technology use in their classes. Additionally, technology enhanced teaching environments need to be provided to teachers to scaffold them in terms of technology integration.

Integrating technology into the classroom settings is not an easy task. However, when it is accomplished properly, teachers and students are influenced very positively in terms of teaching and learning quality (Goktas et al. 2009). Teachers can facilitate their teaching with new technology-based techniques while students can learn the course content with higher motivation. Mobility can enhance the integration process due to more flexible use. Hence, portable devices, such as laptops, could be used in school settings for better instructional outcomes.

Because laptop computers have become more accessible and affordable than before, students are provided portable computers in today's classrooms (Teo et al. 2008a). Teachers and students could benefit from laptop computers during the instruction in numerous ways (Conole et al. 2008; Kumar and Kumar 2003; Thompson et al. 2003). In classes, laptop computers are mainly used to motivate students in the learning process by assigning them more active roles (Beeland 2002). For example, students may be asked to look for additional resources on websites regarding to a topic and share them with the class. In addition, activities can be conducted to investigate students' progress. Among many factors that affect the students' motivation, attitudes and skills of teachers have

become key factors in computer use in classroom settings (Beeland 2002; Christensen 2002; Woodrow 1992). That is, teachers need to have a positive mood when using technology in the classroom. Therefore, it is important to investigate teachers' attitudes towards technology in different settings in order to figure out better ways of technology integration in education (Li 2007; Teo et al. 2008a; O'bannon and Thomas 2014) and overcome potential issues.

Although many researchers have focused on teachers' attitudes towards technology use, limited research exists on exploring potential reasons of forming and changing attitudes. The purpose of this study is to examine teachers' comfort level with Chromebook laptop computers, how their technology attitudes are influenced after teaching in a technology enhanced classroom for a year, and any potential key obstacles of using laptops (Chromebooks) in classroom settings.

## 2 Literature Review

### 2.1 Teachers' Attitudes and Technology Use

A growing body of research has studied teachers to explore the reasons of using or not using technology (Vannatta and Fordham 2004). Although many factors have been proposed to explain teachers' technology use in schools, MacArthur and Malouf (1991) noted that teachers' technology use in their teaching is related to their attitudes towards technology. That is, teachers need to have sufficient desire of using technology to benefit from technology-integrated instruction adequately (Teo et al. 2008b). The ways of forming teacher attitudes towards technology use have taken researchers' attention. Here, we will mainly focus on the impact of experience, training and obstacles on technology use to illuminate teachers' approach to technology use in the classroom settings.

Field experience is one of the factors that influence teachers' technology use. That is, teachers are supposed to have sufficient experience in their fields in order to use technology effectively when teaching their curriculum (Teo et al. 2008b). According to Baylor and Ritchie (2002), technology integration to education is related to teachers' willingness to change. In other words, when a qualified teacher has a high confidence level of teaching a subject to students via traditional teaching techniques, it is more likely for the teacher to seek new approaches to use and integrate technology in teaching. Cervantes et al. (2011) noted that teachers' technical and pedagogical readiness has an impact on changing instruction in schools. For instance, using laptops in the classroom may direct teachers to use a student-centered approach rather than teacher-centered approach (Windschitl and Sahl 2002). The success of this change requires teachers to be experienced in their field.

On the other hand, today's teachers are exposed to technology more than senior educators. Hence, younger teachers might have more technological knowledge that may foster technology integration in their classroom. However, cooperation of field experience and technology expertise of teachers is not an easy task and may take several years (Thompson et al. 2003). Baylor and Ritchie (2002) stated this relation as follows: "Regardless of the amount of technology or its sophistication, technology will not be used unless faculty members have the skills, knowledge, and attitudes necessary to infuse it into the curriculum" (p. 398). Integration of technology to instruction requires a more sophisticated set of skills than one can easily think. In this regard, Mishra and Koehler (2006) proposed the technological pedagogical content knowledge (TPCK) framework that suggests the correct use of technology to teach the content with proper pedagogical approaches. In other words,

just knowing how to use a technology would not guarantee successful technology integration in every context of instruction. They simply indicated this as follows: “there is no single technological solution that applies for every teacher, every course, or every view of teaching” (p. 1029). This suggests that teachers need to have sufficient technology, pedagogy, and content knowledge in order to benefit from technology in school settings.

Teachers’ comfort and confidence level of using computers and related technologies are very important to ensure student engagement during the learning process in a technology enriched classroom (Christensen 2002). Therefore, their teaching experiences need to be enriched with the current technology otherwise, use of computers in classrooms will be limited (Lim and Khine 2006). For instance, according to studies conducted by Becker (1994) and Sheingold and Hadley (1990), teachers do not use computers effectively in their teaching in the beginning of their career, and it takes more than 5 years for them to become comfortable with the computer use. Thus, new methods and environments need to be designed and tested to figure out how to motivate teachers to use laptop computers in their teaching. In this way, they will “understand the precise role of technology so that they can effectively cope with the pressure created by continual innovation in educational technology and tensions to prioritize the use of technology” (Teo et al. 2008b, p. 266).

Teachers’ technology training has been accepted as another factor that influences the attitudes and use of technology in the classroom (Christensen 2002; Yildirim and Kiraz 1999; Yildirim 2000; Yusuf and Balogun 2011). Training is a need for every type of teachers because “it requires them to learn how to use the technology and reconsider their approach to teaching” (Thompson et al. 2003, p. 74). For example, senior teachers may not have the aforementioned sufficient technology use experience. Thus, they need to be trained on technology use, before expecting such technology integration. In addition, young teachers may have some level of skills in technology, but they still need to follow current technology, and explore methods that benefit from technology in their fields. Most of the teacher education programs have a lack of adequate technology related courses (Kumar and Kumar 2003; Willis and Mehlinger 1996; Rogers 2000) if teachers do not improve themselves on technology use, their attitudes towards technology use in a classroom setting may be affected negatively (Ropp 1999), and they may be hesitant to use technology. In terms of laptop use, apart from proper curriculum design, teachers’ training via professional development programs are very essential to ensure high benefit in schools (Cervantes et al. 2011).

Technology training can be conducted in two ways for teachers. First, they can be provided courses on technology use in formal or informal ways—such as laptop computer or smart board use in the undergraduate programs (Peña-López 2010). As a second way, teachers can improve themselves in classroom settings by trying new teaching techniques that are combined with a proper technology—such as mobile devices. It is important to note that new teachers may not be skilled to integrate technology in classroom settings (Kumar and Kumar 2003; Yusuf and Balogun 2011), even if they have confidence in using technology in their daily lives. The main reason for this contradiction could be not practicing technology use during their field experiences (Thompson et al. 2003). Hence, it is essential to pilot technology use in teaching with pilot courses before and during the teaching career. Employing professional development programs could be helpful for in service teachers to improve and transfer their technology skills to their teaching in correct and fruitful ways (Levin and Wadmany 2008; Schoepp 2005).

Apart from technology courses in teacher training programs, preservice teachers can be asked to integrate personal technology skills when completing coursework in other subjects (Lee and Lee 2014). For example, Kumar and Kumar (2003) conducted a research with 31 preservice and in service teachers who were enrolled in a Special Education course to

investigate their attitudes towards computers. In the study, participants were supposed to complete a web-based project as a course requirement. The results showed meaningful increase in teachers' attitudes even though the course subject was not directly related to technology. This shows us that technology skills can be practiced with other subject areas to increase the confidence level of teachers technology use. In another study by Vannatta and Fordham (2004), technology training was found as one of the three key factors to predict K-12 teachers' classroom technology use. In a similar vein, Yildirim (2000) noted that teachers' attitudes to include computers in teaching are positively related to their daily computer use.

When teachers have some prejudices or negative practices with technology use, it causes negative attitudes, and a limited use of technology in classroom settings. In other words, teachers usually have an excuse for not integrating technology in their teaching. These excuses may change teacher to teacher or condition to condition. Rogers (2000) emphasizes the reasons of inadequate use of technology as follows:

Barriers to successful technology adoption appear to have internal and external sources. Internal barriers may be summarized as "teacher attitude" or "perceptions" about a technology. External sources include the availability and accessibility of necessary hardware and software, the presence of technical personnel and institutional support, and a program for staff development and skill building (p. 459).

It is the administrators' responsibility to provide, free, proper technical devices and support to teachers and students to integrate technology into instruction adequately. Especially, using emerging technologies, such as laptops, in schools raise the issues related to teacher attitudes (Rogers 2000) because teachers may have anxiety when using new devices. Training sessions or pilot practices could be organized in order to remove such barriers. In addition, in terms of laptop use in the classroom, the teacher is the first person that is supposed to scaffold students to troubleshoot any potential issues (Cervantes et al. 2011). Therefore, "By helping faculty better integrate the technology, and by responding to student requests for more choice, the value of the computer to student academic experience is likely to be enhanced even further" (Demb et al. 2004, p. 400).

## 2.2 Mobile Devices in Education

As with other technologies, mobile devices, such as laptops and tablets, have been integrated in education. Kay and Lauricella (2011) stated three reasons for the increase in using laptops in classrooms, including technology skills of today's students, affordance of emerging devices and widespread wireless Internet connections. Cervantes et al. (2011) described laptops as "an auxiliary tool to capture students' attention, create supporting material for difficult subjects, and help students produce higher quality work" (p. 950). Laptops have many advantages in nature, which makes them suitable for schools settings even in large classes (Barak et al. 2006). These portable devices mostly provide multiple connection features to users with low cost (Houser et al. 2002). That is, they can be easily transferred from one location to another, used by multiple users and connected to Internet and other devices. Apart from being mobile, laptops usually have full functionality as regular computers. Hence, they can be easily integrated into instruction. Cervantes et al. (2011) noted that teachers' interests and skills have an important role in benefiting from laptops in school settings. In addition, teachers need to manage the learning environment and the curriculum in the classroom where laptops are used as an educational device (Windschitl and Sahl 2002) because "laptops will change the learning environment, and in particular the classroom settings and activities" (Barak et al. 2006, p. 246).

There are several research studies that investigate laptop use in school settings. For instance, in a study by Demb et al. (2004), most of the students reported that using laptop computers had a significant role on their study behaviors and academic success. In another study, Kay and Lauricella (2011) studied structured and unstructured laptop use in classrooms. They found that students tend to use laptops for academic related tasks—such as note-taking. As aforementioned, laptops are portable devices and can be used in traditional classroom settings to increase the learning success. Barak et al. (2006) reported in their study that students preferred using laptop computers when compared with desktop computers in the lab. There are some other studies that compare laptop classrooms with non-laptop classrooms. For example, Trimmel and Bachmann (2004) found that students who used laptops in the classroom had greater participation, interest and motivation during the instruction when compared to students in a non-laptop classroom.

There are also some types of laptops, which have some special ways for use. Chromebooks can be given as an example of laptops that are produced for particular use—they are affordable and useful mobile devices, which are very suitable for classroom settings. Their main distinction from regular laptops is being cloud based. That is, it is dependent on the Internet connection thereby employs cloud services. In other words, it requires an Internet connection in order to be operated with full functionality. Mainly, it uses the Internet connection to run programs or access files. This also makes Chromebook users meet online, share files and communicate mutually with its unique features. Because students are very familiar with web-based environments (Conole et al. 2008), Chromebook use may provide students numerous online opportunities for information access. It is important to note that new technologies, such as Chromebooks, require users to practice using new devices with their new features in order to become familiar with them so they can benefit from those for instructional purposes. The focus of the current study on teachers' use of laptops in educational settings led us to develop these research questions:

1. What is the relationship between teachers' years of experience, number of technological devices they have and their comfort level in teaching with technology?
2. To what extent did Chromebook integration change teachers' attitudes towards technology use?
3. What do teachers who used Chromebook laptops think about their instructional use of the laptops?

### 3 Methods

We used a mixed method to investigate whether teachers' experience and number of technological tools they have are associated with their comfort of teaching with technology. Also, we investigated how teachers' attitudes towards technology changed after laptop integration to their teaching, as well as what teachers thought about the laptop implementation in their schools.

#### 3.1 Participants

Samples for the study were collected from public schools located in Southwestern, United States. The instrument designed to investigate teachers' attitudes towards their technology use, years of teaching, types of technology they have, and their reflection on laptop use was

sent to 658 6–12 grade Mathematics and English teachers from 30 schools and 553 teachers completed the survey. We chose these schools because they distributed laptops to their 6–12 grade teachers and students to be used in their mathematics and English classes during the 2012–2013 school year. School principals reported that they chose Chromebooks over other tablets and laptops because it has superior features that other devices don't have. For example, they reported that Chromebooks have its own cloud option. So they don't have to worry about finding additional sites to direct their students to for resources, and saving and accessing files. Its internet connection, keypad, and affordability are other reasons the principals told they preferred it over iPad and other tablets.

### 3.2 Research Design

Although we planned to conduct pre-post design to measure teachers' attitudes towards technology use, the approval from the school administrators came very late. Therefore, we used retrospective post-then-pre design for the study. We asked participants what they believed they felt about their Chromebook use before and after it in the same question through Likert questions (see questions 1–12 in "[Appendix](#)"). According to Klatt and Taylor-Powell (2005), the retrospective design is a popular way to assess learners' self-reported changes in a measured construct including knowledge, awareness, skills, confidence, attitudes or behaviors. It is also less time-consuming and less intrusive. For self-reported change, it avoids pretest sensitivity and response shift bias that result from pretest overestimation or underestimation (Howard 1980; Rockwell and Kohn 1989; Pratt et al. 2000; Lam and Bengo 2003).

### 3.3 Data Collection and Management

First, we contacted each school's principal to get approval to carry out the study. We visited 40 campuses and got approval from 30 schools. Once we got the approval and received the support letter from schools, we applied for an IRB to conduct the study. After IRB approval, we prepared our online survey by using one of the online survey tools. We shared the link with the designated person given by each school principal. Student, teacher, and parent participants completed the survey during Spring 2013 semester. We checked response rates regularly. Participants were reminded biweekly in the 2-month period of their survey taking and 84 % of participants completed the survey. We stored the collected data on a jump drive and, to make it safe, we encrypted the file.

### 3.4 Instrument

We developed an instrument including both multiple choice, and open-ended questions. One of the things we wanted to measure was how teachers' attitudes towards technology use changed, a teacher attitude towards technology instrument was used to measure that. The 12-question survey "Computer and E-mail Use" incorporated questions from the "Faculty Attitudes towards Information Technology" (FAIT) created by the Texas Center of Educational Technology (1998) and the "Electronic E-mail Questionnaire" created by M. Lynne Markus (1987). We also asked how long teachers have been in the teaching profession, the types of technology they have used personally, and how comfortable they are teaching with technology. High instrument reliability for the twelve items was estimated using a calculation of Cronbach's alpha ( $\alpha = .929$ ).



### 3.5 Data Analyses

We used the Pearson product moment correlation and paired-sample t-tests to analyze the quantitative part of the study. The qualitative part was analyzed by using the phenomenological method suggested by Colaizzi (1978) because the method might be useful to “obtain an overall feeling for them” (Creswell 2007, p. 270). This might enable us to see easily what the participants point out as general patterns. Initially, perspectives of teachers were gathered. After getting the whole transcripts, we open coded by reading the transcripts several times to have significant statements. Teachers’ voices were formulated through significant statements. By looking at these formulated perspectives and voices, fundamental themes showing participants’ overall feeling in Chromebook usage emerged.

## 4 Findings

### 4.1 Research Question 1

We found that teachers’ years of experience are not correlated with their comfort level of teaching with technology ( $r = .003$ ). However, the number of technological devices teachers have are significantly correlated with their comfort of teaching with technology ( $r = .110$ ,  $p = .012$ ) (see Table 1).

### 4.2 Research Question 2

We ran a paired-sample t-test to examine whether teachers’ attitudes towards technology changed after the first year of laptop implementation at the schools. We found that the decrease in the teachers’ attitudes towards technology use was statistically significant ( $t(407) = 5.423$ ,  $p = .001$ ) after they taught with a laptop for a year (see Table 2). Although the effect size is relatively small (Cohen’s  $d = 0.27$ ) according to Cohen’s

**Table 1** Relationships between year of teaching experience, number of technological devices teachers have and their comfort of teaching with technology

	Comfort teaching with technology	# of tech device	Years of experience
Comfort teaching with technology			
Pearson correlation	1	.110*	.003
Sig. (2-tailed)		.012	.941
N	518	517	507
# of tech device			
Pearson correlation	.110*	1	.024
Sig. (2-tailed)	.012		.580
N	517	552	540
Years of experience			
Pearson correlation	.003	.024	1
Sig. (2-tailed)	.941	.580	
N	507	540	541

\* Correlation is significant at the 0.05 level (2-tailed)



**Table 2** Teacher attitude towards technology change after teaching A-year with laptop

	Mean	SD	N	<i>T</i>	Df	Sig. (2-tailed)
Teacher attitude Pre	3.705	.585	408	5.423	407	.000
Teacher attitude Pos	3.459	.881	408			

(1988) benchmarks, the way effect sizes are interpreted might sometimes be problematic because it is not generally interpreted within the frame of a given unit of examination. Therefore, smaller effects for groups of people may be more notable than equivalent effect sizes for individuals (Thompson 2008).

Apparently, when pre-test and post-test results were compared, the mean attitude of the participants toward technology use has significantly decreased after the instructional use of Chromebooks from 3.705 to 3.459. However, as stated above, when we evaluate the effect size within the frame of a given unit of examination, there might be several reasons to elaborate the significant decrease in the attitudes such as teacher's present negative attitudes to technology use, insufficient training, lack of technical support, etc.

### 4.3 Research Question 3

We qualitatively examined teachers' Chromebook laptop experience and what they thought about the implementation of the laptops. From verbatim transcripts of teachers, 35 significant statements were obtained. After the formulated meanings were arranged into clusters, 2 main themes and 7 sub-themes resulted.

### 4.4 Theme 1: Concerns

Chromebook usage in teaching and learning stimulated teachers in having some concerns about the efficacy of its usage in education. Through the verbatim transcripts, teachers' concerns generally consisted of 4 sub-themes restrictions, disappointment, technological problems, and distractions.

#### 4.4.1 Restrictions

As one of the vital concerns, restrictions applied in using only suggested programs in Chromebooks drew the reaction of teachers. Quite remarkably, the following description "carrying paperweights" used usually by teachers showed the magnitude of the situation. A teacher explain it in detail:

...At the beginning, Chromebook usage engaged my students and their learning on a daily basis. However, once all the websites were blocked, the Chromebooks became completely useless and were never usable in my class. All of the websites and apps necessary to make an engaging class were blocked from the students and the Chromebooks became an unusable paperweight.

Teachers expected that the use of Chromebook would help students learn better. However, the statements of the participants illustrated that restrictions in Chromebooks hindered the process of learning. A teacher stated the adversity of doing research with Chromebooks with the following expression: "I found it incredibly frustrating that students

could not use the Chromebooks for research because everything is blocked.” Another teacher mentioned the disadvantage of the restrictions as follows: “The Chromebook is good, but there are limitations. Students are blocked from so many sites that when we do research, it is hard to find the information we may be looking for.” Quite obviously, teachers felt that restrictions applied in Chromebooks hindered doing research so that Chromebooks became insufficient to contribute in the process of learning.

#### *4.4.2 Technological Problems*

Another sub-category of the first fundamental theme, concerns, due to technological problems arising in Chromebooks throughout the semesters. Teachers highlighted that Chromebooks had some tech problems that generally thwarted the works they were doing. A teacher declared the following problem, “It was impossible to make the Chromebook compatible with a printer, and many assignments were required to be printed. The Chromebook was very fragile and would constantly fall apart.” Another teacher focused on the operator of Chromebooks and said, “The wireless system (the routers or cables) is SLOW, too SLOW. Every time we have MAP testing, wireless SLOWS down too much.”

By the same token, teachers also criticized the repair duration when Chromebooks were broken because it had an impact on classroom climate. A teacher stated, “Too many students have broken or non-working Chromebooks causing class disruptions because they are out of service for so long.”

#### *4.4.3 Distractions*

In this sub-theme, teachers felt that Chromebooks brought distractions to the students. They noticed that they can easily unblock and hack them and spend more time on entertainment rather than education. One of the teachers criticized this by comparing with the previous system when paper was being used with the following expression:

...I would love to go strictly paperless in my classroom, but I find the technology distracting for my students. When I assign work online, I have more zeros or incomplete work than when I use paper. I find it easy to use, distribute and grade assignments online but students reject the use of technology in this way.

Another teacher also stated, “I think the students were too distracted by temptations to use the Chromebooks for other “social” purposes.”

The aforementioned statements clearly illustrate that teachers did feel that Chromebooks were more likely to distract students from educational works, and to attract students to the entertainment.

#### *4.4.4 Disappointment*

With the aforementioned concerns, teachers also felt that Chromebooks caused disappointment in using them in education. They used to expect Chromebooks to be really helpful in improving students’ learning; however, Chromebook did not meet their hopes suitably. Teachers were disappointed because of the shortcomings of the Chromebooks—such as restrictions, tech problems, etc. One teacher underscored this as follows: “I feel like the Chromebooks could’ve been such a beneficial tool in my classroom. However, the students weren’t able to fully utilize the devices to the extent they could’ve been used because of internet restrictions.” One of the teachers also said, “What could have been a

really great tool for students to use in their class ended up becoming a useless, distracting tool.” Another teacher expressed the disappointment with the statement below:

...When we trained on the use of the Chromebook, we were really excited about all the possible uses and believed that the students would really enjoy using them. We talked about the possibility of going green in the classroom. However, there are so many restrictions on how the students can use it that both teachers and students are disappointed and we are no longer enthused about them.

## 4.5 Theme 2: Recommendations

Participants in the study not only highlighted their concerns of Chromebook usage in education, but also offered some recommendations that are valuable for the future applications of Chromebook or any technological tool for educational purposes. Recommendations made by the teachers revealed three sub-themes, including careful monitoring, proper training and not blocking but filtering.

### 4.5.1 Careful Monitoring

One of the recommendations made by teachers was to provide careful monitoring. Participants believed that to be able to use Chromebooks for educational purposes efficiently, monitoring the usage of Chromebooks prudently was an essential intervention in both the schools and homes. A teacher stated the need for careful monitoring as follows: “I like the Chromebooks in the classroom. I believe it can do a lot of great things for the students and their education, but monitoring student use needs improvement.”

Teachers also focused on net support system for proper monitoring of Chromebooks usage during class. One of them explained it in detail, “The net support system needs to be better refined to monitor student Chromebook use. Chromebook wireless access should automatically connect to teacher’s net support software for immediate monitoring of student’s Chromebook use without having to have students manually enroll.”

### 4.5.2 Proper Training

Another vital recommendation made by teachers was to provide proper training before allocating Chromebooks to students. One of the teachers made the following recommendation regarding proper training: “I would recommend more thorough and robust training.” One teacher expressed inadequate training as a major problem:

...There has been one major problem with the Chromebook roll out. There was absolutely no training for my department on how to use them. We had a short, 1 h or so, seminar on what the Chromebooks were capable of doing but not a single minute on how to actually do it.

Another teacher mentioned the need for sufficient training for two purposes, as follows: “I think there should be more training for teachers, and students on proper and improper use and Internet safety.”

#### 4.5.3 Not Blocking but Filtering

As the final recommendations, teachers agreed that there should be an appropriate filtering system rather than blocking the entire internet system which obstructs searching even educational websites. One teacher stated: “I could not have a functional website because of the blocking situation. We need to implement a filtering system rather than blocking everything.” Teachers generally did want the filtering system rather than the blocking system. Another teacher complained of blocking and highlighted the need for filtering rather than blocking as follows:

...The use of the Chromebook would have been much more effective if everything had not been blocked. I could not communicate with the students because of the blocking and they could not communicate with me for the same reason. I could not send them handouts or information either because of that same reason. I could not have a functional website because of the blocking situation. We need to implement a filtering system rather than blocking everything.

### 5 Discussion

Because mobile technology has become so pervasive in children’s lives, use of it for teaching and learning has become a must. In this study, we first aimed to examine the relationship of teachers’ years of teaching experience and number of tech devices they have being related to teachers’ comfort of technology use in their instruction. Also, we studied whether teachers’ attitudes towards technology use in their teaching changed after they taught a year with Chromebook laptops, as well as teachers’ experience regarding their use of Chromebooks. We found that teachers’ years of teaching were not related to teachers’ comfort of teaching with technology, whereas the number of technological devices teachers had, significantly correlated with their comfort level of teaching. The second question yielded an interesting finding where teachers’ attitudes towards technology use significantly decreased after teaching it for a year. The final qualitative section resulted in restrictions and recommendations of teachers.

Although teachers’ experience is an important variable in teachers’ teaching and students’ learning (e.g., Darling-Hammond and Sykes 2003; Sahin 2008, 2015), it may not be a positive contributor when it comes to technology integration to education. We found that teachers’ years of teaching are not correlated with their comfort of teaching with technology. This might be the case because teachers with more years of teaching experience might be resistant to change, where they will have to learn new technological tools to integrate in their teaching, which is a challenge. These result echo the study of Ertmer et al. (1999). They indicated in their study that “changes in classroom practices will not occur simply because computers are more available in the classroom” (p. 55). Indeed, research says that successful technology integration is related to teachers’ willingness or openness to change (Baylor and Ritchie 2002). On the other hand, teachers’ experience might be a positive factor for teachers with more years of teaching because experienced teachers are the ones who are ready in terms of pedagogy and content, thus their transition to technology integration might be easier for those with less years of experience (Cervantes et al. 2011).

Mobile devices, including smart phones, tablets, and laptops, have become indispensable parts of today’s people; especially for the younger generation. Each and every person

in today's age has multiple devices. We found that the number of technological devices teachers had significantly correlated with their comfort level of teaching. Therefore, it is reasonable to say that teachers with more mobile device experience might be more comfortable with integrating technology in their teaching because they are familiar with the tools (Dasdemir et al. 2012; Uzoglu and Bozdogan 2012). This familiarity may speed up the teachers' transition from traditional teaching to technology-integrated teaching as Cervantes et al. (2011) noted, that teachers' technical and pedagogical readiness has an impact on changing instruction in classrooms.

While everybody agrees on the necessity of integration of technology in teaching and learning, some teachers may have problems using technology in their teaching due to their negative attitudes (Lee and Lee 2014; Teo et al. 2008a, b). For the second question, we found that teachers in our study developed negative attitudes towards technology use after teaching with a Chromebook laptop for a year. More specifically, their attitudes towards Chromebook integration has changed to negativity. We know that teachers' technology use is related to their attitudes (e.g., MacArthur and Malouf 1991; Teo et al. 2008b). Our finding is parallel with Rogers' (2000) research where it was noted that teachers may develop negative attitudes when there are some personnel and/or institutional problems present. As mentioned in the research, this may be related to insufficient training, lack of technical support and/or policies (Demb et al. 2004). Ertmer (1999) explained aforementioned issues as the first-order barriers in technology integration. In this case, it seems that teachers' attitudes changed due to school administration's inconsistent policies and unprepared attempt.

It was important to utilize the qualitative part to this study so we could see why the implementation of laptop computers was successful or insufficient from the teachers' experience perspective. Teachers' answers revealed that they had some challenges during the first year implementation of the Chromebook laptops that led them to provide some suggestions to improve the quality of the implementation. They had problems with a variety of restrictions to lack of proper technical supports. Insufficient rules and policies allowed students to be distracted with the Chromebook laptops. Because of too many restrictions, lack of proper technical support and weak planning, both teachers and students felt disappointment. These findings are also congruent with research where Rogers (2000) defines these problems as external ones, including "...the availability and accessibility of necessary hardware and software, the presence of technical personnel and institutional support, and a program for staff development and skill building." (p. 459) Although these problems seem pretty well known, lack of fixes caused unpleasant educational outcomes, as happened in this example. Finally, teachers seemed to be part of a solution. Therefore, they provided some recommendations for their schools to improve the implementation. Teacher transcripts revealed that monitoring student use rather than blocking everything was one of their suggestions. They also stated the importance of better and proper teacher and student training before their implementation of Chromebook laptops as a solution to the problems they experienced during their first year (Ekmekci et al. 2015). Teachers' suggestions were parallel to Schoepp (2005)'s study. These are all known and studied factors that help schools and teachers integrate technology better (Christensen 2002; Yildirim and Kiraz 1999; Yildirim 2000; Yusuf and Balogun 2011). Therefore, it is important to learn lessons from other implementation practices not to make the same mistake twice.

## 6 Implications and Limitations

It is obvious that portable devices, such as laptops, tablets, and smartphones, have started playing important roles in our daily lives, and their integration to education has emerged as a common and must use way for K-16 level education. They have very unique features that may facilitate learning and teaching practices in schools when the integration process is planned well. However, user groups (students and teachers) may face some issues when using laptops. Hence, benefit levels of such devices is more likely to decrease. As mentioned above, it is very important to train, and prepare users before they are asked for a new type of technology use. Otherwise, it may take some time to overcome potential barriers while using the device, such as a Chromebook. For example, students and the teacher may be asked to meet for some informal class sessions to pilot the use of laptops in the classroom. If they are faced with issues in these pilot sessions, school staff could solve them ahead of implementation. Also, mobile device use in education is very popular and was tried in many different school environments. Therefore, any educational institutions that plan to integrate technology, including laptops, should study their lessons and learn from other examples before they implement those in their schools. The learning environment would then be ready for laptop use.

Although this study investigates teachers' attitudes change towards technology use, potential barriers of using laptops in the classroom settings, and how teachers' years of teaching experience and number of tech tools they have are related to their comfort of teaching with laptops, study results need to be interpreted while considering several limitations:

1. Because this study utilized retrospective post-then-pre design to measure teachers' attitudes towards technology use, pretest sensitivity and response shift bias might result from pretest overestimation or underestimation and might have been avoided. The retrospective design is another proper way to measure learners' self-reported changes (Klatt and Taylor-Powell 2005).
2. We did not control the kinds of technologies teachers used before the Chromebook technology integration, and this might have had some influence on students' attitudes toward Chromebook integration.
3. Chromebooks were only used in Mathematics and English classes in the schools we have studied. Integrating Chromebooks in other subjects might shed more light on how teachers' attitudes change by those subjects. Comparison of Chromebooks integration with regular laptop usage or iPad could deepen our understanding of the difference among the use provided by these different technology tools.

## Appendix: Teacher Attitudes Towards Technology

Please read each statement and then circle the number which best shows how you feel.

1	2	3	4	5		
D=Strongly Disagree	D=Disagree	U=Undecided	A=Agree	SA=Strongly Agree		
1	I think that working with technology would be enjoyable and stimulating. Before Chromebook was distributed. After Chromebook was distributed and used.	1	2	3	4	5
2	The use of technology makes the student feel more involved. Before Chromebook was distributed. After Chromebook was distributed and used.	1	2	3	4	5
3	The use of technology helps provide a better learning experience. Before Chromebook was distributed. After Chromebook was distributed and used.	1	2	3	4	5
4	The use of technology makes the course more interesting. Before Chromebook was distributed. After Chromebook was distributed and used.	1	2	3	4	5
5	The use of technology helps the student to learn more. Before Chromebook was distributed. After Chromebook was distributed and used.	1	2	3	4	5
6	The use of technology increases motivation for the course. Before Chromebook was distributed. After Chromebook was distributed and used.	1	2	3	4	5
7	More courses should use technology to disseminate class information and assignments. Before Chromebook was distributed. After Chromebook was distributed and used.	1	2	3	4	5
8	The use of technology creates more interaction between students enrolled in the course. Before Chromebook was distributed. After Chromebook was distributed and used.	1	2	3	4	5
9	The use of technology creates more interaction between student and instructor. Before Chromebook was distributed. After Chromebook was distributed and used.	1	2	3	4	5
10	Technology provides better access to the instructor. Before Chromebook was distributed. After Chromebook was distributed and used.	1	2	3	4	5
11	Technology is an effective means of disseminating class information and assignments. Before Chromebook was distributed. After Chromebook was distributed and used.	1	2	3	4	5



- |    |   |   |   |   |   |   |
|----|---|---|---|---|---|---|
| 12 | I prefer using technology to traditional class handouts as an information disseminator.<br>Before Chromebook was distributed.<br>After Chromebook was distributed and used. | 1 | 2 | 3 | 4 | 5 |
|----|---|---|---|---|---|---|
- 13    How long have you been in the teaching profession?
- 1-5 years  
6-10 years  
11-15 years  
16-20 years
- 14    How comfortable are you in teaching with technology?
- Extremely uncomfortable  
Not very comfortable  
Comfortable  
Very Comfortable  
Extremely comfortable
- 15    What types of technology do you have for your personal use?
- Tablet (iPad, etc.)  
Smart phone  
Laptop  
PC  
Others

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