THE IMPACT OF DIRECT DETERMINANTS OF TECHNOLOGY ACCEPTANCE ON BEHAVIORAL INTENTION TO USE AND ACTUAL USE OF CHROMEBOOKS IN THE ELEMENTARY CLASSROOM

A Thesis Presented to the Faculty
of
California State University, Stanislaus

In Partial Fulfillment
of the Requirements for the Degree
of Master of Arts in Education

By
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February 2018

CERTIFICATION OF APPROVAL

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Dr. Dawn Poole Professor of Educational Technology	Date
Dr. Oddmund Myhre Dean, College of Education, Kinesiology, and Social Work	Date

DEDICATION

I lovingly dedicate this work to my wonderful parents, both of whom have sacrificed so much to allow me and my siblings to succeed in our professional and personal endeavors. Your hard work and sacrifices throughout the years are my inspiration.

ACKNOWLEDGEMENTS

I was certainly aware that completing a Master's program would not be an easy feat for me when I decided to begin my journey. This journey would have definitely been short-lived had it not been for amazing people helping me along the way. First and foremost, I would like to thank my dear parents and my wonderful siblings. You have been pillars of strength for me throughout my life, and I thank every single one of you for your emotional support and encouragement throughout this process.

I would also like to thank the district administration and staff for their assistance and contributions in order to get this project off the ground.

Finally, I would like to express my deepest gratitude to Dr. Dawn Poole. You have been exceptionally helpful and encouraging since the first time I contacted you for information about the program. Your patience and understanding during difficult times in my personal life were very much appreciated. You, along with the rest of the Educational Technology department staff and faculty, are the main reason why this paper finally came to fruition. Thank you for all your help, encouragement, and support.

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ABSTRACT

Research suggests that technology integration can produce significant gains in academic settings, but acceptance and use of emerging technologies continue to be a challenge for school officials and administrators. This study utilized a modified Unified Theory of Acceptance and Use of Technology (UTAUT) survey to gather data that examined the impact of seven direct determinants of technology acceptance on behavioral intention to use and actual use of Chromebooks in the elementary classroom. The results from multiple regression analyses indicated the seven direct determinants were not statistically significant predictors of behavioral intention or of actual use. A new multiple regression analysis was conducted using only the four direct determinants that were found to be significant in previous research. The results returned significant *p* values for both behavioral intention and actual use. However, the coefficient factor results did not return significant values. Results, limitations of the study, and recommendations for future research are discussed.

CHAPTER I

INTRODUCTION

As technology evolves, it is imperative for educators to maintain their technological skills and knowledge relevant to the ever-changing educational environment. The Elementary and Secondary Education Act of 1965, considered the nation's national education law, has been reauthorized by Congress twice since its inception in the form of the No Child Left Behind Act of 2002 and the more recent Every Student Succeeds Act (ESSA) of 2015. Section 7119 of ESSA ("Activities," 2015) outlines the use of funds in support of effective use of technology, which includes providing educators with the necessary training, tools, and resources in order to personalize learning, encourage collaboration, and improve student academic achievement.

The nonprofit organization International Society for Technology in Education (ISTE) has provided a framework, known as ISTE Standards for Educators (2017). Under these standards, educators take on different roles including that of designer. Under the role of designer, educators design authentic, learner-centered classrooms that recognize and accommodate learners' various learning styles. Educators also design personalized learning experiences, foster independent learning that aligns with content area standards, and use digital tools and resources to maximize their students' learning experience.

The need for personalized learning technologies in the education system has led private technology enterprises to get involved in the educational technology market. Google Inc. is no exception. On June 15, 2011, Google introduced both the Chromebook as well as a management console for IT departments (Upson & Pichai, 2011). The Chromebook, which is supported by Google and its partners, is a notebook computer that runs on the Chrome operating system. Google provides the digital ecosystem and the software, while third-party vendors provide the hardware (Chromium OS FAQ, n.d.). Out of 12.6 million mobile devices purchased by schools in the United States in 2016, Chromebooks accounted for 58% of the purchases (Wingfield & Singer, 2017).

An interest in providing personalized learning experiences has driven educators, private enterprises and government officials to pave the path for successful technology integration in the classroom. Continuous advances in technology will inevitably permeate educational environments, and it is up to educators, administrators, and stakeholders to ensure technology is used and integrated effectively in the 21st century classroom.

Statement of the Problem

Technology integration in the classroom is a priority for a small school district near Sacramento, California as reflected in the district's Technology Vision Statement, the 2016-2017 Technology Plan, and the School Board's Strategic Plan. Technology integration, supported by sustained job-embedded professional development, has been shown to produce significant gains in academic settings

(Blanchard, LePrevost, Tolin, & Gutierrez, 2016; Koh, Chai, & Lim, 2017). Unfortunately, technology resistance in educational settings continues to be a barrier for technology integration and a challenge for administrators. Factors found in the literature that would explain either user acceptance or resistance to using technology for instruction include school size (Wu, Hsu, & Hwang, 2008), fear and anxiety (Jarrett, 2004), attitudes toward technology (Legris, Ingham, & Collerette, 2003), perceived usefulness and perceived ease of use (Davis, 1989), continuous training and support (Mayya, 2007), and self-efficacy (Albion, 1999; Wang, Ertmer, & Newby, 2004).

At the start of the 2017-2018 academic year, the district implemented a one to one Chromebook initiative in grades three to eight. Every classroom within those grades has enough Chromebooks for every student enrolled. Yet it would not be hard to imagine finding classroom sets of these mobile devices sitting mostly untouched in $1,500 mobile device carts. When the cost of the Chromebooks is factored in, equipment worth approximately $9,000 can potentially sit underutilized in some classrooms. Meanwhile, in other classrooms, teachers seem to have fully embraced these Internet-connected devices in order to transform learning. What, then, are the direct determinants of acceptance and use among those who embrace emerging technologies?

Venkatesh et al. (2003) stated that before technologies can improve productivity, they must first be accepted and used by employees in the organization. In their study, the authors aimed to formulate a unified model of acceptance and use

known as The Unified Theory of Acceptance and Use of Technology (UTAUT). The UTAUT model was validated with original data and was found to outperform the eight individual models and theories that are integrated within UTAUT with an adjusted R^2 of .69. It was then cross validated with data from two new organizations and was able to account for 70% of the variance in user intention (Venkatesh et al., 2003). Due to the effectiveness of UTAUT's predictive power, this study aimed to extend the UTAUT model to the K-8 system to see how well it fits in a district expanding its one to one device program. The purpose of this study was to examine the impact of direct determinants of technology acceptance on behavioral intention to use and actual use of Chromebooks in the elementary classroom.

Significance of the Study

Venkatesh et al. (2003) posited that UTAUT can be useful to decision-makers and administrators who need to know the likelihood of acceptance of a new technology that is introduced in an organization. They further stated that understanding the key determinants of intention and use of new technologies will help administrators design professional development initiatives that focus on users who may be less likely than some of their colleagues to adopt or use new technologies.

In previous research, UTAUT has been used to study perceptions toward mobile services and technology (Koivimäki, Ristola, & Kesti, 2008), the influence of workplace social groups on intention to adopt technology (Eckhardt, Laumer, & Weitzel, 2009), the adoption of social media (Curtis et al., 2010), and computer use frequency in university freshmen (Verhoeven, Heerwegh, & De Wit, 2010). A search

for UTAUT studies related to elementary education in the ERIC database yielded extremely scarce results. In one study, Chen and Huang (2012) focused on intention to use mobile and wireless technologies in an outdoor education setting while in another, Ho, Hung, and Chen (2013) examined teacher behavior of adopting mobile phone messages as a parent–teacher communication tool. Since the literature on UTAUT applicability to the K-8 system was scarce, the intent of this study was to extend the UTAUT model to the K-8 system to see how well it fits within that setting.

Research Question and Hypotheses

How much do direct determinants of technology acceptance predict teachers' intention to use and actual use of Chromebooks in the classroom?

Hypothesis #1: There will be variation in the amount of influence each direct determinant has on teacher behavioral intention to use Chromebooks in the classroom.

Hypothesis #2: There will be variation in the amount of influence each direct determinant has on teachers' actual use of Chromebooks in the classroom.

Hypothesis #3: The influence of direct determinants of technology acceptance on behavioral intention to use Chromebooks in the classroom will be moderated by gender and experience.

Hypothesis #4: The influence of direct determinants of technology acceptance on actual use of Chromebooks in the classroom will be moderated by gender and experience.

Theoretical Framework

The UTAUT model integrates constructs from eight competing models or theories in order to arrive at a unified understanding of user acceptance. Therefore, in order to understand UTAUT, we must examine the eight models and theories included in the instrument. These are the theory of reasoned action (TRA), the technology acceptance model (TAM), the motivational model (MM), the theory of planned behavior (TPB), a hybrid model that combines TAM and TPB (C-TAM-TPB), the model of PC utilization (MPCU), the Innovation Diffusion Theory (IDT), and the Social Cognitive Theory (SCT) (Venkatesh et al., 2003). See Table 1 for an overview of these models and theories.

In total, there were 36 different items on the original UTAUT instrument stemming from the 8 models and theories. To account for the overlap in similarities found throughout the 36 items, Venkatesh et al. (2003) sorted the items into seven new factors. Four of the seven factors were found to be direct determinants of user acceptance and use behavior. These are performance expectancy, effort expectancy, social influence, and facilitating conditions. Three factors were theorized not to be direct determinants of intention. These are attitude toward using technology, self-efficacy, and anxiety. This study used the four core factors emphasized by Venkatesh et al. (2003) to be direct determinants of user acceptance and behavior as well as the three determined by the authors to not be as impactful in order to examine whether they influence the outcome of this study. See Table 2 for an overview of all seven factors.

Table 1
Models and Theories of Individual Acceptance

Model/Theory	Explanation
Theory of Reasoned Action (TRA)	TRA has been used to predict how individuals will behave based on their pre-existing behavioral intentions and attitudes. For example, it takes into account an individual's positive or negative feelings about performing a target behavior.
Technology Acceptance Model (TAM)	TAM was designed to predict information technology acceptance and use within an organization. This model focuses on perceived usefulness and perceived ease of use.
Motivational Model (MM)	MM deals with two classes of motivated behavior. Behavior performed in order to experience pleasure and satisfaction inherent in the activity rather than for an apparent reinforcement is known as intrinsic motivation. Performing behavior in order to achieve desired outcomes separate from the activity itself is known as extrinsic motivation.
Theory of Planned Behavior (TPB)	TPB is an extension of TRA that adds perceived behavioral control as an additional determinant of intention and behavior.
Combined TAM and TPB (C-TAM-TPB)	C-TAM-TPB is a hybrid model that combines TPB's predictors with TAM's perceived usefulness construct.
Model of PC Utilization (MPCU)	Adapted from the theory of human behavior, MPCU is useful in predicting individual acceptance and use of a range of information technologies in addition to PC utilization.
Innovation Diffusion Theory (IDT)	IDT explains how an idea or product spreads over time through a specific population or social system. The population or social system must perceive the idea, behavior, or product as new or innovative before adoption can happen.
Social Cognitive Theory (SCT)	SCT posits that learning occurs in a social context and that knowledge acquisition can occur through observing a model that demonstrates the behavior.

Venkatesh et al., 2003

Table 2
Direct Determinants of Technology Acceptance

	Definition
Performance Expectancy	
Perceived Usefulness	Degree to which individuals believe using a particular system would enhance their job performance.
Extrinsic Motivation	Perception that individuals want to perform an activity because it is perceived to be helpful in achieving desired outcomes.
Job-fit	How the capabilities of a system enhance an individual's job performance.
Relative Advantage	Degree to which using an innovation is perceived as being better than using its precursor.
Outcome Expectations	Separated into performance expectations (job-related) and personal expectations (individual goals), outcome expectations relate to the consequences of the behavior.
Effort Expectancy	
Perceived Ease of Use	Degree to which a person believes that using a system would be free of effort.
Complexity	Degree to which a system is perceived as relatively difficult to understand and use.
Ease of Use	Degree to which using an innovation is perceived as being difficult to use.
Social Influence	
Subjective Norm	Individuals' perception that most people who are important to them think they should or should not perform the behavior in question.
Social Factors	Individuals' internalization of the reference group's subjective culture and specific interpersonal agreements that they made with others, in specific social situations.
Image	Degree to which use of an innovation is perceived to enhance one's image or status in one's social system.

Table 2 (Continued)
Direct Determinants of Technology Acceptance

	Definition
Facilitating Conditions	
Perceived Behavioral Control	Reflects perceptions of internal and external constraints on behavior and encompasses self-efficacy, resource-facilitating conditions, and technology-facilitating conditions.
Facilitating Conditions	Objective factors in the environment that observers agree make an act easy to do including the provision of computer support.
Compatibility	Degree to which an innovation is perceived as being consistent with existing values, needs and experiences of potential adopters.
Attitude Toward Using Technology	
Attitude Toward Behavior	An individual's positive or negative feelings about performing the target behavior.
Intrinsic Motivation	The perception that individuals will want to perform an activity for no apparent reinforcement other than the process of performing the activity itself.
Affect Toward Use	Feelings of joy, elation, or pleasure; or depression, disgust, displeasure, or hate associated by an individual with a particular act.
Affect	An individual's liking of the behavior.
Self-efficacy	Judgement of one's ability to use a technology to accomplish a particular job or task.
Anxiety	Evoking anxious or emotional reactions when it comes to performing a behavior such as using a computer.

Venkatesh et al., 2003

Definitions

Blended Learning: A hybrid education model in which students receive instruction both online and in a supervised brick-and-mortar location away from home with some

element of student control over time, place, path, and/or pace (Horn & Staker, 2014).

Chromebook: Computing device that runs Google's Chrome operating system and relies on cloud applications and storage such as Google's G-Suite and Google Drive.

Differentiated instruction: A form of instruction that recognizes students have different ways of learning, different interests, and different ways of responding to instruction. Differentiated instruction involves offering students several project or assignment options in response to their specific learning styles (Ravitch, 2007).

Learner-centered classroom: A classroom in which students choose their own learning goals and activities based on their interests and needs. Students work on projects of their own choosing, and teachers are expected to adapt activities to their students' different learning styles (Ravitch, 2007).

One to one computing: An instructional concept where each enrolled student at a particular school receives an electronic computing device in order to access online digital content and coursework.

Technology acceptance: Also known as technology use (Davis, 1989) and technology adoption (Rogers, 2003), technology acceptance is a decision to make full use of an innovation as the best course of action available (Rogers, 2003).

Technology integration: The use of technology resources in daily classroom practices and in the management of a school such as supporting curricular goals and helping students to effectively reach their goals (Technology integration, n.d.).

Summary

Technology resistance in educational settings continues to be a barrier for

technology integration, but the need to provide students with personalized learning experiences and differentiated instruction gives educators the opportunity to rise to the challenge. Classroom technology is only effective when it is accepted and integrated into the curriculum by teachers who embrace the technology as an effective learning tool. Understanding the direct determinants of technology acceptance and use can help administrators gauge the likelihood of acceptance of new technologies among their teachers and allow them to design more effective professional development programs that use technology to improve student achievement. The purpose of this study was to examine the impact of direct determinants of technology acceptance on behavioral intention to use and actual use of Chromebooks in the elementary classroom.

CHAPTER II

REVIEW OF LITERATURE

The following two sections in the review of literature focus on common models and factors used to predict user acceptance of technologies. The first section examines the factors involved in teacher acceptance of technology based primarily on the technology acceptance model (Davis, 1989). The second section focuses on UTAUT-based studies carried out in academic settings with either teachers or students, or both, as part of the samples.

Teacher Acceptance and Use of Technology

Adiguzel, Capraro, and Willson (2011) examined teachers' acceptance of handheld computers using a modified technology acceptance model (TAM). The factors used in the modified TAM were perceived ease of use, perceived usefulness, subjective norms, intention to use, and dependability. Data were collected through an online survey distributed to 137 teachers, with a response rate of 33% or 45 participants. Common fit indexes were used to evaluate the overall fit of the modified model due to the small sample size. GFI = .992 (> .90), AGFI = .939 (> .80) and NFI = .974 (> .90) revealed an acceptable fit. Perceived usefulness had a statistically significant direct effect on participants' intention to use handheld computers (standard path coefficient = 0.49; $p < .01$). Perceived ease of use also had a statistically significant direct effect on participants' intention to use handheld computers (standard path coefficient = .42; $p < .05$). The direct effect of perceived

ease of use on perceived usefulness was significant (standardized path coefficient = .56; $p < .01$). Dependability had a statistically significant effect on perceived ease of use (standard path coefficients = .58; $p < .001$). The modified TAM accounted for a statistically significant amount of variance ($R^2 = .57$; $p < .001$) in participants' acceptance of handheld computers.

Yeni and Gecu-Parmaksiz (2016) studied pre-service special education teachers' acceptance and use of technology. A Structural Equation Model (SEM) was used to determine the TAM factors that affected participants' acceptance and use decisions. The sample consisted of 208 pre-service teachers enrolled in Marmara University's Department of Special Education in Turkey. The survey used in this study contained a total of 20 items related to perceived usefulness, perceived ease of use, behavioral intention, and subjective norm. The results indicated that perceived ease of use had a statistically significant impact on perceived usefulness ($r = .29$; $t = 4.51$; $p < .001$), perceived usefulness had a statistically significant impact on behavioral intention to use technology tools ($r = .38$; $t = 4.59$; $p < .001$), subjective norm had a statistically significant impact on perceived usefulness of technology tools ($r = .54$; $t = 7.23$; $p < .001$), and subjective norm had a statistically significant impact on behavioral intention to use technology tools($r = .39$; $t = 4.86$; $p < .001$). The overall model was significant ($\chi^2 = 401.01$; $df = 161$; $\chi^2/df = 2.49$; $p < .001$; RMSEA = .08)

Gyamfi (2016) also adopted TAM to examine factors that affect technology acceptance among pre-service teachers from Ghana. A survey was randomly

administered to 400 respondents with 380 usable responses returned. This study focused on pre-service teachers who were being trained to teach in elementary and middle schools since they made up over 75% of pre-service teachers in Ghana. The survey included items related to perceived usefulness (PU), perceived ease of use (PEU), attitude towards computer use (ATU), pedagogical beliefs (PB), and actual computer use (ACU). There were statistically significant and strong positive correlations between ATU and ACU ($r = .206$; $p < .000$), and PU and ACU ($r = .118$; $p < .021$). There were statistically significant but moderate correlations between PB and PEU ($r = .111$; $p < .031$); PB and PU ($r = .110$; $p < .033$), PU and ATU ($r = .109$; $p < .034$), PEU and ATU ($r = .106$; $p < .039$), and PEU and ATU ($r = .106$; $p < .039$). The author found a weak correlation between PEU and PU ($r = .098$; $p > .056$), which was inconsistent with the results of other studies based on TAM. The results indicated that PB of the pre-service teachers had a significant positive influence on both PEU ($\beta = 111$; $p < .031$) and PU ($\beta = 110$; $p < .033$).

UTAUT Model in Education

Kolog, Sutinen, Vanhalakka-Ruoho, Suhonen, and Anohah (2015) used the UTAUT model to determine students' behavioral intention to use an e-counseling system throughout Ghana's secondary education system. Ghana's secondary education is divided into three separate classes that take into account students' socio-economic status as well as their academic achievement. Class A is composed of affluent students with high academic achievement while, at the other end of the spectrum, Class C is composed of financially disadvantaged students who

underperform academically. Class B students are in between Class A and Class C students both academically and socio-economically. The authors randomly selected 250 students from all three classes from different high schools throughout the country. Data were collected through a survey with question items related to all the UTAUT constructs. Performance expectancy and social influence positively influenced students' behavioral intention to adopt and use e-counseling while facilitating conditions and effort expectancy had no effect on the same. The overall model was significant (F = 106.607; df = 243, 4; p. < .001; R = .797; R^2_{adj} = .63).

Van Schaik (2009) applied the UTAUT model to website use by students at a university in the United Kingdom. Two studies were carried out in order to explore the degree of acceptance of assigned websites versus user-selected websites through a non-experimental research design. In the first study, 118 students participated in the study as part of a course requirement. Using a UTAUT-based survey, participants rated both the homepage of the university's Virtual Learning Environment (VLE) and the university's library website with regard to their acceptance. The results showed that the VLE's mean acceptance outcomes were significantly higher than for the library website for behavioral intention, $t(117) = 5.89$, $p < .001$, $r = .48$; and actual use, $t(117) = 2.37$, $p < .05$, $r = .21$. The results also showed that the library website had a variance that was significantly greater than for the VLE for behavioral intention, $F(117, 117) = 3.37$, $p < .001$; as well as actual use, $F(117, 117) = 1.75$, $p < .01$.

In the second study, 121 students participated as part of a course requirement. None of these students participated in the first study. The school library website and two additional websites were presented to participants alongside a survey so participants could rate each of the websites with regard to their acceptance. The two additional websites were chosen by the participants. The author used the terms *goal mode* and *action mode* to describe the websites' mode of use. In goal mode, the website is "a means to an end." In action mode, using the website is the "end in itself." The results showed that intrinsic motivation was higher for the user-selected websites than for the assigned website. The websites used in action mode had the highest intrinsic motivation followed by the website used in goal mode. The assigned website had the lowest intrinsic motivation. A significant effect of website type on voluntariness of website use was found through an ANOVA, $F(2, 240) = 19.49$, $p < .001$, $\varepsilon^2 = .09$, for the library website and the goal mode website, $p < .01$, $r = .28$; for the library website and the action mode website, $p < .001$, $r = .50$; and for the goal mode website and the action mode website, $p < .01$, $r = .27$. An additional ANOVA showed a significant effect of website type on intrinsic motivation, $F(2, 240) = 108.87$, $p < .001$, $\varepsilon^2 = .31$, for the library website and the goal mode website, $p < .001$, $r = .67$; for the library website and the action mode website, $p < .001$, $r = .81$; and for the goal mode website and the action mode website, $p < .001$, $r = .35$.

Akbar (2013) used the UTAUT model as a theoretical framework to explore the factors that have an effect on students' acceptance and use of technology at Carnegie Mellon University's Qatar campus (CMUQ). Participants were recruited

via email and were able to participate if they met the acceptance criteria. Data were collected through surveys that were based on the original UTAUT model at three different stages during the semester. The first data collection (T1) was within one week from the introduction of the technology in the class and an initial training. At this stage, the data collected measured participants' reaction toward the new technology. Behavioral Intention results at T1 (N = 35) were residual standard error = 0.7001; R^2 = 0.9443; R^2_{adj} = 0.7296; F = 4.397; p = 0.02482. The second data collection (T2) took place four weeks after T1, and the third data collection (T3) took place four weeks after T2. The purpose for T2 and T3 was to measure participants' reaction after getting used to the new technology as well as their self-reported actual use. Behavioral Intention results at T2: residual standard error = 0.31; R^2 = 0.9852; R^2_{adj} = 0.9284; F = 17.32; p = 0.000355. At T3, residual standard error = 1.113; R^2= 0.9286; R^2_{adj} = 0.6531; F = 3.37; p = 0.05081. Use results at T2: residual standard error = 1.548; R^2= 0.2047; R^2_{adj} = 0.09863; F = 1.93; p = 0.1312. At T3; residual standard error = 1.495; R^2= 0.3147; R^2_{adj} = 0.2233; F = 3.444; p = 0.01975. The significant determinants of technology acceptance were effort expectancy, performance expectancy, attitude towards use, and facilitating conditions. A significant moderating influence was measured among all moderating variables except for experience. Behavioral intention was found to have a significant positive influence on usage.

Chen and Huang (2012) created a context-aware ubiquitous learning system (CAULS) composed of wireless networks, handheld devices, radio-frequency

identification (RFID) technology, and database technologies to explore student learning behaviors. Two Taiwanese elementary schools with a sizable indigenous population participated in this study. Participants, who included four teachers and 80 sixth grade students, were randomly assigned to the experimental group or the control group. A pretest (t = -0.635, p = .527, d = 0.142, $\hat{g}$ = 0.140), comprehension test (t = 0.099, p = .922, d = 0.022, $\hat{g}$ = 0.021), and post-test (t = 8.493, $p < .05$, $d > 0.8$, $\hat{g} >$ 0.8) were administered to both the experimental group and the control group. The experimental group received instruction using the CAULS at a museum that housed aboriginal artifacts, whereas the control group only received a tour of the museum without relying on the CAULS or electronic devices. An independent two-sample t test was used to evaluate the learning gains of the control group (74.75 ± 8.19) and the experimental group (87.50 ± 4.78), which exceeded that of the control group by 12 points. After the experiment was carried out, a UTAUT-based survey was used to measure participants' inclination to adopt or use the CAULS. The p values for performance expectancy, effort expectancy, social influence, and facilitating conditions were all under 0.01.

Ho, Hung, and Chen (2013) studied teacher adoption of a mobile phone messaging system as a communication medium for parent outreach. Data were collected using surveys sent by mail to elementary school teachers in Taiwan, 315 of whom returned usable responses. Data analysis under the UTAUT model resulted in perceived usefulness and subjective norms being significant determinants of behavioral intention (BI) to use the messaging system ($\beta = 0.350 < 0.563$, $p < 0.001$,

R^2 = 0.808); perceived ease of use did not influence BI. Perceived behavior control (β = 0.012, p = 0.894) and BI (β = 0.017, p = 0.072) were not significant determinants of use behavior (R^2 = 0.032).

Sundaravej (2010) used the UTAUT model to examine students' acceptance of Blackboard, a learning management system (LMS) used as part of a university course. A total of 262 students responded to a UTAUT-based survey, which was distributed after the LMS had been introduced to the students. Moderators such as age, gender, voluntariness, and experience were not included to avoid mitigating or amplifying the relationship between the independent and dependent variables. Effort Expectancy (EE), Performance Expectancy (PE), Anxiety (AX), and Self-Efficacy (SE) were statistically significant ($p \leq .01$). PE had the greatest effect on Behavioral Intention (BI) (β = .34). EE (β = .26), AX (β = -.21), and SE (β = .15) also had a significant effect on BI. Attitude and Social Influence (AT&SI) were not significant to BI (p = .64), and the coefficient for AT&SI (β = -.264) was not statistically significant in relation to EE, PE, AX, and SE.

Summary

The studies covered in this chapter reported results that were mostly consistent with each other. One exception was the Ho et al. (2013) study, which reported that behavioral intention was not found to be a significant determinant of actual use. The authors suggest that it may be because actual use behavior relates to school policies rather than teacher intention. Another exception was the Gyamfi (2016) study, where the author reported a weak correlation between perceived ease of

use and perceived usefulness. The author offered a possible reason for the inconsistency by suggesting that pre-service teachers adopted the technology primarily because of the functionality offered rather than the ease of use. Other than these two instances, the research suggests the models and factors used to predict participant acceptance of technologies are consistent across academic settings.

CHAPTER III

METHODOLOGY

This chapter includes information about the processes involved in carrying out this study as well as relevant information regarding participant and school district demographics. A description of the instrument used in this study as well as its validation process is summarized. Additionally, data analyses conducted to test the hypotheses are discussed.

Sample

This correlational study was carried out in a suburban school district east of Sacramento in California during the 2017-2018 fall semester. The district is composed of five elementary schools and two middle schools. District demographic data for the 2016-2017 academic year are included in Tables 3 and 4.

The district's Technology Vision Statement envisions an academic institution that utilizes technology to integrate problem solving, communication, and collaboration skills into its standards-based and student-focused learning environment (Technology vision statement, n.d.). Two goals from the district's 2016-2017 Technology Plan focus on teacher integration of technology. The outcome of one of these goals is to increase achievement in the California State Standards, while the other goal specifically focuses on technology-related professional development for administrators, teachers, and support staff in order to help students succeed academically and embrace 21st Century Skills. Additionally, the School Board's

Table 3
District Student Demographic Data, 2016-2017

	School						
	A	B	C	D	E	F	G
Ethnicity %							
White	71.2	73.9	71.1	89.3	73.5	62.0	80.2
Hispanic/Latino	12.3	13.8	16.0	7.7	25.6	29.7	14.6
Asian	8.1	5.3	6.0	11.5	0.2	1.6	1.8
Two or More	6.0	5.7	1.5	7.5	5.4	3.8	0.7
Other	2.4	1.3	5.4	2.4	2.1	2.9	2.7
FRPM %	5.4	5.6	9.2	4.9	19.9	35.1	27.1
Total Enrollment	782.0	457.0	463.0	549.0	574.0	445.0	446.0

California Department of Education, 2017b

California Department of Education, 2017c

Table 4
Credentialed Staff Demographic Data, 2016-2017

	School						
	A	B	C	D	E	F	G
Ethnicity %							
White	94.4	91.3	100.0	81.5	89.7	84.0	100.0
Hispanic/Latino	2.8	8.7	0.0	7.4	3.4	4.0	0.0
Asian	0.0	0.0	0.0	0.0	3.4	4.0	0.0
Two or More	0.0	0.0	0.0	7.4	3.4	8.0	0.0
Other	2.8	0.0	0.0	3.7	0.0	0.0	0.0
Gender %							
Male	27.8	8.7	8.3	14.8	27.6	12.0	13.6
Female	72.2	91.3	91.7	85.2	72.4	88.0	86.4
Av. Exp. In Years	15.0	14.0	14.0	16.0	18.0	17.0	17.0
Teaching Staff	36.0	23.0	24.0	27.0	29.0	25.0	22.0

California Department of Education, 2017a

Strategic Plan includes five guiding principles, one of which focuses on innovation and technology. This guiding principle envisions improvement in student achievement due to increased use of technology in the classroom as well as ongoing professional development for teachers (Board focus goals, 2015).

The district has hired three teachers on special assignment (TOSAs) who

provide one-on-one and small group training on technology integration. There are also three technology support specialists and one database support specialist, and one technology director who assist with the technical implementation and support of technology throughout the district. There are two district-wide professional development days per year in order to ensure teachers receive the necessary support for software they use on a regular basis. The district has access to Educator Effectiveness funds (EEF) and Title II, Part A funds, which are used for staff development efforts.

Participants of this study were selected from the 3rd to 8th grade teacher pool from across the district, all of whom participated in the Chromebook one to one implementation during the 2017-2018 academic year.

Methods

A modified UTAUT survey (Venkatesh et al., 2003) was created and distributed to the entire 3rd to 8th grade certificated teaching staff during the fall semester of the 2017-2018 academic year. Modifications to the survey included replacing the words "the system" to "Chromebooks" as well as adding additional items related to demographics and Chromebook usage. The survey was distributed via email and was active for two weeks. A reminder was sent via email two days before the survey was scheduled to close. Participation was voluntary. Participants were notified that they would be eligible to enter a drawing for one of six $50 Target gift cards in exchange for their participation. Funds for the drawing were made possible by a CSU Stanislaus graduate studies mini-grant. The names of six

participants were randomly selected as part of the drawing a week after the survey closed. This study was approved by the California State University Stanislaus Institutional Review Board as well as administrators of the district where this study was conducted.

Instrument

The instrument used in this study was adapted from the UTAUT survey questions used by Venkatesh et al. (2003) with minor modifications to fit the context of an elementary school district. The UTAUT survey used by Venkatesh et al. (2003) adapted the items from eight previous models found in the literature. The UTAUT model was validated by using longitudinal, within-subjects data from four organizations and was found to outperform the eight individual models that are integrated within UTAUT with an adjusted R^2 of .69. It was then cross validated with data from two additional organizations and was able to account for 70% of the variance in user intention (Venkatesh et al., 2003). Thirty-four items on the instrument used for this study were grouped into categories by their corresponding factors, and two additional items were related to participant demographics. There were four items per factor with the exception of "Behavioral intention to use the system" and "Chromebook acceptance and use," which had one item and five items respectively. Twenty-eight items used a 7-point Likert scale with one labeled as "Strongly Disagree" and seven labeled as "Strongly Agree." The rest of the items used multiple choice selections. A list of technology acceptance factors along with

their corresponding survey item numbers can be found in Table 5. The full text of the survey items is included in Appendix A.

Table 5
Technology Acceptance Factors with Corresponding Item Numbers

Factor	Item Number
Performance expectancy	1,2,3,4
Effort expectancy	5,6,7,8
Attitude toward using technology	9,10,11,12
Social influence	13,14,15,16
Facilitating conditions	17,18,19,20
Self-efficacy	21,22,23,24
Anxiety	25,26,27,28
Behavioral intention to use Chromebooks	29
Chromebook acceptance and use	30,31,32,33,34
Gender	35
Experience (in years)	36

Data Analysis

Using the Statistics Package for the Social Sciences, v. 24, multiple regression analyses were conducted to determine whether performance expectancy, effort expectancy, social influence, facilitating conditions, attitude toward using technology, self-efficacy, and anxiety influence teachers' behavioral intention to use Chromebooks and actual use of Chromebooks. An alpha level of .05 was used for all analyses.

Summary

A total of 52 teachers from across the district participated in the UTAUT survey as part of this study. The results were aggregated, and multiple regression analyses were performed in order to gauge behavioral intention to use and actual use of Chromebooks based on seven predictive factors. Descriptions of participants,

processes, instrument used, and data analyses carried out were included in this chapter.

CHAPTER IV

RESULTS

This chapter presents the results of the UTAUT-based survey emailed to 94 elementary school teachers at a small school district near Sacramento, California. The survey was part of the study that examined the impact of direct determinants of technology acceptance on behavioral intention to use and actual use of Chromebooks in the elementary classroom. There were 52 teachers who responded to the survey with 45 responses being valid. Table 6 presents descriptive statistics based on the direct determinants of technology acceptance. Subsequent sections and tables present the results of multiple regression analyses that examine the predictive power of the seven determinants of technology acceptance. The contributions of two moderating variables to the overall model are also presented. Table 7 presents the correlations between the seven determinants of technology acceptance and behavioral intention to use Chromebooks in the classroom. Table 8 presents the correlations between the seven determinants of technology acceptance and actual Chromebook use in the classroom.

Table 6
Descriptive Statistics Based on Determinants of Technology Acceptance

Factor	*n*	*M*	*SD*
Performance expectancy	45	22.64	4.19
Effort expectancy	45	22.78	4.49
Attitude toward use	45	24.20	4.05
Social influence	45	22.76	2.95
Facilitating conditions	45	23.56	3.36
Self-efficacy	45	21.89	3.83
Anxiety	45	24.47	3.99

Table 7
Correlations for Variables Included in the Regression - BI

Factor	*BI*	*PE*	*EE*	*ATU*	*SI*	*FC*	*SE*	*ANX*
R								
BI	1.000	0.313	0.346	0.467	0.404	0.362	0.248	0.080
PE	0.313	1.000	0.484	0.813	0.478	0.367	0.308	0.243
EE	0.346	0.484	1.000	0.570	0.341	0.762	0.475	0.621
ATU	0.467	0.813	0.570	1.000	0.571	0.464	0.362	0.197
SI	0.404	0.478	0.341	0.571	1.000	0.259	0.368	-0.029
FC	0.362	0.367	0.762	0.464	0.259	1.000	0.475	0.481
SE	0.248	0.308	0.475	0.362	0.368	0.475	1.000	0.431
ANX	0.080	0.243	0.621	0.197	-0.029	0.481	0.431	1.000
p								
BI		0.018	0.010	0.001	0.003	0.007	0.050	0.300
PE	0.018		0.000	0.000	0.000	0.007	0.020	0.054
EE	0.010	0.000		0.000	0.011	0.000	0.000	0.000
ATU	0.001	0.000	0.000		0.000	0.001	0.007	0.098
SI	0.003	0.000	0.011	0.000		0.043	0.006	0.426
FC	0.007	0.007	0.000	0.001	0.043		0.000	0.000
SE	0.050	0.020	0.000	0.007	0.006	0.000		0.002
ANX	0.300	0.054	0.000	0.098	0.426	0.000	0.002	

Table 8
Correlations for Variables Included in the Regression - ACU

Factor	*ACU*	*PE*	*EE*	*ATU*	*SI*	*FC*	*SE*	*ANX*
R								
ACU	1.000	0.388	0.382	0.403	0.184	0.378	0.266	0.218
PE	0.388	1.000	0.484	0.813	0.478	0.367	0.308	0.243
EE	0.382	0.484	1.000	0.570	0.341	0.762	0.475	0.621
ATU	0.403	0.813	0.570	1.000	0.571	0.464	0.362	0.197
SI	0.184	0.478	0.341	0.571	1.000	0.259	0.368	-0.029
FC	0.378	0.367	0.762	0.464	0.259	1.000	0.475	0.481
SE	0.266	0.308	0.475	0.362	0.368	0.475	1.000	0.431
ANX	0.218	0.243	0.621	0.197	-0.029	0.481	0.431	1.000
p								
ACU		0.004	0.005	0.003	0.113	0.005	0.039	0.075
PE	0.004		0.000	0.000	0.000	0.007	0.020	0.054
EE	0.005	0.000		0.000	0.011	0.000	0.000	0.000
ATU	0.003	0.000	0.000		0.000	0.001	0.007	0.098
SI	0.113	0.000	0.011	0.000		0.043	0.006	0.426
FC	0.005	0.007	0.000	0.001	0.043		0.000	0.000
SE	0.039	0.020	0.000	0.007	0.006	0.000		0.002
ANX	0.075	0.054	0.000	0.098	0.426	0.000	0.002	

Direct Determinants of Behavioral Intention to Use Chromebooks

A multiple regression analysis was conducted to determine how well the seven determinants of technology acceptance predict behavioral intention to use Chromebooks in the elementary classroom. The regression equation was not significant ($F = 2.144$, $p = .063$) with $R = .54$, $R^2 = .29$, $R^2_{adj} = .15$.

Moderators Influencing Behavioral Intention to Use Chromebooks

A multiple regression analysis was run to determine how well gender and teaching experience contribute over and above the seven determinants of technology acceptance to behavioral intention to use Chromebooks in the elementary classroom. The model that included the moderating variables was not significant, $R = .55$, $R^2 = .30$, $R^2_{adj} = .12$, $F = 1.669$, $p = .134$, and the moderating variables did not significantly contribute to the model above the seven determinants of technology acceptance, $R^2_{change} = .012$, $F_{change}(2, 35) = .295$, $p = .747$.

Direct Determinants of Actual Use of Chromebooks

A multiple regression analysis was conducted to determine how well the seven determinants of technology acceptance predict actual use of Chromebooks in the elementary classroom. The regression equation was not significant ($F = 1.575$, $p = .173$) with $R = .48$, $R^2 = .23$, $R^2_{adj} = .08$.

Moderators Influencing Actual Use of Chromebooks

A multiple regression analysis was run to determine how well gender and teaching experience contribute over and above the seven determinants of technology acceptance to actual use of Chromebooks in the elementary classroom. The model

that included the moderating variables was not significant, $R = .53$, $R^2 = .28$, $R^2_{adj} = .09$, $F = 1.486$, $p = .191$, and the moderating variables did not significantly contribute to the model above the seven determinants of technology acceptance, $R^2_{change} = .047$, $F_{change}(2, 35) = 1.134$, $p = .333$.

Summary

Multiple regression analyses were conducted in order to examine the impact of direct determinants of technology acceptance on behavioral intention to use and actual use of Chromebooks in the elementary classroom. The results indicated the seven direct determinants were not statistically significant predictors of technology acceptance and use. The contributions of gender and teaching experience were not significant to the overall model.

CHAPTER V

SUMMARY, DISCUSSION, AND RECOMMENDATIONS

Technology integration, supported by sustained job-embedded professional development, has been shown to produce significant gains in academic settings (Blanchard, LePrevost, Tolin, & Gutierrez, 2016; Koh, Chai, & Lim, 2017). As teachers take on the role of designers of personalized learning experiences, they must make sure technology is effectively integrated into their designs in order to improve student achievement. A small district near Sacramento, CA implemented a Chromebook one to one program as a solution for personalized learning experiences and technology integration. Since the one to one program was expanding in the district, the UTAUT model was used to study the direct determinants of technology acceptance and use for Chromebooks. The UTAUT model presents seven direct determinants of technology acceptance and use, with four of them being significant predictors in prior research (Venkatesh et al., 2003). The impact of the seven direct determinants on Chromebook use behavior was analyzed. A summary and discussion of the results are presented. Limitations of the study and recommendations for future research are offered.

Summary of Results

The modified UTAUT survey used in this study gathered technology

acceptance and use behavior data to examine the impact of direct determinants of technology acceptance on behavioral intention to use and actual use of Chromebooks in the elementary classroom. The results from multiple regression analyses indicated the seven direct determinants were not statistically significant predictors of behavioral intention (BI) ($F = 2.144$, $p = .063$) with $R = .54$, $R^2 = .29$, $R^2_{adj} = .15$; or of actual use (ACU) ($F = 1.575$, $p = .173$) with $R = .48$, $R^2 = .23$, $R^2_{adj} = .08$. The contributions of gender and teaching experience were not significant to the overall model. There were statistically significant and strong positive correlations between performance expectancy (PE) and attitude toward use (ATU) ($r = .813$; $p < .000$), and effort expectancy (EE) and facilitating conditions (FC) ($r = .762$; $p < .000$). There were statistically significant but moderate correlations between ATU and BI ($r = .467$; $p = .001$); social influence (SI) and BI ($r = .404$; $p = .033$), FC and BI ($r = .362$; $p = .007$), PE and actual use (ACU) ($r = .388$; $p = .004$), EE and ACU ($r = .382$; $p = .005$), ATU and ACU ($r = .403$; $p = .003$), and FC and ACU ($r = .378$; $p = .005$). There was a weak correlation between PE and BI ($r = .313$; $p = .018$), EE and BI ($r = .346$; $p = .010$), self-efficacy (SE) and BI ($r = .248$; $p = .050$), anxiety (ANX) and BI ($r = .080$; $p = .300$), SI and ACU ($r = .184$; $p = .113$), SE and ACU ($r = .266$; $p = .039$), and ANX and ACU ($r = .218$; $p = .075$). See Table 6 for full list of correlations between the seven determinants of technology acceptance.

Discussion of Results

Tests of significance are sensitive to sample size, and it is possible that the small number of valid survey responses yielded no statistically significant results for

the seven determinants of technology acceptance and use in this study. It is also possible that other factors contributed to the lack of statistically significant results. For example, Venkatesh et al. (2003) found only four of the seven factors of technology acceptance to be significant determinants of user acceptance and use behavior in the original UTAUT study. These are performance expectancy, effort expectancy, social influence, and facilitating conditions. Performance expectancy, the degree to which users believe that using a particular technology will help them attain gains in job performance, is a construct that revolves around task accomplishment. Minton and Schneider (1980) stated that performance expectancy is likely to be more statistically significant in men due to their tendency to be highly task-oriented, although Venkatesh et al. (2003) suggested that psychological gender roles are the root cause of the effects observed rather than biological gender. But if gender does indeed play a role in the statistical significance of performance expectancy, it should be noted that only eight survey respondents were male while 37 were female in this study.

Venkatesh et al. (2003) stated that effort expectancy, the degree of ease associated with the use of a system, is significant in either voluntary or mandatory settings only during the early stages of a new behavior. An internal aggregate Chromebook usage report shows that during the first month classes were in session for the 2017-2018 academic year, there was a daily average of 2,457 Chromebooks being used in classrooms across the district. By September, the daily use average had risen to 2,785 Chromebooks. By the time the survey had gone out to teachers in the

month of October, there was a daily average of 3,011 Chromebooks being utilized in classrooms across the district. A small number of Chromebooks was initially introduced in the district as replacements for aging Windows laptops during the 2014-2015 academic year. During the following three years, Chromebooks were purchased by the schools and the district based on teacher demand. During that time period, schools went from sharing a couple of classroom sets of Chromebooks throughout the school to having a shared cart per grade level. The district purchased approximately 1,200 additional Chromebooks for the 2017-2018 academic year in order to implement the one to one Chromebook program in grades three to eight. Since the intention of the UTAUT model is to predict the adoption of new technologies, behavioral intention may have been affected by previous use of Chromebooks in the classroom.

Venkatesh et al. (2003) also explained that social influence, the degree to which users perceive that others believe they should use the new system, is not significant in voluntary contexts. The authors also noted that social influence is significant in mandatory settings only in the early stages of technology adoption. Its importance erodes over time until it becomes non-significant with sustained usage and increasing experience. The average number of years of experience for participants in this study was 11 to 15, so the majority of respondents would have been employed during the initial introduction of Chromebooks in the district. This initial interaction with Chromebooks, however small, could have made the effort expectancy factor become non-significant with sustained usage and increasing

experience. Although teachers are expected to utilize the technologies provided by their school and district, there is no official directive for Chromebook usage in the classroom. Current Chromebook usage throughout the district appears to be a voluntary matter, thus, possibly resulting in the social influence factor being non-significant.

The results from the UTAUT survey showed that the item responses for the seven determinants of technology acceptance had similar means near the top of the Likert scale, and their standard deviations showed little variation from factor to factor. These high means and lack of variation across the seven factors were possibly reflected in the absence of significant results in the regression models. Across the seven determinants of technology acceptance, teachers reported an overall positive perception toward behavioral intention to use and actual use of Chromebooks in the classroom. One possible explanation for the overall positive perception toward the technology used in this study may be the facilitating conditions found within the district. "Facilitating conditions" is defined by Venkatesh et al. (2003) as the degree to which an individual believes that an organizational and technical infrastructure exists to support use of the system. An example of the existence of facilitating conditions can be found in the district's emphasis on professional development. The district qualifies for Educator Effectiveness funds (EEF) and Title II, Part A funds, which are used for staff development efforts. A portion of those funds are used for two district-wide professional development days offered every academic year in order to ensure teachers receive the necessary support for technology used in their

classrooms. Additionally, 14 teacher collaboration days were scheduled for the 2017-2018 school year. Other examples of emphasis on professional development can be found in the district technology plan and the school board's strategic plan. One of the goals in the 2016-2017 Technology Plan focuses on technology-related professional development for administrators, teachers, and support staff in order to help students succeed academically and embrace 21st century skills. The school board's strategic plan includes a guiding principle that envisions improvement in student achievement due to increased use of technology in the classroom as well as ongoing professional development for teachers (Board focus goals, 2015). Additionally, the district has employed three teachers on special assignment (TOSAs) to assist in the execution of technology-related district vision and goals. TOSAs are responsible for providing ongoing professional development for teachers, staff, and administrators. They introduce teachers to new technology integration methods, online resources, and strategies in order to increase student achievement. They also provide regular support to teachers with demonstration lessons, co-teaching, and peer observations. In addition to TOSAs, the district employs one technology director, three technology support specialists, and one database support specialist, all of whom assist with the Chromebook one to one implementation throughout the district. Since the Chromebook one to one initiative is heavily supported by the TOSAs, technology support staff, and robust professional development initiatives, the facilitating conditions factor may be non-significant in that particular environment.

After analyzing the results reported in Chapter IV, a new multiple regression analysis was carried out using only the four factors found to be significant by Venkatesh et al. (2003) in order to see whether eliminating the three non-significant factors from the model returned significant results. The results returned significant *p* values for behavioral intention ($F = 3.095$, $p = .026$) with $R = .48$, $R^2 = .23$, $R^2_{adj} = .16$, and for actual use ($F = 2.883$, $p = .034$) with $R = .47$, $R^2 = .22$, $R^2_{adj} = .14$. The new regression model echoed the findings of Venkatesh et al. (2003), which suggested that only four of the seven factors were significant predictors of technology acceptance and use. The results of the new multiple regression analysis parallel the UTAUT results found in the literature and offer a broader contribution to the field concerning the factors that help predict adoption of new and emerging technologies.

Although the results of the new regression returned significant *p* values for both BI and ACU, the coefficient factor results did not return significant values. A possible explanation may be that the four significant factors contributed to the model collectively, while the small sample size may have limited the capacity of the model to determine if any of the four factors were of any significance individually. The combination of the four factors interacting with each other to produce a significant model suggests that multiple characteristics of individuals factor into their beliefs and actions.

Limitations of the Study

There are a number of limitations to this study. For example, this study was conducted with a technology tool that was gradually introduced in the district over a

number of years before the study took place. In contrast, the original UTAUT study examined technologies from the time of their initial introduction to stages of greater experience and adoption in order to avoid retrospective responses based on routine. This previous experience with the technology within the district likely diminished the predictive power of the direct determinants of technology acceptance and use.

There is a risk of incorrectly failing to reject the null hypothesis when results are obtained from a small sample size (Chou & Bentler, 1995; Kline, 2005). Based on a sample size calculator (Soper, n.d.), the minimum required sample size for a multiple regression analysis with seven predictors is 103 participants. With four predictors, the minimum required sample size is 84. There were 52 teachers who responded to the survey in this study, and only 45 responses were valid. Testing the model with a larger number of teachers might provide more stable results, although obtaining a large sample size from small districts may be a challenge to smaller districts wanting to replicate a similar study. A possible solution may be using focus groups to complement and enhance the use of survey data in education research as demonstrated by Panyan, Hillman, and Liggett (1997). Conducting focus groups in smaller districts may provide a deeper understanding of the factors influencing acceptance and use. Additionally, care must be taken to ensure that collected responses are representative of the district staff as participants may provide different responses than those who choose not to participate.

Wu, Hsu, and Hwang (2008) reported that teachers at small schools tend to have positive attitudes toward technology use. The authors suggested that small

schools provide a better environment for technology integration in the classroom. The positive perception of technology experienced across the district in this study may be due to its smaller size, and may have affected participant responses; this, in turn, might have influenced the prediction model.

In order to adapt the survey to the district environment, a few modifications were made to certain survey items. For example, the original survey had three behavioral intention (BI) items with nuanced wording adapted from Davis et al. (1989). Actual use (ACU) was measured as duration of technology usage via system logs in the Venkatesh et al. (2003) study. The survey used in this study had one BI item and five ACU items that captured Chromebook usage via frequency of use of native cloud-based apps. It is possible that the dependent variable items used in this study did not accurately capture the constructs in the original study. Using different or more items for the BI and ACU constructs may produce different outcomes.

Recommendations for Further Research

Successful implementation of technologies depends on learning communities that engage in a cycle of continuous improvement as demonstrated by Koh, Chai, and Lim, (2017). The authors implemented a year-long study conducted with 37 teachers organized into seven lesson design teams. The authors reported that five of the seven design teams made pedagogical changes toward 21st century learning, and six of the teams saw improvement in student learning outcomes. Introducing a new technology with a robust professional development plan and abundantly available resources can lead to positive perceptions of technology and improvements in learning outcomes.

Future research should consider the effect technology coaches and learning communities have on technology perceptions and technology adoption.

Venkatesh et al. (2003) suggested that the UTAUT model is useful to administrators who need to know the likelihood of acceptance of new technologies introduced in an organization. The one to one Chromebook program implemented in the district for the 2017-2018 academic year was a gradual endeavor over the span of four to five years due to limitations in technology funds. Future research on one to one technology adoption using the UTAUT model should focus on the active adoption period and perhaps include students as participants.

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APPENDIX

APPENDIX A

UTAUT SURVEY ITEMS

Table 9
UTAUT Survey Items

Factor	Item
Performance expectancy	I find using Chromebooks useful in my job.
	Using Chromebooks will enable my students to accomplish tasks more quickly.
	Using Chromebooks will increase my students' productivity.
	If my students use Chromebooks, they will increase their chances of getting a high grade.
Effort expectancy	My interaction with Chromebooks will be clear and understandable.
	It will be easy for me to become skillful at using Chromebooks.
	I find Chromebooks easy to use.
	Learning to operate Chromebooks is easy for me.
Attitude toward using technology	Using Chromebooks is a good idea.
	Chromebooks will make work more interesting.
	Working with Chromebooks is fun.
	I like working with Chromebooks.

Table 9 (Continued)
UTAUT Survey Items

Factor	Item
Social influence	People who influence my behavior think that I should use Chromebooks.
	People who are important to me think that I should use Chromebooks.
	The senior management of the district has been helpful in the use of Chromebooks.
	In general, the district has supported the use of Chromebooks.
Facilitating conditions	I have the resources necessary to use Chromebooks.
	I have the knowledge necessary to use Chromebooks.
	Chromebooks are not compatible with other classroom technology tools I use.
	A specific person (or group) is available for assistance with Chromebook difficulties.
Self-efficacy	I could complete a job or task using Chromebooks…
	If there was no one around to tell me what to do as I go.
	If I could call someone for help if I got stuck.
	If I had a lot of time to complete the job for which the device was provided.
	If I had only the built-in help facility or assistance.

Table 9 (Continued)
UTAUT Survey Items

Factor	Item
Anxiety	I feel apprehensive about using Chromebooks.
	It scares me to think that I could lose a lot of information using Chromebooks by hitting the wrong key.
	I hesitate to use Chromebooks for fear of making mistakes I cannot correct.
	Chromebooks are somewhat intimidating to me.
Behavioral intention to use Chromebooks	On average, how often do you intend to use Chromebooks in your classroom in the next 6 months?
Chromebook acceptance and use	On average, how often have you incorporated Chromebooks for class assignments in the past 6 months?
	On average, students use Chromebooks to login to educational apps.
	On average, students use Chromebooks to research information.
	On average, students use Chromebooks to create slides.
	On average, students use Chromebooks for writing assignments.
Gender	Male/Female
Experience (in years)	0-5; 6-10; 11-15; 16-20; 21-30; 31+