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Teacher Characteristics and Blended Learning Adoption in STEM-Focused Charter Schools

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2020

Abstract

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by

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MS, Istanbul Fatih University, 2005

BS, Istanbul Kultur University, 2002

Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

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Abstract

As an innovative teaching strategy, blended learning provides an environment where students are able to receive individualized instruction based on their needs. Even though the number of schools that adopt blended models of instruction has been increasing nationwide, the number of studies that explore the relationship between teacher characteristics and blended learning use is limited. This quantitative survey study explored the relationship between selected characteristics of teachers and the levels of blended learning adoption in charter schools with science, technology, engineering, and mathematics (STEM) focus. The concerns-based adoption model (CBAM) was used as a theoretical lens as it provided tools to understand and address the concerns, perceptions, and attitudes of individuals who were in the process of blended learning adoption. Research questions pertained to the relationship, if any, between selected teacher characteristics and levels of blended learning adoption. A census sample of 211 K to 12 teachers from 10 campuses of a charter management organization (CMO) received an email with a link to the level of adoption (LoA) survey. Data analysis consisted of Kruskal-Wallis H, chi square, and ordinal regression analyses. The outcomes indicated that elementary school teachers did not adopt blended learning as much as middle and high school teachers. Additionally, duration of blended learning professional development was the only predictor of the blended learning adoption level. The findings of this study could be used to promote positive social change by assisting the CMO leaders in creating faculty development strategies and facilitating professional trainings to increase the level of blended learning adoption.

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Dedication

I want to dedicate this dissertation to my loving family; my wonderful wife, Sebahat, my little princess, Beyza Nur, and my handsome prince, Eren Yusuf. They have been the backbone of my support. I would not have been able to complete this doctoral journey without their motivation and inspiration. Mom and Dad, without your prayers, I would not have been able to be who I am now. Thanks for your endless love and support!

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Chapter 1: Introduction to the Study

Blended learning is a formal education program that can be defined as the combination of face-to-face instruction and online learning (Graham, 2013). Schools can adopt blended learning as an innovation to better serve their students with different learning styles and capabilities as blended learning creates an environment where students are able to receive personalized instruction (Christensen, Horn, & Staker, 2013). In addition, blended learning provides opportunities for teachers as it helps them increase student engagement, flexibility, and access to education (Bakia, Shear, Toyama, & Lasseter, 2012).

Blended learning has been implemented in K to 12 settings with the categorization of its four models: flex model, A La Carte model, enriched virtual model, and rotation model (Horn & Staker, 2014). Additionally, the rotation model of blended learning includes four submodels: flipped classroom, individual rotation, station rotation, and lab rotation (Horn & Staker, 2014). Schools that promote blended learning strategies choose one or more of the aforementioned models that fit the best in their campuses, instructional approach, and philosophy. In this study, I used the data that were collected from the teachers of a charter management organization (CMO) that promotes the station-rotation model of blended learning due to the sizes of the classrooms and teaching approach.

The research on blended learning is more prevalent for postsecondary learning; only a limited amount focuses on K to 12 schools (Means, Toyama, Murphy, & Baki, 2013). In order to explore the effectiveness and use of blended learning and online

education, more research is needed in K to 12 settings (Clark, 2015; Dziuban, Picciano, Graham, & Moskal, 2016). While it is commonly accepted that there is insufficient use of blended learning in the classroom, a review of the research has produced no documentation to support that suggestion. This study was conducted in an attempt to take the big picture of blended learning implementation in the entire CMO. Additionally, I explored the relationship between the levels of blended learning adoption and selected characteristics of the participating teachers as the characteristics of the teachers that play a key role in the effective implementation of blended learning (see Inan & Lowther, 2010; Zhang, Dang, & Amer, 2016).

Chapter 1 of this study includes background, problem statement, purpose, research questions and hypotheses, theoretical framework, nature of the study, definitions, assumptions, scope and delimitations, significance, and the summary. The background section addresses the research literature related to blended learning and its implementation in K to 12 schools in addition to describing the gap in the literature. The problem statement addresses the gap in the current research and details the need for this research study. The purpose of the study section includes the intention of this study in addition to the independent and dependent variables. The identification of the theory along with its origin and relation to this study are addressed in the theoretical framework section of this chapter. The nature of the study section includes the information in regard to the methodology and rationale for selection of the design of this study. Finally, the implications of this study for positive social change are addressed in the significance section.

Background

The current school systems need to be highly responsive to the new patterns of evolving educational objectives, changing student needs, and demographic differences (Boeskens, Liebowitz, Lima, & Radinger, 2018). A one-size-fits-all approach may not always be suitable for meeting the individual needs of the learners in classrooms as learning is not differentiated and students are expected to progress through the same curriculum at the same pace (Patrick, Worthen, Frost, & Gentz, 2016). Blended learning creates an environment where students are able to receive personalized instruction (Christensen et al., 2013). In addition, blended learning provides opportunities for teachers as it helps them increase student engagement, flexibility, and access to education (Bakia et al., 2012). According to Headden (2013), blended learning has been considered as one of the most promising instructional models for the students with different learning styles and needs.

The research on blended learning is more prevalent for postsecondary learning; however, only a limited amount focuses on K to 12 schools (Means et al., 2013). Additionally, the literature on K to 12 blended learning has placed more focus on concerns of the administrators who want to establish a blended learning school and who have institutional concerns (Graham, Henrie, & Halverson, 2015; Horn & Staker, 2014). In order to explore the effectiveness and use of blended learning and online education, more research is needed in K to 12 settings (Clark, 2015; Dziuban et al., 2016). Blended learning can be used to support face-to-face learning when implemented properly (Freeland, 2015; Powell et al., 2015). One of the critical factors in effective integration,

adoption, and success of instructional technology and blended learning is the characteristics of instructors such as teaching experience, experience with instructional technology, and types and duration of training (Inan & Lowther, 2010; Zhang, Dang, & Amer, 2016). The research on the teachers' competencies of implementing blended learning is also very limited (Pulham & Graham, 2018). Additionally, engagement levels and motivation of teachers in blended learning implementation are key factors that also take limited focus in the literature (Schweighofer & Ebner, 2015). Based on the need, I focused on the characteristics of the teachers that included the experience, professional development, teaching approach, experience with instructional technology, subject taught, grade-level taught, and highest level of college degree. According to David and Hesla (2018), there are 3.1 million K to 12 students attending charter schools in the United States, and most of those schools promote blended learning as an innovative teaching tool (Bingham, 2016). As a result, even less research has addressed blended learning in K to 12 charter schools even though they have flexibility in choosing the curricular focus and using various teaching strategies (Betts & Tang, 2016). In this study, participating teachers were the employees of a CMO that operates 10 science, technology, engineering, and mathematics (STEM)-focused schools. Based on my review of the literature, this study was needed as it could contribute evidence on whether or not selected teacher characteristics have any type of relationship with the levels of blended learning adoption.

Problem Statement

As blended learning is one of the promising practices that provides a combination of face-to-face and online learning in order to fulfill various needs of learners, the number of K to 12 classrooms in the nation that are adopting blended learning models has been increasing (Headden, 2013; Schechter, Kazakoff, Bundschuh, Prescott, & Macaruso, 2017). Although the number of blended learning adopting schools is increasing, the research on the effectiveness, the role of teachers, teacher competencies, and teacher characteristics is very limited (Allen & Seaman, 2015; Dziuban et al., 2016; Pulham & Graham, 2018; Wayer, Crippen, & Dawson, 2015). As a result, researchers have indicated that there is a lack of understanding as to the effectiveness of blended learning and the impact of the teachers, their competencies, and characteristics on the effective implementation of blended learning (Bingham, 2016; Pulham & Graham, 2018).

As the characteristics of the teachers play a key role in effective implementation of the blended learning, it has been the focus of some of the studies. In one quantitative survey study, Zhang et al. (2016) emphasized the importance of teacher characteristics in the effective implementation of blended learning in a postsecondary setting. Similarly, Ginsberg and Ciabocchi (2014) found that when working on the faculty development strategies, consideration of the characteristics of the instructors encouraged faculty participation in the adoption of an innovation process. The problem addressed in this study was the lack of knowledge about the relationship between the selected characteristics of teachers and the levels of blended learning adoption in STEM-focused charter schools.

Purpose

The purpose of this quantitative survey study was to explore the relationship between selected characteristics of teachers and the levels of blended learning adoption in STEM-focused charter schools. Possible relationships between the levels of blended learning adoption and the selected characteristics of teachers, such as years of experience, the highest level of college education, subjects taught, grade-level taught, teaching strategy, experience with instructional technology, and duration of training, were identified. I aimed to determine whether the adoption level of blended learning in STEM-focused charter schools was related to the selected characteristics of the teachers. In order to examine the relationships, nonparametric data analyses were used. The study's dependent variable was the level of blended learning adoption measured by the Levels of Adoption (LoA) survey. The independent variables were seven aforementioned characteristics of the teachers who are currently working in a CMO that operates 10 different schools. This study may contribute to the literature of blended learning adoption in STEM-focused charter schools regarding its relationship with teacher characteristics.

Research Questions and Hypotheses

This study has the following research questions that were designed to explore the relationship between selected teacher characteristics and levels of blended learning adoption:

Research Question (RQ)1: Are there between-group differences between participating teachers in terms of their selected characteristics (years of experience, highest level of college education, subject and grade level taught, teaching strategy,

experience with instructional technology, and duration of professional development) and their levels of blended learning adoption, as measured by the LoA survey?

$H_0$1: There is no between-group difference between participating teachers in terms of their selected characteristics (years of experience, highest level of college education, subject and grade level taught, teaching strategy, experience with instructional technology, and duration of professional development) and their levels of blended learning adoption, as measured by the LoA survey.

$H_1$1: There are between-group differences between participating teachers in terms of their selected characteristics (years of experience, highest level of college education, subject and grade level taught, teaching strategy, experience with instructional technology, and duration of professional development) and their levels of blended learning adoption, as measured by the LoA survey.

Research Question (RQ)2: Do one or more of the selected teacher characteristics (years of experience, highest level of college education, subject taught, grade-level taught, teaching strategy, experience with instructional technology, and duration of professional development) predict the levels of blended learning adoption?

$H_0$2: None of the selected teacher characteristics (years of experience, highest level of college education, subject taught, grade-level taught, teaching strategy, experience with instructional technology, and duration of professional development) predict the levels of blended learning adoption.

$H_1$2: One or more of the selected teacher characteristics (years of experience, highest level of college education, subject taught, grade-level taught, teaching strategy,

experience with instructional technology, and duration of professional development) predict the levels of blended learning adoption.

The independent variables in this study were years of teaching experience, highest level of college education, subject taught, grade-level taught, teaching strategy, experience with instructional technology, and duration of professional development. The only dependent variable of this research study was the level of blended learning adoption, which was operationalized as an ordinal variable. Four of the independent variables were ordinal variables: years of teaching experience, highest level of college education, experience with instructional technology, and duration of professional development. Lastly, subject taught, grade-level taught, and teaching strategy were nominal variables.

Theoretical Framework

The theoretical base for this study was the concerns-based adoption model (CBAM) as it was appropriate for describing the teachers' development as they learn about blended learning and stages of the implementation process (see Hall, 1976; Hall, George, & Rutherford, 1979). Chapter 2 of this study contains extensive information regarding the selection of the CBAM theory. In this section, I briefly explain how the CBAM related to the approach and research questions of this study.

The CBAM provides tools to understand and address the concerns, perceptions, and attitudes of individuals who are in the process of implementation of an educational innovation (Hall, Loucks, Rutherford, & Newlove, 1975). As the theory assists researchers in understanding the attitudes of individuals who are adopting an educational innovation, the CBAM has been used in mostly educational settings for the evaluation of

adoptions and implementations of innovations (Hall & Hord, 2011). Blended learning is an educational innovation (Sari & Karsen, 2016); as a result, the CBAM was the best fit to help me identify and categorize the teachers' attitudes and motivations related to the process of blended learning adoption.

The CBAM has three components that assist the researchers in addressing the changes of adopting individuals: innovation configurations (IC), stages of concern (SoC), and levels of use (LoU; Saunders, 2013). Out of the three components, the LoU dimension of the CBAM has a specific focus on the teachers who are in the process of adopting an educational innovation (Newhouse, 2001). The LoU dimension of the CBAM was not used in this study; however, an instrument called the LoA that was developed by two Canadian researchers, Orr and Mrazek (2010), was employed.

The LoA instrument was created with the foundational bases of the LoU and the SoC dimensions of the CBAM (Orr & Mrazek, 2010). The primary reason for the use of the LoA tool is the fact that it promotes self-reflection. The LoA involves the participating teachers to self-reflect on the use of blended learning implementation as opposed to being interviewed, which is promoted by the LoU. Additionally, the LoA survey was developed as a data-gathering instrument to assist the researchers in collecting information about the adoption process of an innovation (Orr & Mrazek, 2010). The details of the LoA are discussed to a greater extent in Chapter 2 of this study.

Nature of the Study

Quantitative research was the most effective method in attaining the research objectives and answering the research questions of this study as it allowed me to examine

the relationships among identified variables by using a measurement (see McCusker & Gunaydin, 2015). Additionally, the quantitative research method aligned with the research questions of this study as I aimed to measure the level of blended learning use (see McCusker & Gunaydin, 2015). The amount of blended learning use was the answer to a question starting with "how much," which could be answered by quantitative methods (see McCusker & Gunaydin, 2015).

The independent variables for this study were the selected characteristics of STEM-focused charter school teachers: years of teaching experience, the highest level of college education, subjects taught, grade-level taught, teaching strategy, experience with instructional technology, and duration of training. The dependent variable was the level of blended learning adoption as measured by the LoA instrument. As I collected measurable data from the surveys that included forced-choice closed questions, the data were analyzed through numerical comparisons and a quantitative approach became the most suitable method to answer my research questions. A qualitative approach, on the contrary, uses data that are collected through the observations of the participants, group discussions, and interviews (McLeod, 2019). In terms of survey design, the LoA survey that allowed the participants to self-reflect on the adoption of the implementation of blended learning was used. The data that were retrieved from the LoA surveys were numerically reported through statistical analyses of quantitative research. However, qualitative data are analyzed by themes that are obtained from the informants (McLeod, 2019).

For this study, descriptive statistics, Kruskal-Wallis H, chi square, and ordinal regression analysis were used. Descriptive statistics were used to present the selected characteristics of teachers as well as their levels of blended learning adoption. Kruskal-Wallis H and chi square tests were executed to investigate the relationship between the levels of blended learning adoption and teachers' years of experience, highest level of college education, subject taught, grade level taught, teaching strategy, experience with instructional technology, and duration of professional development. Ordinal regression analysis was used to determine whether one or more of the independent variables predicted the levels of blended learning adoption. Further information that explains the design of the LoA survey and data analysis process is provided in the Chapter 3 of this study.

Definitions

Blended learning: Blended learning is defined as a formal education program which is a combination of face-to-face and online learning. Students learn in part through online instruction and at least in part at a supervised brick-and-mortar location away from home. (Staker & Horn, 2012, p. 3).

Charter schools: Charter schools are publicly funded and independently operated schools that provide tuition-free education to the students (Zimmer, Gill, Booker, Lavertu, & Sass, 2009).

Concerns-based adoption model (CBAM): CBAM is a model that provides tools to understand and address the concerns, perceptions, and attitudes of individuals who are in the process of implementation of an educational innovation (Hall et al., 1975).

Levels of adoption (LoA) instrument: The LoA instrument is a survey that has the foundational basis of CBAM. It assesses the use of an educational innovation and promotes collaborative self-reflection and discussion about the implementation stage of an innovation (Orr & Mrazek, 2010).

Station rotation model of blended learning: Different than the individual-rotation model, the station-rotation model provides stations for the students to rotate on a fixed schedule. This model includes at least one station for online learning. The instructor may assign small-group projects, paper-pencil class work, 1 on 1 tutoring, or full-class instruction for the other groups of this model. Some implementations may involve all of the students in the class to alternate among activities, whereas others split the students up into small groups for rotations (Staker & Horn, 2012).

Teacher's subject taught: This term refers to the content that the teachers teach and students are expected to learn in a given subject or content area, such as mathematics, English, science, foreign language, or history (Content Knowledge, n.d., para. 1).

Teaching strategy: This term refers to the content delivery approach of the teacher, such as student-centered and teacher-centered. A student-centered approach is primarily based on constructivist and democratic principles. On the other hand, a teacher-centered approach relies primarily on the behaviorist theory (Serin, 2018). Student-centered learning can be viewed as a progressive approach to today's teaching methods.

Assumptions

I made a few assumptions for this study. I anticipated that the survey email would go to the teachers' inboxes as opposed to going to their spam folders. This was necessary

to this study as the teachers might not check their spam folders and miss the email that included the survey. According to the sample size calculation, 105 was the minimum sample size required for this study; therefore, it was essential to keep the number of participating teachers high. I also assumed that the participating teachers would be honest to self-reflect on their level of blended learning use. As the survey included a self-reflection tool, participating teachers' being honest with identifying the level of blended learning use was essential in obtaining reliable outcomes. Another assumption that I made was that the teachers would not face any technical difficulties while taking and submitting their surveys. The data collection survey was delivered via email; therefore, there should not have been technical problems with the internet connection, browser, email server, and the computer. Lastly, I assumed that the teachers would understand that the survey was confidential, and the anonymity of the survey-takers was preserved. The teachers were informed in advance that the participation for the survey was voluntary and anonymous; therefore, they would feel comfortable to self-assess on the level of blended learning use. This was necessary to this study as it helped me obtain more reliable outcomes.

Scope and Delimitations

This study was limited to one CMO that was operating 10 different schools in Southern California during the academic year of 2019-2020. The CMO had approximately 211 full-time teachers in addition to 90 administrators, office personnel, paraprofessionals, psychologists, librarians, counselors, and janitorial staff. The nonteaching staff members of the CMO were not included in this study; therefore, 211

full-time teachers were emailed the LoA survey. Per the outcomes of a sample size calculation, I had to obtain 105 completed surveys, which was approximately 50% of the sampling. The efforts to obtain that number are discussed in Chapter 3 of this study.

One of the delimitations of this study was that the station-rotation model of blended learning was researched. The CMO that employed the teachers who were surveyed in this study promoted the station-rotation model of blended learning due to the sizes of the classrooms and teaching approach. As a result, the research was limited to a station-rotation model of blended learning. Additionally, the participating teachers of this study limited the generalization to noncharter school teachers and teachers of the schools without a STEM-focus.

Limitations

In this study, the participating teachers self-reflected and selected their level of blended learning adoption by choosing one of the nine options from the radio buttons provided in the LoA survey. As a result, it could be subjective and biased as they were the ones who chose their level of adoption. One of the limitations of this study was the timing of the survey completion. The responses to the questions might vary based on the timing of the survey completion. For instance, a teacher might be trained after taking the survey; therefore, it might impact the duration of the professional development, which was the predicting variable of blended learning adoption. Also, the time of the day when the teachers took the survey might have been a factor that affected how a teacher would take it. Depending on the timing of the survey completion, teachers might have rushed through the survey.

Another limitation for this study was the method of statistical analysis. The number of independent variables was seven; therefore, ordinal regression analysis was used to determine whether one or more of the independent variables predicted the levels of blended learning adoption. Additionally, descriptive statistics, Kruskal-Wallis H, and chi square tests were used to examine the effects of selected teacher characteristics on the levels of blended learning adoption. Constantine (2012)stated, “The potential power and added complexity of regression analysis are best reserved for either predicting outcomes or explaining relationships. The prediction of outcomes on the basis of current characteristics is possible without regard to the causal relationships among variables” (p. 2). Possible relationships between the variables were used for prediction for this study. As a result, causal relationships between the variables were not obtained.

Additionally, the characteristics of the teachers who did not take the survey might have a relationship with the levels of blended learning adoption that were not represented in this study. As a result, it limited the generalizability to the entire teaching faculty. Also, the use of the email did not ensure that the survey was taken by the owner of the email address. Somebody else might have taken the survey on behalf of the email recipient, which could be a limitation for this study. Participating teachers were not asked to log in to their school emails in order to take the survey as the link to the survey was open to public access. As a result, I did not track down or know the survey takers.

Significance

The significance of this study originated from the need of increased blended learning use in K to 12 schools. As the schools promote blended learning, the students

have access to personalized instruction to fulfill their individual academic needs (Christensen et al., 2013). If implemented effectively, blended learning can empower learners to be critically engaged in their own learning processes (Greene & Hale, 2017). This is one of the reasons why blended learning as an instructional strategy is expanding in K to 12 settings (Halverson, Spring, Huyett, Henrie, & Graham, 2017; Parks, Oliver, & Carson, 2016). Additionally, effective implementation of blended learning provides a venue where students can have meaningful and cognitively demanding activities and collaboration with their peers while they take the maximum benefit of technology integration (Nickels & Gartner, 2018). As a result, blended learning implementation assists teachers in meeting the individual needs of students with various learning styles by providing them opportunities to receive small setting lectures, collaboration and group work with peers, and working in an online setting to receive customized instruction (Headden, 2013; Schechter et al., 2017). Providing personalized instruction based on the unique needs of learners and helping them close their academic achievement gap are essential to make a social change impact.

This study may also contribute to the literature of blended learning adoption regarding its relations to the characteristics of users. As the number of K to 12 schools that promote blended learning as an innovation is increasing (Headden, 2013; Schechter et al., 2017), the outcomes of this study are important for the CMOs as they may assist the decision-makers in reshaping their practices in regards to professional development, academic planning, and teacher hiring.

Additionally, this study could be a contribution to the CBAM literature as I used an instrument, the LoA survey, that was developed from the LoU dimension of the CBAM. As the LoA survey has not been used to examine the relationship between the selected characteristics of STEM-focused charter school teachers and their levels of blended learning adoption, this study may further contribute to the current adoption of innovation literature.

Summary

In this study, I explored the relationship between STEM-focused charter school teachers' selected characteristics and the levels of blended learning adoption. Using the CBAM as the theoretical framework, I sought to understand whether the challenges of blended learning adopting teachers in the use of blended learning were related to their selected characteristics.

As discussed in the introduction, problem statement, and background sections of this chapter, research on blended learning's effectiveness, levels of adoption, and its relations to teacher characteristics is very limited in K to 12 settings (Clark, 2015; Dziuban et al., 2016; Pulham & Graham, 2018). There was a need for more research regarding the teacher characteristics and their possible relationship to the blended learning use. The purpose of this quantitative survey study was to explore the relationship between selected characteristics of teachers and the levels of blended learning adoption in STEM-focused charter schools. Additionally, the research questions, theoretical framework, nature of the study, definitions, assumptions, scope and delimitations, limitations, and significance of this study were discussed in this chapter. Chapter 2

provides further review of the literature that includes information about the CBAM theory, blended learning, and charter schools.

Chapter 2: Literature Review

Introduction

As the world is rapidly changing, the learning needs of students are not remaining the same. A one-size-fits-all approach may not always be suitable for meeting the individual needs of the learners in classrooms as learning is not differentiated and students are expected to progress through the same curriculum at the same pace (Patrick et al., 2016). Blended learning creates an environment where students are able to receive personalized instruction (Christensen et al., 2013). In addition, blended learning provides opportunities for teachers as it helps them increase student engagement, flexibility, and access to education (Bakia et al., 2012). According to Headden (2013), many educators and policymakers consider blended learning as one of the most promising means of educating students with different learning styles and needs. Little research is available pertaining to the role of teacher characteristics in adopting and implementing blended learning strategies (An & Reigeluth, 2011; Inan & Lowther, 2010; Zhang et al., 2016).

The problem that was addressed in this study was the lack of knowledge about the relationship between selected characteristics of teachers and the levels of blended learning adoption in STEM-focused charter schools. The purpose of this quantitative survey study was to explore the relationship between selected characteristics of teachers and the levels of blended learning adoption in STEM-focused charter schools. Possible relationships between the levels of blended learning adoption and the characteristics of teachers, such as years of experience, the highest level of college education, subjects taught, grade level taught, experience with instructional technology, teaching strategy,

and duration of training were identified. In order to examine the relationship, Kruskal-Wallis H and chi square tests were conducted in SPSS. Additionally, descriptive statistics were used to present the selected characteristics of teachers as well as their level of blended learning use. Ordinal regression analysis was also conducted to determine whether one or more of the selected teacher characteristics predicted the levels of blended learning adoption.

This chapter has major sections that include the details of the search strategy, theoretical foundation, and explanation and rationale for the selected theory. A comprehensive literature review includes the current knowledge about the blended learning strategies, implementation, and adoption in addition to teacher characteristics and the connections to effective usage. After defining the selected characteristics of teachers, the findings of the literature review are analyzed, and the connections between teacher characteristics and blended learning use are discussed. At the end of the chapter, there is summary and conclusions section that includes identified connections and the gap in the research.

Literature Search Strategy

The role of teacher characteristics in blended learning adoption, implementation, and use in STEM focused charter schools was searched in current literature and research studies. Additionally, the literature review has a section that summarizes the CBAM as it is appropriate for describing the teachers' development as they learn about blended learning and stages of implementation process (see Hall, 1976; Hall et al., 1979).

The library databases and search engines that I accessed were the following; ProQuest, Academic Search Complete, SAGE Journals, ERIC, Education Source, Science Direct, and SocINDEX. Additionally, I used Google Scholar as a search engine. *Diffusion of Innovations* (Rogers, 2010), *Tinkering toward Utopia: A Century of Public-School Reform* (Tyack & Cuban, 1995), and *Blended: Using Innovation to Improve Schools* (Horn & Staker, 2014) were the hardcopy literature I used.

The key search terms and combinations of search terms that were used to conduct research in the online databases were *blended learning, disruptive innovation, teacher characteristics, faculty characteristics, attitudes, charter schools, STEM, faculty development, CBAM,* and *technology integration.*

In terms of years, the database searches were set for 2014-present in order have access to the most recent research, articles, and studies. However, when there were articles that were older than 5 years, I searched for more recent articles or studies that cited the findings of the older research and used them in this study. In addition, I kept searching articles and studies in Google Scholar in case the databases did not include the most recent research. I continued to search the literature to keep it updated throughout the process.

Theoretical Foundation

The theoretical base for this study was the CBAM as it was appropriate for describing the teachers' development as they learn about blended learning and stages of implementation process (see Hall, 1976; Hall et al., 1979). The CBAM provides tools to understand and address the concerns, perceptions, and attitudes of individuals that are in

the process of implementation of an educational innovation (Hall et al., 1975). According to Hall, Hord, Aguilera, Zepeda, and von Frank (2011), the CBAM has been used in mostly educational settings for the evaluation of adoptions and implementations of innovations.

The CBAM was developed by Hall, Wallace, and Dossett (1973) from the University of Texas' Research and Development Center for Teacher Education in 1973. The theoretical framework was based on Fuller's (1969) work that included the concerns of teachers who had just started their teaching career. Fuller also examined new teachers' responses to instructional and innovational change. The primary purpose of the CBAM as a framework was exploring the concerns of teachers who are introduced to an innovation and the measure the effects of that innovation (George, Hall, Stiegelbauer, & Litke, 2008; Hall & Hord, 2006). The framework has been used in many studies to examine the change for educators who are adopting and implementing new educational innovations (Hall, 1979; Hall et al., 2011).

The CBAM was developed with three components: IC, SoC, and LoU (Saunders, 2013). These components assist the researchers in understanding the process of the change that the teachers go through and their perceptions while implementing the innovation. According to Saunders (2013), the CBAM provides a lens to understand the change process for the teachers who experience behavioral changes while adopting an innovation. While SoC and LoU are focusing on the teacher who implements the innovation, IC examines the nature of the innovation itself (Hall et al., 1973; Newhouse, 2001). Out of those aforementioned components of the CBAM, the SoC identifies and

categorizes teachers' attitudes and motivations related to the process of change and adoption. Fuller (1969) defined those categories as unrelated, self, task, and impact. As it is a developmental process, Hall et al. (1973) identified seven SoC in order to provide more detailed and leveled descriptions of the concerns that teachers have when they are in the process of adopting an innovation. The seven SoC include the following: (a) awareness, (b) informational, (c) personal, (d) management, (e) consequence, (f) collaboration, and (g) refocusing (Hall & Hord, 2006; Hall et al., 1973).

Additionally, the seven SoC were identified within four main categories as unrelated (awareness), self (informational and personal), task (management), and impact (consequence, collaboration, and refocusing) in order to further explain the relationship between stages and attributes of concern (Fuller, 1969; Hall & Hord, 1987). Teachers who are asked to adopt an innovation show developmental progression from being unrelated to having an impact for the betterment of the innovation and student outcomes (Hall et al., 1973). In the earliest stage, teachers are unaware and have no involvement with the innovation. When they are informed about the innovation and the process of adoption, they become concerned with their capabilities and skill sets. In Stage 3 (management), teacher concerns focus on the process of implementation. The most important aspect of this stage is creating an environment where the innovation is implemented effectively. The concerns of teachers focus more on the outcomes of the student learning in Stage 4 (consequence). Additionally, teachers are concerned with the instructional changes for a better implementation of the innovation in this stage. Stage 5 (collaboration) is the stage when teacher concerns focus on coordination and cooperation

with others who are involved in the process of adoption and implementation. In the final stage (refocusing), teachers are concerned with creating modifications, evaluation of the process, and alternatives to current innovation (Hall et al., 1973).

One of the other components of the CBAM that focuses on the teacher who implements the innovation is LoU. This dimension identifies what a teacher is doing or not doing in terms of the adoption and implementation of the innovation (Newhouse, 2001). The LoU focuses on specific teacher behaviors during the implementation process (Saunders, 2013). Teachers who are in the process of implementing an innovation gain confidence and skill; therefore, their specific behaviors change as they progress through the sequence of levels. Hall (1975) identified and defined the sequence of levels as

0. Nonuse: No action is taken; no use of the innovation occurs.
1. Orientation: Information about the innovation is received.
2. Preparation: Preparation to begin use of the innovation starts.
3. Mechanical: Implementation begins.
4. Routine: Changes are made to the current routine of the implementation.
5. Refinement: The innovation is assessed and actions are taken for better outcomes.
6. Integration: Collaboration with others takes place to increase the impact on students.
7. Renewal: Modifications are created and alternatives to current innovation are sought.

Teachers' behavioral changes are assessed using the CBAM's LoU dimension. According to Anderson (1997), LoU assists researchers in exploring the theory of change in practice as the teachers who are implementing an innovation are informed about it at the beginning, then they begin to use it, and they become more experienced about the adoption and use of it. However, not all of the participating teachers follow the same paths in the process of change (Hall & Hord, 2006). The majority of the teachers pass the first three levels quickly: nonuse, orientation, and preparation. The problem occurs when most of those teachers remain in Stage 4 (mechanical). Hall and Hord (2006) explained this as those teachers who remain in mechanical level having a hard time passing through the implementation bridge as it requires changes in practices and reform implementations.

The implementation bridge is defined as the levels of fourth, fifth, sixth, seventh, and eighth in LoU of the CBAM (Hall & Hord, 2006). In the levels of the implementation bridge, participating teachers start to implement the innovation, make some changes to the current routine, assess the innovation and take actions accordingly, collaborate with other users to increase student outcomes, and create modifications and explore new ideas. According to Hall and Hord (2006), teachers who pass through the implementation bridge have better academic results than the teachers who remain in the first three levels.

The third dimension of the CBAM is IC. Unlike the SoC and LoU, the IC focuses more on the nature of the innovation rather than the users and their change processes of them. The IC assists the teachers in understanding how an innovation is used effectively. The change facilitators and leaders use the IC with participating teachers to establish a

system of use and create expected outcomes and actions. With the use of the IC, teachers are provided guidelines to have a better use of an innovation. Additionally, the IC helps the new teachers understand what is expected from them in terms of adoption and use of an innovation. According to Newhouse (2001), the IC uses the current documents about the innovation, interviews with participating teachers, and interviews with their supervisors in order to prepare a two-dimensional chart that includes series of statements (vertical) and range of variations (horizontal).

The CBAM is based on a number of assumptions about the process of change (Hall & Hord, 2006; Hall & Hord, 2011). They are listed as (a) effective implementation of an innovation is a process and it takes time; therefore, it does not occur over night as it is not an event, (b) change is a unique and personal experience for each participating teacher, (c) as individuals are involved in the process of change, what happens to them is essential to understand the change process in an organization, (d) change is a developmental process for an individual; therefore, it requires developmental growth, (e) interventions help the change facilitators manage the process, (f) new strategies, methodologies, and practices need to be used in order to have better outcomes.

The CBAM addresses each of the six aforementioned assumptions in addition to the teacher concerns about the implementation of an innovation, the strategies that change facilitators or leaders use for an adoption of innovation process, and the individual's adaptation of the innovation (Hall & Hord, 1987).

CBAM and components of it have been extensively used in educational research to evaluate and understand the changes in participating teachers who are in the process of

an adoption and implementation of an innovation (George et al., 2008). Additionally, the outcomes of the educational studies that used CBAM as the theoretical framework informed the decision making and supported change facilitators and school leaders in designing professional development programs for more effective implementations of innovations (Holland, 2001; Saunders, 2013). Most of the studies, that incorporated CBAM as the theoretical framework, applied one of the three aforementioned dimensions; SoC, LoU, and IC.

One of the educational studies that incorporated CBAM as the theoretical foundation is Hao and Lee's (2015) survey research study which examined 200 Taiwan middle school teachers' implementation of Web 2.0 technology integration in instruction and examined the relationships among teacher characteristics and types of their concerns. In this study, the authors used the stages of concern questionnaire (SoCQ) as the instrument to assess participating teachers' stages of concern. Additionally, the relationship between characteristics of teachers and types of their concern about the integration of Web 2.0 technologies was identified (Hao & Lee, 2015). The outcomes of this quantitative survey study indicated that participating teachers' concerns were the most intense in the following stages; informational, personal, and management. In terms of the relationship between the stages of concern and personal characteristics, the findings indicated that the teachers with characteristics of Web 2.0 use, gender, age, and discipline have concerns of varying stages (Hao & Lee, 2015). Also, the outcomes of this study had several implications for the development of professional trainings to increase the integration of Web 2.0 technologies in the classrooms.

Another study in which CBAM was incorporated was Alenezi's Technology leadership in Saudi Schools (2017). In addition to the use of CBAM theory, Alenezi (2017) used grounded theory methodology to shed light on the Learning Resource Centers and their roles in the current Saudi education reform. The author interviewed the participating teachers with the LoU survey to collect the data. Those teachers were asked to self-assess their technology competence and rate their information, communication, and technology skills. Additionally, Alenezi used the SoCQ to analyze the stages of concern of the participating teachers about their technology leadership. The findings of this study indicated that in order for the schools in Saudi Arabia to move higher stages of concern and levels of technology use, the schools require standardized technology leadership (Alenezi, 2017).

In their study, Donovan, Green, and Mason (2014) used CBAM's IC Map to represent the different ways 21st century skills are evident. IC maps assist the school leaders and decision makers in providing a rich description of innovation. In this ethnographic grounded theory study, Donovan et al. developed an IC Map to provide description of 21st century skills implementation. The findings indicated that 21st century skills can be manifested with two configurations; traditional and content-based approach and project-based approach. In addition to the two different approaches, Donovan et al. stated that 21st Century Ecology plays a significant role in providing a rich description of the 21st century skills in today's classrooms.

Different than the three components of CBAM, Orr and Mrazek (2010) developed another tool that also reflects the CBAM theory. The authors developed an instrument

that can measure the changes in understanding an educational innovation and competence with it. The LoU and the SoC dimensions of the CBAM theory became the foundational basis for the development of the LoA instrument (Orr & Mrazek, 2010). In addition to assessing the use of an educational innovation, the LoA promoted collaborative self-reflection and discussion about the implementation stage of an innovation.

Hall and Hord (1987) identified the LoU dimension as the diagnostic instrument to assess the change process (p. 81). Additionally, Hall et al. (1975) stated that the intention of the LoU tool was to describe the behaviors of participating adopters rather than affective attributes. Using the concepts and components of SoC and LoU tools, Orr and Mrazek (2010) developed a data-gathering instrument and named it the Level of Adoption (LoA) survey. In their study, Orr and Mrazek wanted to pilot the LoA survey to assess the adoption of innovations in educational technology. Different than the interview process of the LoU, LoA allows participants to self-reflect on the adoption and implementation of an educational innovation. In the development process of the LoA, Orr and Mrazek did not use the original descriptors of LoU. Instead, the original descriptors were utilized to frame precise stem structures and level descriptors related to the educational innovation of interest (Orr & Mrazek, 2010). Also, in order to address the content validity issues, Orr and Mrazek paid extra attention to the design of the instrument by ensuring that the LoA survey had the comprehensive self-reporting scale and it described all kinds of behaviors and changes in the process of adoption that the participants might have.

Hall, Dirksen, and George (2013) described the LoU tool as an interview protocol that measures teachers' actions in eight behavioral profiles along a continuum of use. As it has an interview tool to collect the data and LoA uses self-reflection, the formats of these tools are not the same. For instance, the forms that LoA uses have identical radio buttons and check boxes to assess the level of adoption as opposed to having numbers used in the interview forms of LoU (Orr & Mrazek, 2010). With this change in formatting, Orr and Mrazek aimed to have a nominal description of the state of participating teachers' adoption of an educational innovation rather than implying a hierarchical progression.

The sampling for Orr and Mrazek's (2010) study was the graduate students of the University of Lethbridge that was located in Alberta, Canada. The authors, Orr and Mrazek, were both instructors in the University and taught a graduate level course named Using Emergent Technologies to Support School Improvement in a blended format. The assignments and readings were provided to the course taking students via the university's learning management system (LMS) followed by 2-week face-to-face instruction. After that, the course activities resumed online via the LMS tool. The participating 26 graduate students took the same survey three times; two of which were conducted during the course and the last one was taken four months after the course ended. The LoA survey consisted of 20 questions and was taken in an online setting; the course's online learning management system.

The results indicated the competence levels of participating students with the emergent educational technologies such as podcast, video stream, spreadsheet, interactive

whiteboard, clickers, etc. Additionally, the survey takers were able to see real-time aggregate comparative information after they submitted the survey. As the outcomes of the study indicated aggregate comparative reports, it assisted the educational leaders and decision makers in establishing collaborative professional development plans and providing training opportunities for the participants based on their common needs to increase the use of the emergent educational technologies (Orr & Mrazek, 2010). Additionally, Orr and Mrazek were able to revise and refine the LoA instrument based on the comments from the participating respondents. For instance, one of the participants stated that there should have been an option of "I know quite a bit about this tool and choose not to use it" and the authors found it legitimate and added this option to the revised version of the LoA survey (Orr & Mrazek, 2010, p. 12). As a result, the number of descriptors for the LoA survey increased from eight to nine after considering the comments that came from the participants (See Appendix A).

I selected the CBAM as the most appropriate theoretical framework for providing an understating of school teachers' blended learning implementation and evaluating adoption of innovation process. According to Anderson (1997), CBAM is the most robust and empirically grounded model to highlight the change process and explore the concerns and levels of use of participating teachers (p. 331). Additionally, CBAM has been providing a framework for examining the adoption process of educational implementation and assisting the educational leaders and decision makers in specifying professional development for the faculty (Brenner & Brill, 2016; Donovan, Hartley, & Strudler, 2007). In addition to examining the levels of blended learning adoption of the

participating teachers, one of the aims of this study was using the outcomes to inform the decision making about the professional development on the implementation of blended learning and assist the educational leaders in specifying the plans for the training and professional development plans. Therefore, CBAM and its LoA survey tool were chosen as they were the best fit for this research.

In this study, I incorporated CBAM theory as a lens for exploring the levels of blended learning adoption. As the theoretical framework, CBAM informed this study's research and its LoA instrument shed light on identifying the levels of blended learning adoption of the participating teachers. This study might also contribute to the current literature as the LoA tool has not been used in a study that examines the adoption levels of blended learning in STEM-focused charter schools. Additionally, findings of this study might contribute to the relevant literature as adequate research that used CBAM as a theoretical framework and its LoA tool as the instrument was lacking on the relationship between selected characteristics of teachers and their levels of blended learning adoption in STEM-focused charter schools.

Literature Review Related to Key Concepts

The literature review of this study continued with the definition of charter schools with a specific focus on the STEM-focused schools. Additionally, the definition of blended learning and the types of blended learning implementations were further reviewed.

Charter Schools

Charter schools are publicly funded and independently operated schools that provide tuition-free education to the students (Zimmer et al., 2009). Even though they are considered as public schools, their governance structure is different as they are run by stakeholders, community groups, or private organizations (Berends, 2015). The first charter school of the nation was established in the state of Minnesota in 1992 (Cheng, Hitt, Kisida, & Mills, 2017). Year after year, the number of charter schools grew steadily and the legislation for opening those schools was passed in 43 states of the United States (U.S. Department of Education, 2016). According to a recent report, charter schools keep expanding and nearly 6% of the public school students chose charter schools to attend. Between the years 2000 and 2015, the public school students who attended charter school increased from 1% to 6% (U.S. Department of Education, National Center for Education Statistics, 2018).

Charter schools operate with freedom from some of the regulations and restrictions that the traditional district schools are required to have (Cheng et al., 2017; Zimmer et al., 2009). One of the flexibilities that charter schools have is the ability to enroll students from a wider geographical area (Cheng et al., 2017; Judson, 2014). Therefore, students are not required to live in a certain geographical area or a zip-code to be able to attend a charter school. As a result, charter schools are to provide education to any student who wants to apply. If a charter school has more applicants than its capacity, a lottery process is required to provide equal access to all of the applying students (Berends, 2015).

Additionally, charter schools are exempt from some of the state-mandated requirements that the traditional public schools have such as the curricular focus, teaching methods, and hiring teachers from different academic backgrounds (Betts & Tang, 2016). However, they are held more accountable than the traditional district schools with renewals, annual oversight visits, and audits to name a few (Cheng et al., 2017). As the charter schools have this type of flexibility, many of them have opened their doors with various curricular and instructional focuses. Keeping state-mandated teaching and assessment requirements, charter schools have various focuses and they specialize in particular areas such as STEM, college prep, and arts to name a few (What is a Charter School, 2019).

In addition to the charter schools' various instructional and operational focuses, they also vary in terms of their management organizations (Molnar et al., 2017). There are also for-profit charter schools, in other words, not all of the charter schools are non-profit. Additionally, with the rapid growth of charter schools, there has been an increase in the number of CMOs and education management organizations (EMOs, Molnar et al., 2017). CMOs are the non-profit organizations that run multiple charter schools regardless of where they are located (Molnar et al., 2017). The EMOs operate multiple sites similar to CMOs; however, they are not non-profit (Molnar et al., 2017). Besides the EMOs and CMOs, there are independent charter schools that do not have a management organization. They represent the idea of "small schools" in addition to being locally run and autonomous (Molnar et al., 2017, p. 16).

In this study, I surveyed the teachers from a CMO that operated ten campuses located in three underserved areas of Southern California counties. During the time of the data collection, the organization employed around 360 teachers, administrators, and staff serving approximately 3,800 students with various demographics. The number of teaching staff ranged from 9 to 32 on those campuses.

STEM-Focused Charter Schools

STEM has been one of the areas that charter schools have specialized in over the years (Cheng et al., 2017). This is not surprising as today's jobs require STEM skills and outsourcing STEM workers has been growing in scale and scope (Hira, 2019). The major need in the areas of STEM drew the attention of state legislators and they began to focus more on STEM education in K to 12 settings. According to the STEM Education Act of 2014, more K to 12 schools that have a STEM focus are needed (Icel, 2018). The CMO that was the focus of this study had been established by scientists in order to fulfill the aforementioned need.

As the charter schools have flexibility to specialize in particular areas, STEM has been promoted in many charter schools (Judson, 2014). As a result, with the increase of STEM-focused charter schools, more students will graduate from those schools with exposure to math and science; therefore, more high school graduates will be motivated to enter STEM field majors (Icel & Davis, 2018). When the sampled CMO in this study was founded, the mission was inspiring students to choose career paths in the areas of science. The new management of the CMO changed the mission after 9 years and defined particular focus of the organization as STEM.

STEM-focused charter schools are popular in the nation; however, the research that explores the answers to the question regarding their effects on student achievement has provided no clear resolution (Judson, 2014). The outcomes of one of the few studies indicated that the academic achievement of students who were transferred to STEM-focused charter schools increased over the years (Judson, 2014). The studies that explore the academic achievement of the students focus more on charter schools in general; therefore, the literature is limited to charter schools in general as opposed to focusing more on the ones with various instructional focuses.

The CMO that was the focus of this study operated ten STEM-focused charter schools. As their particular specialization was STEM, they focused more on those areas in order to fulfill what they promised to the society. Same as the other public schools, these schools were required to teach four core subjects; English, math, science, and history. Additionally, physical education was taught as the requirement of the state (EC Section 51220). Also, the high schools of the CMO were required to meet the admission requirements for the University of California and California State Universities in order for its graduates to be admitted by those universities. The unique features that the schools provide included, but are not limited to, computer classes, STEM expos, participating in local, national, and international science Olympiads and fairs, Vex and Lego Robotics, and attending Mathcounts, AMC 8 and AMC 10 math contests to name a few. Each student in those schools was required to work on a science project with a given timeline. The eligible projects were showcased in CMO-wide STEM Expo and qualifying projects were taken to the national and international science Olympiads.

Blended Learning

Blended learning can be defined as the combination of face-to-face instruction and online learning (Graham, 2013). It can be a very effective teaching strategy as it accommodates a wide range of learning styles of today's learners (Nair & Bindu, 2016). As it is the combination of face-to-face and online learning, blended learning has the advantages of all of the methods that it includes (Staker & Horn, 2012). For instance, the human component of face-to-face instruction is essential for the student satisfaction (Buchanan & Palmer, 2017). Flexibility and personalization can be considered as the two most important advantages of the online learning (Pulham & Graham, 2018). Additionally, in K to 12 settings, blended learning creates a venue for teachers to replace classroom activities with online learning by providing the flexibility of choosing where the online learning takes place (Staker & Horn, 2012).

If implemented effectively, blended learning can empower learners of today to be critically engaged in their own learning processes (Greene & Hale, 2017). This is the primary reason why blended learning as an instructional strategy is expanding in K to 12 settings (Halverson et al., 2017; Parks et al., 2016). In addition, one of the rationales behind the implementation of blended learning is to provide a venue for the students where they can have meaningful and cognitively demanding activities and collaboration with their peers while they take the maximum benefit of technology integration (Nickels & Gartner, 2018). As a result, blended learning implementation assists teachers in meeting the individual needs of students with various learning styles by providing them

opportunities to receive small setting lecture, collaboration and group work with peers, and working in an online setting to receive customized instruction.

Blended learning in K to 12 schools has been implemented in four different models; flex model, A La Carte model, enriched virtual model, and rotation model (Horn & Staker, 2014). The flex model allows students to take online courses while they physically go to the school. The students in this model are offered face-to-face support based on their needs and requests. The a la carte model offers students the option to take supplemental online courses while they are in the classrooms receiving face-to-face instruction from their teachers. The enriched virtual model has all of the courses online; however, students are required to physically attend initial course meetings. Also, face-to-face support is available for the students who have individual academic needs. Lastly, the rotation model offers students to rotate between online courses or tools and face-to-face instruction (Staker & Horn, 2012). Additionally, students can benefit from group activities with their peers in this model. Schools that are implementing blended learning strategies choose one or more of those models that fit the best in their campuses, instructional approach, and philosophy. The models of blended learning are further described in the following paragraphs.

Flex Model

The flex model provides students venues to take the courses online while they physically attend the school (Staker & Horn, 2012). In this model, students are involved in creating their own schedules that allows them to have more control and work at their own pace in the classrooms. Teachers provide students in-person support as needed that

can also be requested by the students based on their individual academic needs (Horn & Staker, 2014). The supervision is always done by the teachers in the classrooms. Also, there are one-on-one or small group instructions, individual tutoring, and group projects available. This model changes the traditional structure of the schools and provides the students opportunities to have more control in their schedules, be placed in age-based cohorts, work their own pace, and experience a flexible seat-time (Christensen et al., 2013). One of the advantages of this model is the individualization as the students work on their own pace and get to choose the courses themselves. Therefore, this model may be a good fit for the schools with non-traditional students (Christensen et al., 2013).

A La Carte Model

This model offers students flexibility to take courses fully online in addition to their experiences and activities in the brick-and-mortar school (Horn & Staker, 2014). Online classes that are offered in this model can be taken on the campus or off-campus. This option is provided to the students to increase the flexibility. Also, students are given chances to choose which courses to take online and which courses to take on the brick-and-mortar campus. While the students are on the campus, they are offered academic support, mentoring, and tutoring (Christensen et al., 2013). As mentioned above, schools choose one or more models of blended learning based on their size of classrooms and campus, academic structure, placement of the teachers and students, and specific instructional focus.

Enriched Virtual Model

In this model, students are required to take some of the sessions in a face-to-face environment from their teachers and then are free to complete the remainder of the course remotely (Horn & Staker, 2014). Typically, the same teacher delivers the instruction both in online and face-to-face settings. Attending face-to-face sessions is not optional; it is one of the requirements for the students in the enriched virtual model. This is the primary difference between enriched virtual model and fully online learning.

Rotation Model

The rotation model consists of different variations with different learning modalities. According to Horn and Staker (2014), there are four different variations of the rotation model; station-rotation, flipped classroom, lab rotation, and individual rotation. In a station-rotation model, students are required to rotate through different stations that can include small group instruction, online learning, and collaborative activities. Different from station-rotation model, flipped classroom offers students the opportunity to participate online and then attend a face-to-face setting, a collaborative session, projects, or teacher-guided activity. In the lab-rotation model, students rotate to a computer laboratory in order to receive online instruction and participate in an online setting. Lastly, individualized rotation requires the students to have an individualized playlist and rotate to not all of the stations, but to the ones that are more needed based on the academic needs (Horn & Staker, 2014).

The CMO that was the focus of this study had schools that were implementing the station-rotation model of the blended learning's rotation model. This was due to the

classroom sizes and placement of the teachers and students. As it was implemented in the CMO campuses, the station-rotation model is further described in the following paragraphs.

Station-Rotation Model

The charter schools that were the focus of this study utilized the station-rotation model as it was the best fit for their campuses. This was due to the classroom sizes, placement of teachers and students, and students' access to computers with internet connection at their homes. The station-rotation model is one of the rotation models of blended learning. During the implementation of this model, students rotate on a fixed schedule or at the teacher's directions between the stations (Horn & Staker, 2014). The stations and the time students spend in each station are determined by the content teacher. Stations of this model may include direct instruction, group work, and online learning. Teachers of station-rotation model are required to get trained on how to pace the instruction among the groups and systemize the delivery.

One of the stations of this model is online learning (Horn & Staker, 2014). Students in that station are required to work on a computer-based adaptive learning tool. Since the tool is adaptive, students receive instructions based on their individual needs. As a result, the content that is delivered to a high-achieving student and a low-achieving student is not the same as it is customized. Therefore, it provides opportunities for low-achieving students to receive foundational level instruction to maximize their understanding of the content while the high-achieving students are challenged with harder problems so that they do not get bored during the class time. With the

implementation of station-rotation model, students are provided opportunities to demonstrate proficiency and to continually appropriate their comprehension of the content until they have met specified objectives in each station (Nickels & Gartner, 2018).

As it was mentioned earlier, the STEM-focused charter schools which were the focus of this study implemented station-rotation model of blended learning. This was primarily because of the classroom sizes and students' access to computer and internet in their homes. Classrooms of those schools were relatively smaller and not all of the students had access to a computer with an internet connection at home. Therefore, implementing the station-rotation model was the best fit for the campuses of this CMO. The schools had an average of 25 students in each classroom; therefore, three stations with around 8 students in each station formed this model.

Literature Review Related to Key Variables

In this study, I explored the relationship between selected characteristics of teachers and the levels of blended learning adoption in STEM-focused charter schools. Seven selected characteristics of the teachers were the independent variables for this study. The independent variables predicted the outcome of the dependent variable which was the level of the blended learning adoption. In this section, there is further review of the aforementioned independent variables; years of experience, level of college education, subject taught, grade-level taught, teaching strategy, experience with instructional technology, and duration of professional development.

Selected Teacher Characteristics

The independent variables for this study were demographic and technographic characteristics of the participating teachers. The demographic characteristics could be identified as years of experience, the highest level of college education, subjects taught, and grade level taught. Technographic characteristics that were explored in this study were teaching strategy, experience with instructional technology, and duration of professional development.

There is sufficient evidence that demonstrates the integration of technology is increasing in today's classrooms (Vongkulluksn, Xie, & Bowman, 2018). However, as the integration of technology is a complex process, majority of the teachers are still struggling in their daily instructions (Ertmer, Ottenbreit-Leftwich, Sadik, Sendurur, & Sendurur, 2012; Tondeur, van Braak, Ertmer, & Ottenbreit-Leftwich, 2017). As blended learning requires effective technology integration in a classroom setting, the new role of the teachers is of facilitator and guide (Shivam & Singh, 2015). Blended learning facilitators increase the quality of the face-to-face instruction and empower the students by enhancing their skills to get the most out of the online material to create an effective environment of blended learning (Shivam & Singh, 2015). As the instructor characteristics have significant effects on the levels of effective technology integration concern (Hao & Lee, 2015) and the research that explores the impact of instructor characteristics in the adoption and integration of instructional technology and blended learning is limited (An & Reigeluth, 2011; Clark, 2015; Dziuban et al., 2016; Means et al., 2013), this study might play a supporting role in filling the gap in that area.

Years of Experience

Teachers with fewer years of teaching experience require less amount of basic training in implementing an innovation and integrating technology in the classrooms (Hao & Lee, 2015). Additionally, teaching experience has a negative significant association on the use of technology (Blackwell, Lauricella, & Wartella, 2014; Gil-Flores, Rodríguez-Santero, & Torres-Gordillo, 2017; Karaca, Can, & Yildirim, 2013; Liu, Ritzhaupt, Dawson, & Barron, 2017). Cox (2013) attributed this negative association to the fact that more tenured teachers were not able to receive same amount of pre-service technology integration trainings compared to less experienced teachers. In his study, Cox explored technology integration experiences of three tenured teachers with at least ten years of experience in teaching. The site where the study took place was an urban school in one of the underserved areas of Alberta, Canada. The population of the school consisted of students with problems of homelessness, mental illness, poverty, and addiction. According to the author, these circumstances had a negative impact on the integration process of technology for the interviewed teachers (Cox, 2013). The three selected teachers were asked to provide their technology integration experiences in one-on-one interviews that were also digitally recorded. The teachers also filled out a one-page questionnaire that had questions about their technology background and experiences. Findings of the study indicated that more tenured teachers did not receive same amount of pre-service trainings regarding technology integration compared to their less experienced counterparts. As a result, more tenured teachers did their best to integrate the technology; however, the success of the attempts varied (Cox, 2013).

On the other hand, according to some research, teachers' years of teaching experience may not be a predictor of technology integration in the classrooms (Gil-Flores et al., 2017). Teaching experience may not play a significant role in teachers' use of technology in daily instruction. The study of Gil-Flores, Rodríguez-Santero, and Torres-Gordillo (2017) included findings that supported this outcome. In the study, the authors aimed to analyze the impact of the age, gender, and years of experience on the use of Information and Communication Technology (ICT) in the classrooms. The data for this international study was collected by OECD and consisted of surveys of 3339 teachers from 192 secondary schools of Spain. In addition to the teacher characteristics to explain the use of ICT in the classrooms, the ICT infrastructure of the schools and their impact on the use of ICT were explored in this study. Analysis of survey results indicated that age, gender, and years of experience did not play a significant role in technology integration in the classrooms (Gil-Flores et al., 2017). As a result, years of experience may not be a predictor of technology integration in the classrooms.

Level of College Education

According to the research, teachers who want to integrate technology in the classroom need to be equipped with specific knowledge and skills (Hsu, 2016). The competence level of teachers plays a key role in the integration process as it is not just about using technology and its tools. The effectiveness of integration of technology increases when the instructors have higher competence of technology and its tools to be used in the classrooms (Hsu, 2016). A national survey of elementary and high school teachers revealed that the teachers who use computers most often have a larger number of

college course credits and degrees (Inan, Lowther, Ross, & Strahl, 2010). In one of the studies, findings indicated that there is a relationship between the teachers' educational degrees and their concerns about the implementation of technology in the classrooms (Cetinkaya, 2012; Yang & Huang, 2008). Additionally, as it requires fair amount of technology integration, instructors' academic merit is one of the most significant factors of successful blended learning implementations (Diep, Zhu, Struyven, & Blieck, 2017).

In their study, Diep, Zhu, Struyven, and Blieck (2017) had the purpose of predicting the students' satisfaction with the blended learning, examining the relationship between instructor expertise and learning management systems (LMS), and investigating whether different modes of blended learning have an impact on students' perceived achievement goals, teacher evaluations, and LMS quality. Participants of this study were 138 students from one of the adult education centers in Belgium. Those were the teacher candidates in a preparation program that used blended learning as an instructional approach. The questionnaires were provided to the participants in two different formats; paper-based and online. The questionnaire took about 20-30 minutes to complete and taking it was completely voluntary; so that the participants felt comfortable to leave without completing it. According to one of the outcomes of the data analysis, teachers' academic merit was listed as one of the most significant factors in effective blended learning implementation (Diep et al., 2017).

On the contrary, teachers' gender, teachers' age, receiving an advanced degree, years of experience, and their instructional leaders and immediate supervisors seemed to have no significant relationship in classroom integration (Brunk, 2008). Moreover,

teachers' level of college education was not a significant factor in the process of technology integration (Stammen & Aronson, 2008). Stammen and Aronson (2008) examined the extrinsic and intrinsic barriers that could affect the technology integration of 7,153 K to 12 teachers in the state of North Dakota. The task that was given to the teachers was completing an online portfolio which was a requirement of no child left behind (NCLB) law. According to the results, education level as an extrinsic factor had no impact on the technology integration (Stammen & Aronson, 2008).

The research that examines the impact of college education level of the teachers is limited. Also, current research has various outcomes mentioned above. As a result, more research studies with the focus of the impact of teachers' level of college education in the technology integration process are needed. As it was one of the independent variables of this study, the outcomes might help fill the gap in this area.

Subject Taught

There is limited research that analyzes the relationships between the subjects that the teachers teach and their level of technology integration (Howard, Chan, & Caputi, 2015). Howard et al. (2015) stated that there are significant differences in the use of instructional technology among the subjects; English, math, and science. The study was limited to three subjects; therefore, further research that explores more subjects is needed. According to another study, the subject that gained the most attention for technology integration was English Language Arts (Hsu, 2016). In this mixed-methods study, the author surveyed 152 K to 6 teachers in the Midwestern United States and observed 8 teachers in their classrooms to examine their current beliefs, practices, and barriers

concerning the effective integration of technology (Hsu, 2016). One of the findings indicated that English Language Arts teachers were the ones who integrated the technology the most.

As a result, there are various outcomes of studies that explore the impact of subjects taught in technology integration. The findings of this study might be helpful in closing that gap as the participating teachers were the teachers of many different subjects that include art, music, and foreign language to name a few. Regardless of the subjects taught, there are different factors such as teacher readiness and teacher beliefs that have a direct impact of the integration of technology in today's classrooms (Howard et al., 2015).

Grade-Level Taught

The literature indicates that the researchers have been exploring the relationship between the teachers' grade level taught and their concerns as opposed to their amount of technology integration in the classrooms. One of the few studies that explored the relationship between teachers' grade level taught and technology integration has results that show upper level teachers have more problems with the access and time for technology integration than lower level teachers (Hechter & Vermette, 2013). However, having time to implement technology in their classes, technological support, and access to technology does not automatically mean teachers will use technology effectively in their classrooms (Ertmer et al., 2012) Additionally, a recent study's findings indicated that, secondary school teachers' grade level taught has relationships with their technology integration (Gil-Flores et al., 2017). In this study, the authors used the data from an

international study that was conducted by OECD and consisted surveys of 3339 teachers from 192 secondary schools of Spain. Information and communication technology (ICT) infrastructure of the schools and teacher characteristics to explain the use of ICT in the classrooms were explored in this study. One of the outcomes indicated that male teachers who taught the highest grades had greater ICT use in the classrooms (Gil-Flores et al., 2017). As seen in the outcomes, the results were limited to male teachers; therefore, further investigation that explores the relationship between the grade-level taught and technology integration of the teachers was needed. In this study, I explored the relationship between elementary, middle, and high school teachers and their levels of blended learning adoption.

Teaching Strategy

Laferrière, Hamel, and Searson (2013) listed student-centered teaching as one of the factors that helps the teachers integrate technology effectively in classrooms. This constructivist approach is usually implemented by teachers, in accordance with their social background and is associated with their teaching strategies (Ritzhaupt, Dawson, & Cavanaugh, 2012). Therefore, a student-centered approach as a teaching strategy is essential and a key factor for an effective implementation.

The use of flexible, competency-based and student-centered educational models are increasing in online and blended learning schools as they are pillars for an effective technology integration (Ritzhaupt et al., 2012). Additionally, student-centered learning promotes personalization along with encouraging students to become independent learners who own their work (Pulham & Graham, 2018). Sang, Valcke, van Braak,

Tondeur, and Zhu (2011) identified two types of teachers; traditional teachers who were using teacher-centered approach during the delivery of instruction and constructivist teachers who embraced student-centered approach and used it in their daily instruction. According to the authors, constructivist teachers were more likely able to integrate technology effectively compared to the teachers who use teacher-centered strategies (Sang et al., 2011). Teachers should quit using their traditional teacher-centered teaching strategies and adopt student-centered approach in their instruction delivery process for the betterment and effectiveness of the technology integration in their classrooms (Kessler & Haggerty, 2010). It was also indicated in one of the findings that the teacher trainings should be contextualized for them to integrate technology in a constructionist approach (dos Santos, Schlünzen, & Junior, 2016). As a result, providing trainings and professional developments that promote student-centered teaching strategies plays a key role in preparing the teachers for effective implementation of technology integration. As the teaching strategy was one of the independent variables, the outcomes of this study might contribute to the research that explores the relationship between the teachers' teaching strategy and technology integration.

Experience With Instructional Technology

The teachers who have more experience with instructional technology tend to adopt student-centered teaching strategies and use them effectively (An & Reigeluth, 2011). The findings of two studies indicated that a teacher's experience with technology significantly influences the effective implementation of technology integration in the classroom (Buabeng-Andoh, 2012; Liu et al., 2017). Martin (2011) identified teachers in

two groups; digital immigrants and digital natives. According to the author, digital immigrants had similar years of technology experience before starting their career as teachers. Additionally, digital natives were less familiar with technology resources than the digital immigrants (Martin, 2011). According to a recent study, experience with instructional technology is associated with the effective use of technology in classrooms (Gil-Flores et al., 2017).

Liu et al. (2017) designed and tested a K to 12 technology integration model that included the teachers, school related variables, and mediating factors such as confidence and comfort with the use of technology. In the study, 1235 K to 12 teachers who were employed in 336 different schools across the state of Florida were surveyed to provide their demographic information that included gender, ethnicity, highest college degree, subjects taught, and which grade-level they teach. Additionally, participating teachers were asked for their teaching experience, teaching environments, experience with instructional technology, and average student numbers in their classes. According to the results, teachers' instructional technology experience is positively correlated with technology integration in the classrooms (Liu et al., 2017).

Duration of Professional Development

Professional development and training are key factors for effective technology integration and blended learning implementation. However, most of the time, educators are required to implement technology integration without the proper training (Downes & Bishop, 2012). One of the key components of successful blended learning implementation in secondary schools is the proper teacher training (Gorozidis &

Papaioannou, 2014; Hilliard, 2015). Additionally, lack of proper training is listed as one of the reasons why the use of technology is not meeting the academic needs of the learners (Hsu, 2016; Ruggiero & Mong, 2015).

The outcomes of a study indicated that, the participating teachers listed lack of in-service training as a barrier to effective technology integration in today's classrooms (Ruggiero & Mong, 2015). In this study, the authors surveyed 1048 K to 12 teachers in from more than 100 different school corporations in one of the Midwestern states of the United States. The teachers were asked six questions about classrooms technology tools and professional development regarding technology integration. Additionally, 111 of the survey takers were interviewed by the authors as a follow up. The results of this study suggested that the professional development that the teachers receive should be restructured on the strategies for more contextualized technology integration (Ruggiero & Mong, 2015). As the duration of training was one of the independent variables, the outcomes of this study might contribute to the research that explores the relationship between the teachers' duration of training and technology integration.

Summary and Conclusions

The major themes which have been identified in the literature review are connections between technology integration and:

- years of experience (Blackwell et al., 2014; Cox, 2013; Gil-Flores et al., 2017; Hao & Lee, 2015; Karaca et al., 2013; Liu et al., 2017)
- level of college education (Brunk, 2008; Cetinkaya, 2012; Diep et al., 2017; Hsu, 2016; Inan et al., 2010; Stammen & Aronson, 2008; Yang & Huang, 2008)

- subject taught (Howard et al., 2015; Hsu, 2016)
- grade level taught (Ertmer et al., 2012; Gil-Flores et al., 2017; Hechter & Vermette, 2013)
- teaching strategy (dos Santos et al., 2016; Kessler & Haggerty, 2010; Laferrière et al., 2013; Pulham & Graham, 2018; Ritzhaupt et al., 2012; Sang et al., 2011)
- experience with instructional technology (An & Reigeluth, 2011; Buabeng-Andoh, 2012; Gil-Flores et al., 2017; Liu et al., 2017; Martin, 2011)
- duration of training (Downes & Bishop, 2012; Gorozidis & Papaioannou, 2014; Hilliard, 2015; Hsu, 2016; Ruggiero & Mong, 2015).

The literature review in this chapter has also focused on CBAM as theoretical framework. The dimensions of CBAM and use of those dimensions in different research studies were reviewed. As none of the three tools of CBAM is appropriate for this study, LoA as a data gathering instrument which is a different version of LoU has been introduced. The knowledge of LoA instrument was extended as it has not been used for the blended learning as an educational innovation. Also, this study might fill a gap in the literature as the research pertaining to the characteristics of teachers and their impact on the level of blended learning adoption is limited.

Additionally, the literature review of this chapter has provided adequate information about the CBAM as the theory, research that explored the characteristics of the teachers and technology implementation in addition to the blended learning. Additionally, the data gathering instrument, LoA, has been introduced. The following chapter details the methods that were used in this study.

Chapter 3: Research Method

Introduction

The purpose of this quantitative survey study was to explore the relationship between selected characteristics of teachers and the levels of blended learning adoption in STEM-focused charter schools. The selected characteristics of the teachers were years of experience, the highest level of college education, subjects taught, grade level taught, teaching strategies, experience with instructional technology, and duration of professional development. Possible relationships between the levels of blended learning adoption and the aforementioned characteristics of the participating teachers were explored.

This chapter provides detailed information regarding the methodology of this study. The specifics of the CMO, including the schools, participating teachers, data collection strategies, data analysis, and the instrument that was used for the data collection are introduced. Additionally, threats to validity along with the ethical procedures are discussed in this chapter.

Research Design and Rationale

The independent variables for this quantitative, nonexperimental survey study were participating teachers' years of experience, the highest level of college education, subjects taught, grade levels taught, teaching strategy, experience with instructional technology, and duration of professional development. The dependent variable of this study was the level of blended learning adoption.

The nonexperimental quantitative survey research design was employed in this study as it aligned with the research questions. The relationship between the selected

characteristics of teachers and the levels of blended learning adoption in STEM-focused charter schools was explored in this study. As in quantitative studies, the researcher examines the relationships among identified variables by using a measurement (McCusker & Gunaydin, 2015). A quantitative research method was the most appropriate in attaining the research objectives and answering the research questions of this study. I collected measurable data from the surveys that included forced-choice closed questions, and the data were analyzed through numerical comparisons; as a result, a quantitative approach was the most suitable method to answer my research questions.

In order to examine the relationship between the selected characteristics of teachers and their levels of blended learning adoption, the survey data were analyzed using Kruskal-Wallis H and chi square tests. Ordinal regression analysis was used to determine whether one or more of the selected teacher characteristics predicted the level of blended learning adoption. Additionally, descriptive statistical procedures were used to present the selected characteristics of teachers as well as their levels of blended learning adoption.

Methodology

This section contains information of the selected population, sampling, sampling procedures, sample size, procedures for recruitment, instrumentation, threats to validity, and summary. This study had the target population that consisted of teachers from 10 different STEM-focused charter schools that were located in underserved areas Southern California. The permission for data collection was obtained from the chief executive officer (CEO) of the CMO who operated the aforementioned schools. As the researcher, I

additionally sought the support from the administrators in each school to make sure the number of participating teachers was high enough to better represent the population.

Population

The target population for this study consisted of the teachers who were working for the CMO that was operating 10 STEM-focused charter schools located in Southern California. There were approximately 211 full-time credentialed teachers teaching approximately 3,800 students in those schools during the 2019-2020 school year. As the target population was relatively small, the sample population for this study was a census sample of all K to 12 teachers (N = 211) of the CMO. The number of teaching staff working in those 10 schools ranged from nine to 32.

Sampling and Sampling Procedures

In this research study, I explored the relationship between selected characteristics of the teachers (independent variables) and levels of their blended learning adoption (dependent variable) in STEM-focused charter schools. As a result, the population for this study consisted of the teachers who were teaching in the academic year of 2019-2020. The nonteaching faculty and staff, such as administrators, Title I coordinators, psychologists, and office personnel, were excluded from the study as they were not teaching in the classrooms. I sought assistance from the deans and principals of the schools to increase the number survey participants by attending their monthly meetings. Upon receipt of Walden IRB approval, all of the teaching staff members were surveyed; therefore, this became a census sample. The staff directory for each school was obtained, and the teachers' email addresses were used to distribute the survey. I emailed the

electronic survey to each of the faculty members of the schools. However, the principals and academic deans were informed prior to the delivery of the survey to make sure that they were aware beforehand. As the researcher, I attended one of the monthly meetings conducted for the principals and academic deans to introduce this study and the purpose. The principals and academic deans mentioned about the upcoming electronic survey in their weekly staff meetings; therefore, the teachers were aware of the survey that they would receive in their emails soon. This helped increase the participation and meaningful involvement by the teachers while they were taking the survey. The teachers were also informed in advance that the participation for the survey was voluntary and anonymous.

Sample Size

According to Tabachnick and Fidell (2006), the minimum sample size for ordinal logistic regression analysis should be calculated with a ratio of one predictor variable to 10 respondents. Dattalo (2018) arrived at a parallel conclusion and suggested the same ratio for sample size calculations in ordinal and Cox regression analyses, which is 10 observations per parameter. In this study, I had seven predictor (independent) variables; therefore, the recommended sample size was calculated as 70. On the other hand, Wright (1995) suggested that a minimum sample size calculation should be based on a ratio of 50 respondents per predictor variable. A minimum sample size of 350 could not be obtained for this study as the total number of teachers who were asked to participate in the LoA survey was 211. Tabachnick and Fidell (2007) also suggested that if the sample size is fewer than 100, statistical power may be low, regardless of the participant-to-variable ratio. As the number of predictors was large and the sample size was small, it was

essential to have more participants to achieve statistical validity. Hair, Black, Babin, Anderson, and Tatham (1998) emphasized the key role of sample size in the outcomes' generalizability and stated that there should be at least 15 to 20 observations per predictor variable. As a result of the aforementioned discussion, the sample size calculation was based on a ratio of 15 respondents per predictor variable as Hair et al. suggested. Results from the calculations suggested employing a minimum sample size of at least 105. This number also fell in the interval that was suggested by Tabachnick and Fidell (2007).

Procedures for Recruitment, Participation, and Data Collection

Before applying for approval from the institutional review board (IRB), I contacted the home office of the schools that were the focus of this study. I presented this study's problem statement, purpose, data collection instrument, and potential benefits for the organization in a PowerPoint to the executive team. After a week from the date of presentation, I obtained a letter of cooperation (see Appendix B) from the CEO. As soon as my doctoral committee approved the proposal of this study, IRB permission was granted.

After the approval was obtained from the IRB, I started to recruit teachers. Recruiting procedures for this study involved collecting the email addresses of the full-time teachers who were working for the schools of the CMO. Google Forms were used to distribute the survey via email accounts of the teachers. As the outcome of a sample size calculation indicated that I needed at least 105 participants, I communicated with the administrators of the schools by attending their monthly meetings in order to have a high response rate for the survey.

The data collection for this study involved an electronic survey (see Appendix C) that was sent to the teachers' email addresses. The survey was created using Google Forms and distributed via school emails of the teachers. At the front of the survey, the participants were provided informed consent which explained that survey participation was voluntary and anonymous. Additionally, the survey takers were informed about their rights as participants. The survey link had public access that did not require a teacher to log in to school email in order to take it. As a result, the participants did not need a Google email account in order to have access to the survey. From the time that the teachers were sent an email that included a link to the survey, they were given 1 week to complete and submit the survey. After 1 week, I sent a friendly reminder email to thank the teachers who completed the survey and to extend the survey for 5 days for the teachers who did not yet take the survey. While taking the survey, the teachers responded to the questions that asked their years of experience, the highest level of college education, subjects taught, grade level taught, teaching strategy, experience with instructional technology, and duration of professional development. After responding to the questions that collected data regarding the selected characteristics, teachers took the LoA questionnaire. The LoA had nine descriptors (see Appendix A) to identify the level of blended learning adoption. The respondents chose one of those nine descriptors using the radio buttons. By taking the LoA questionnaire, teachers self-assessed themselves on the level of blended learning adoption.

As the survey was created using Google Forms, the data that were obtained from the surveys were provided in a spreadsheet. The spreadsheet was kept in password

protected Google Drive that is a cloud-based storage. Additionally, I downloaded the spreadsheet that included the responses of the participating teachers as a Microsoft Excel document, and the data were transferred to SPSS for analysis. The data will be kept for a period of five years, per the requirements of the Walden University.

Instrumentation and Operationalization of Constructs

The interview tool for data collection was the LoA survey developed by Orr and Mrazek (2010). Permission was secured via email to use and modify the LoA survey (see Appendix D). The survey was created using the concepts and components of the LoU and SoC tools of the CBAM (see Orr & Mrazek, 2010). The primary difference between the LoU and LoA surveys is that the LoU has been used as a diagnostic instrument to assess the change process using an interview protocol (Hall & Hord, 1987) while the LoA has been used as a tool to assess the adoption of innovations in educational technology (Orr & Mrazek, 2010). Additionally, the LoA survey allows the participants to self-reflect on the adoption and implementation of the innovation; however, the LoU survey assists the researcher in describing the behaviors of participating adopters rather than affective attributes (Hall et al., 1975; Orr & Mrazek, 2010). The theoretical framework section of Chapter 2 has further information of the differences between the LoU interview protocol and the LoA survey as the data collection tool.

The LoA survey was developed as a self-reflective and self-reporting instrument to reflect the CBAM by Orr and Mrazek (2010). Similarly, the theoretical base for this study was also CBAM as it assisted me in evaluating the teachers' blended learning implementation (Hall et al., 2011). The LoU tool of CBAM is described as an interview

protocol that assists the researchers in measuring the teachers' actions in eight behavioral profiles along a continuum of use (Hall et al., 2013). Different than the LoU tool, the LoA does not include a protocol of interview; instead, the participants use self-reflection with a different format (Orr & Mrazek, 2010). As a result, the LoA surveys include radio buttons and check boxes to have the participants self-assess themselves as opposed to choosing a number to provide the level of use in the LoU interview forms. Orr and Mrazek also changed the format of the LoA survey to have a nominal description of the state of the teachers' innovation usage rather than having a hierarchical progression.

In the process of developing the LoA survey, Orr and Mrazek (2010) conducted a pilot study with the use of the LoA as the data collection instrument. Initially, the LoA survey included eight descriptors for the participants' use in their self-assessment of the innovation use. After obtaining the outcomes of the study, considering additional literature related to adoption of innovation and receiving feedback from their colleagues, the two authors decided to increase the number of descriptors from eight to nine; therefore, the LoA survey that was used as the data collection instrument consisted of nine descriptors (See Appendix A). Additionally, those nine distinct levels were scaffolded onto three major categories of adoption; no or limited knowledge / do not use blended learning for the level one, two, and three, knowledgeable / do not use blended learning for the levels of five, six, and nine, and knowledgeable / use blended learning for the levels of four, seven, and eight. After providing their demographic and technographic information, the participating teachers were able to choose one of those levels of blended learning adoption in order to self-assess themselves. My study included the LoA survey

in addition to several demographic and technographic questions. The questionnaire can be found in Appendix C.

After receiving approval from the IRB, I started to collect the data of participating teachers using the LoA online survey. The collected data were imported to SPSS software for analysis. For the first research question that included the independent variables, descriptive statistics were obtained from the SPSS software to present the selected characteristics of the teachers as well as their levels of blended learning adoption. Additionally, I used Kruskal-Wallis H and chi square tests to compare the mean score of the difference in the levels of blended learning adoption based upon teachers' years of experience, highest level of college education, subject taught, grade level taught, teaching strategy, experience with instructional technology, and duration of professional development. Lastly, I conducted an ordinal regression analysis in SPSS to determine whether one or more of the selected characteristics of the teachers predicted the level of blended learning adoption.

Operationalization

In this quantitative study, there were seven independent variables that might predict the level of blended learning adoption. The between-group differences between participating teachers in terms of their selected characteristics and the level of blended learning adoption were explored by the first research question. The second research question sought an answer to determine if one or more of the selected characteristics of the teachers predicted the level of blended learning adoption. Below are the research questions I looked to answer.

RQ1: Are there between-group differences between participating teachers in terms of their selected characteristics (years of experience, highest level of college education, subject and grade level taught, teaching strategy, experience with instructional technology, and duration of professional development) and their levels of blended learning adoption, as measured by the LoA survey?

RQ2: Do one or more of the selected teacher characteristics (years of experience, highest level of college education, subject taught, grade-level taught, teaching strategy, experience with instructional technology, and duration of professional development) predict the level of blended learning adoption?

All of the aforementioned independent variables were operationalized through the use of the LoA survey items as follows:

Years of experience: Years of experience of a participating teacher was an ordinal variable that was operationalized as the participating teachers' years of teaching experience. The data were obtained in the following groups; Group 1: 0 to 4 years, Group 2: 5 to 10 years, and Group 3: More than 10 years.

Highest level of college education: Highest level of college education was an ordinal variable that was operationalized as the survey takers' highest college degree. It was obtained as the following groups; Group 1: Bachelor's, Group 2: Master's, Group 3: Education Specialist, Group 4: Doctorate, and Group 5: Post-doctorate.

Subject taught: Subject taught was operationalized as a nominal variable with the following categories: Group 1: English Language Arts, Group 2:

Mathematics, Group 3: Science, Group 4: History, Group 5: Foreign Language, Group 6: Arts, Group 7: Computer, Group 8: Physical Education, Group 9: Special Education, and Group 10: Elementary Level (multiple subjects).

Grade level taught: Grade level taught was operationalized as a nominal variable with the following categories: Group 1: Elementary school, Group 2: Middle school, and Group 3: High school. If a participating teacher was teaching in more than one setting, the teacher chose one of them based on the number of classes that were taught in each setting.

Teaching strategy: Teaching strategy was operationalized as a nominal variable with the following categories: Group 1: Student centered, Group 2: Teacher centered, and Group 3: Both student centered and teacher centered.

Experience with instructional technology: Experience with instructional technology was an ordinal variable that showed years of involvement with instructional technologies. The data were obtained in the following groups; Group 1: 0 to 4 years, Group 2: 5 to 9 years, and Group 3: 10 or more years.

Duration of professional development: Teachers were provided professional development and trainings on certain topics and needs throughout the year. Duration of professional development for a participating teacher was an ordinal variable that was operationalized as the participating teachers' hours of blended learning training. The data were collected in the following groups; Group 1: 0 to 1 hour, Group 2: 2 to 4 hours, and Group 3: 5 or more hours.

The dependent variable for this study was the levels of blended learning adoption which was an ordinal variable. The dependent variable was measured by the LoA survey that was delivered to the participants in an email. The LoA survey was created with the foundational bases of LoU and the SoC dimensions of CBAM (Orr & Mrazek, 2010). The LoA survey had nine descriptors to identify the level of blended learning adoption. The respondents chose one of those nine descriptors using the radio buttons. Additionally, those nine distinct levels were be scaffolded onto three major categories of adoption: no or limited knowledge (do not use blended learning) for the levels one, two, and three, knowledgeable (do not use blended learning) for the levels of five, six, and nine, and knowledgeable (use blended learning) for the levels of four, seven, and eight.

Data Analysis Plan

In this study, I explored the relationship between selected characteristics of teachers and the levels of blended learning adoption. I employed non-parametric data analyses to explore whether the selected teacher characteristics had any type of relationships with the levels of blended learning adoption. This design was appropriate as I was aiming to identify relationships among independent and dependent variables and to explain and predict outcomes at one period in time or over time (Tienken et al., 2017). The descriptive statistics assisted me in establishing associations between the variables that were measured once. Additionally, descriptive statistics helped reveal patterns in the data (Babbie, 2010; Lodico et al., 2010). Kruskal-Wallis H and chi square tests were used to examine the relationship between selected teacher characteristics and the levels of blended learning adoption. Lastly, ordinal regression analysis was conducted in SPSS to

determine whether one or more of the selected teacher characteristics predicted the level of blended learning adoption.

In terms of data analysis, I used the following tests; Kruskal-Wallis H, chi square, and ordinal regression. For the four of the ordinal level independent variables; years of teaching experience, highest level of college education, experience with instructional technology, and duration of professional development, I used Kruskal-Wallis H non-parametric test as the ordinal (non-normally distributed) data were suitable for the Kruskal-Wallis H test (McKight & Najab, 2010). Additionally, Kruskal-Wallis H test was used when the data values were ranked in an increasing order (see Ali & Bhasar, 2016). The nominal level independent variables; subject taught, grade-level taught, and teaching strategy were analyzed with chi square test as it was appropriate to analyze the nominal level data (Ali & Bhasar, 2016). Finally, I conducted an ordinal regression analysis to determine whether one or more of the selected teacher characteristics predicted the level of blended learning adoption. Ordinal regression analysis was used when the dependent variable and predictors had an ordinal level of measurement (see Febrilia, Rahayu, & Korida, 2019).

Below are the research questions for this study followed by the null and alternate hypotheses for each question:

Research Questions and Hypotheses

RQ1: Are there between-group differences between participating teachers in terms of their selected characteristics (years of experience, highest level of college education, subject and grade level taught, teaching strategy, experience with instructional

technology, and duration of professional development) and their levels of blended learning adoption, as measured by the LoA survey?

$H_0$1: There is no between-group difference between participating teachers in terms of their selected characteristics (years of experience, highest level of college education, subject and grade level taught, teaching strategy, experience with instructional technology, and duration of professional development) and their levels of blended learning adoption, as measured by the LoA survey.

$H_1$1: There are between-group differences between participating teachers in terms of their selected characteristics (years of experience, highest level of college education, subject and grade level taught, teaching strategy, experience with instructional technology, and duration of professional development) and their levels of blended learning adoption, as measured by the LoA survey.

RQ2. Do one or more of the selected teacher characteristics (years of experience, highest level of college education, subject taught, grade-level taught, teaching strategy, experience with instructional technology, and duration of professional development) predict the level of blended learning adoption?

$H_0$2: None of the selected teacher characteristics (years of experience, highest level of college education, subject taught, grade-level taught, teaching strategy, experience with instructional technology, and duration of professional development) predict the level of blended learning adoption.

$H_1$2: One or more of the selected teacher characteristics (years of experience, highest level of college education, subject taught, grade-level taught, teaching strategy,

experience with instructional technology, and duration of professional development) predict the level of blended learning adoption.

Threats to Validity

In this study, I aimed to assist the CMO in reshaping its academic structure to explore the use of blended learning and developing an efficient professional development plan to train the teachers on how to implement blended learning strategies effectively. Additionally, creating a community of professionals to achieve one goal that was the increased use of effective blended learning was the key for a successful adoption. As a result, the LoA survey was used to evaluate the adoption of the blended learning, not to evaluate the participating teachers. The respondents were notified at the beginning of the survey that the responses would be anonymous. Also, the survey takers were informed about the survey prior to the delivery of it by the principals and academic deans of the schools. Consequently, there could have been teachers who would voice disinterest in the use of blended learning by selecting a low-level of use. Those aforementioned efforts minimized the threats to validity of the study.

The LoA survey that was used as the data collection tool for this study included identical radio buttons for the self-reflection section that measured the level of blended learning use. The radio buttons were placed on the left sides of the nine different descriptors. Since the radio buttons were used, the respondents were able to select only one option. The accuracy of this survey would depend on the accuracy of the respondents; therefore, it was essential to present the survey instrument and administer it carefully to minimize the possible threats to the construct and content validity.

The LoA survey was developed as a self-reflective and self-reporting instrument to collect the data of use of an educational innovation or tool (Orr & Mrazek, 2010). Since the participating teachers selected their level of blended learning use by choosing one of the nine options from the radio buttons, it might have been subjective and biased as they were the ones who chose their level of use. Teachers could also have a misperception for the study and the outcomes of it which could result to be a threat to internal validity. It was essential for the respondents to provide objective data pertaining to the blended learning use level. To be able to minimize the subjective and biased self-reflections, it was important to inform the faculty and staff in advance about the purpose of the survey and the importance of the most accurate feedback in order to receive reliable data.

In order to increase the number of survey takers, I sought support from the administrators of the schools. I attended the monthly meetings conducted for the principals and the academic deans. Additionally, I visited the staff meetings of each school or communicated with the administrator who ran the meeting to provide necessary information about the study and survey in detail. Also, it was essential to keep the time short that was spent to take the surveys. It took approximately 5 to 10 minutes to complete the survey. The questions and responses were kept simple and short to in order to increase the response rate (see Dziuban et al., 2016). Also, the increased number of survey takers did not limit the generalizability of the study.

Ethical Procedures

I completed the training by Collaborative Institutional Training Initiative (CITI) on ethical treatment of human subjects in research (See Appendix E). I abode by the guidelines in all interactions with the participants of this study.

I gained approval to conduct the study and permission to collect data from the CEO and superintendent of the CMO of the schools that were the focus of this study. The letter of cooperation is available in the appendices section (See Appendix B). The email addresses of the potential participating teachers were obtained from the home office of the CMO. The teachers received an email that included the purpose of the study, potential benefits, and appreciation of the researcher for being part of the study. Additionally, the link to the survey was shared in the email for the participating teachers.

The survey link took the participants to the consent form which explained that survey participation was voluntary and anonymous. Additionally, the survey takers were informed about their rights as participants. After viewing the consent form and selecting the option to participate in the study, the teachers were able to take the survey. The survey was delivered as a Google form; however, it did not require them to login to their school emails. This gave assurance to the teachers that I, as the researcher, was not able to know who participated in the survey.

The data that were collected in the survey were limited to the participating teachers' years of experience, highest level of college education, subject and grade level taught, teaching strategy, experience with instructional technology, and duration of professional development. Therefore, no identifiers such as name, age, gender, contact

information, and name of the school were collected to protect the privacy of the participants. The data that were retrieved from the survey results were downloaded and stored for a five-year period. As the survey was created as a Google form, the responses to the survey questions were kept in a password-protected file.

Since I was working in one of the campuses of the CMO which was the focus of this study, this might raise an ethical concern. However, as the participation was voluntary and anonymous, none of the administrators including myself and home office personnel were able to identify the survey takers. My role during the data collection process was informing the potential participants that I, the researcher, would not know who took the survey and who did not. This helped me establish a non-coercive environment for the survey takers. My research was overseen by my chair, methodologist, university research reviewer (URR), and IRB of the Walden University before I initiated the data collection process. The approval notice to collect the data from Walden University's IRB was received on January twenty eighth of 2020. The IRB number for this study is 01-28-20-0482694.

Summary

This chapter of the study provided information and included a plan for the research design and rationale, the population, selection of the sample, variables, instrumentation, details of the LoA survey, and threats to validity. The reasons for the selection of the non-experimental quantitative survey design with the rational were provided. Additionally, independent and dependent variables were defined, and research questions were listed. The methodology section of this chapter included detailed

information about the population of the study. Sampling, sampling procedures, and sample size of the study were also described in this chapter. Finally, the instrument for the data collection was introduced with its developmental process and evolution. This chapter concluded with the threats to validity of the study. The internal threats and threats to construct and content of the study were described. The following chapter, Chapter 4, has in depth analysis of the data and presentation of the outcomes.

Chapter 4: Results

Introduction

The purpose of this quantitative survey study was to explore the relationship between selected characteristics of teachers and the levels of blended learning adoption in STEM-focused charter schools. The station-rotation model of blended learning was the focus as the CMO promotes and encourages station-rotation model in its campuses. The population of this study consisted of 211 content teachers who were working for the CMO on 10 different campuses located in underserved areas of Southern California. Nonteaching staff were not included in the population; as a result, they were not emailed the blended learning questionnaire. The CBAM was the theoretical framework for this study as it provided tools to understand and address the concerns, perceptions, and attitudes of individuals who are in the process of implementation of an educational innovation (see Hall et al., 1975). For this study, a station-rotation model of blended learning was considered as the educational innovation. As the three components of the CBAM, SoC, IC, and LoU, assist the researchers in addressing the changes of adopting individuals, LoU has a specific focus on the teachers who are in the process of adopting an educational innovation (Newhouse, 2011). However, LoU was not used in this study. Instead, an instrument called LoA was used as it allowed the participating teachers to self-reflect on the levels of blended learning adoption.

In this study, I explored the relationship between selected teacher characteristics and level of blended learning adoption with the following research questions followed by the corresponding hypotheses:

RQ1: Are there between-group differences between participating teachers in terms of their selected characteristics (years of experience, highest level of college education, subject and grade level taught, teaching strategy, experience with instructional technology, and duration of professional development) and their level of blended learning use, as measured by the LoA survey?

$H_0$1: There is no between-group difference between participating teachers in terms of their selected characteristics (years of experience, highest level of college education, subject and grade level taught, teaching strategy, experience with instructional technology, and duration of professional development) and their level of blended learning use, as measured by the LoA survey.

$H_1$1: There are between-group differences between participating teachers in terms of their selected characteristics (years of experience, highest level of college education, subject and grade level taught, teaching strategy, experience with instructional technology, and duration of professional development) and their level of blended learning use, as measured by the LoA survey.

RQ2: Do one or more of the selected teacher characteristics (years of experience, highest level of college education, subject taught, grade-level taught, teaching strategy, experience with instructional technology, and duration of professional development) predict the level of blended learning use?

$H_0$2: None of the selected teacher characteristics (years of experience, highest level of college education, subject taught, grade-level taught, teaching strategy,

experience with instructional technology, and duration of professional development) predict the level of blended learning use.

$H_1 2$: One or more of the selected teacher characteristics (years of experience, highest level of college education, subject taught, grade-level taught, teaching strategy, experience with instructional technology, and duration of professional development) predict the level of blended learning use.

This chapter includes the data collection process, which consists of time frame, recruitment of the participating teachers, descriptive statistics about the participants, and response rates. Next, I present the results for each research question. Additionally, the data analysis process to explore the relationship between the independent variables and dependent variable are further explained. A paragraph for each characteristic of the participating teachers is designated to present the Kruskal-Wallis H and chi-square tests, if there is any relationship, and possible post hoc tests for the type of relationship. Finally, the outcomes of the ordinal logistic regression are presented to show if one or more of the independent variables predicts the level of blended learning adoption. Tables for the statistical results are provided for a better understanding of the outcomes. I conclude the chapter with a summary of the descriptive statistics and outcomes of the Kruskal-Wallis H and chi-square tests, post hoc tests, and ordinal logistic regression. I also include the answers to the research questions. Additionally, a transition into Chapter Five is located at the end of the chapter.

Data Collection

The approval notice to collect the data from Walden University's IRB was received on January 28, 2020. The IRB number for this study is 01-28-20-0482694. After obtaining the IRB approval from Walden, 211 teachers who were working for the CMO for the academic year 2019-2020 were sent the email that included a welcome letter, consent form, and blended learning adoption questionnaire, including the LoA survey at the end. Participating teachers answered the first seven questions that asked about their demographic and technographic characteristics. After answering those questions, teachers were asked to self-assess themselves on the adoption of blended learning measured by the LoA survey. The time frame for data collection was 2 weeks, 1 week for the questionnaire, and another week for the teachers who did not get to complete the survey. At the end of the first week, all of the teachers received a friendly reminder email that stated they had a week for the completion of the questionnaire.

Per the sample size calculation that was further explained in the Chapter 3, I needed at least 105 participants. At the end of the first week, I obtained 86 completed surveys (41%). After a friendly reminder email was sent, I received 28 more surveys (13%); as a result, the total number of respondents was 114 (54%). This was nine more than the minimum participant requirement identified by the sample size calculation. The initial questionnaire email was sent on Friday, January 31, 2020. The friendly reminder email was sent 1 week after on Friday, February 7, 2020. The data collection process ended on Friday, February 14, 2020. After that date, I closed the questionnaire and

downloaded the responses as a protected Excel file and saved it for the data analysis phase of the study.

Data Preparation

The data collection process took 2 weeks. At the end of the 2-week data collection period, a total of 114 responses was obtained. That was a rate of approximately 54%. The minimum number of completed surveys was calculated as 105, this was nine more than the targeted number of responses.

The questionnaire had seven questions about demographic and technographic characteristics of the teachers followed by a LoA survey. The LoA had nine descriptors for the participating teachers to self-assess with the level of blended learning adoption. Per the nature of the questionnaire, there were not any incomplete surveys as the tool did not allow the participants to proceed without responding to all of the questions. As a result, none of the submitted surveys was incomplete. Additionally, it was not possible for the respondents to input an invalid choice as all of the provided choices were by either radio button or drop down.

Descriptive Statistics

Participating teachers were asked to enter the years of their teaching experience. The results were placed into the following three groups; Group 1: 0 to 4 years, Group 2: 5 to 10 years, and Group 3: more than 10 years. All of the participants provided data for this question as the survey did not allow them to proceed without responding to this question as well as the other questions. According to the outcomes, the CMO has 37.7% of respondent teachers with more than 10 years of teaching experience. This is

approximately 10% more than the respondent teachers with 0 to 4 years of teaching experience. Additionally, respondent teachers with more than 10 years of experience were 3% more than the respondent teachers with 5 to 10 years of experience. The statistics for years of teaching experience are displayed in Table 1.

Table 1

Years of Teaching Experience

Groups	Frequency	Percent
Group 1 (0 to 4 years)	31	27.2
Group 2 (5 to 10 years)	40	35.1
Group 3 (More than 10 years)	43	37.7
Total	114	100.0

One of the demographic characteristics of the teachers that was asked as the second question of the questionnaire was the highest level of college education. According to the outcomes, all of the participating teachers had at least a Bachelor's degree. This was expected, as one of the minimum requirements to teach in California is having a 4-year degree. The results indicated that 53% of the teachers held a Master's degree. Additionally, 4% of the respondents held an educational specialist degree. There were only three teachers with a doctoral degree, which was approximately 3% of the participants. The statistics for highest level of college education are displayed in Table 2.

Table 2

Highest Level of College Degree

Education	Frequency	Percent
Bachelor's Degree	46	40.4
Master's Degree	60	52.6
Education Specialist	5	4.4
Doctorate Degree	3	2.6
Total	114	100.0

The teachers answered the third question by choosing one of the content areas that was listed in the questionnaire. As seen in Table 3, the CMO has teachers in all of the areas. There are more English and math teachers compared to other content teachers. This is primarily because those courses are considered core classes. Additionally, none of the physical education teachers took the survey. As a result, this study and corresponding table do not include any statistical data related to physical education teachers. The statistics for subject taught are displayed in Table 3.

Table 3

Subject Taught

Subject	Frequency	Percent
Arts/Music	7	6.1
Computer	6	5.3
Elementary level (multiple subjects)	15	13.2
English language arts	18	15.8
Foreign language	8	7.0
History	15	13.2
Mathematics	21	18.4
Science	10	8.8
Special education	14	12.3
Total	114	100.0

The fourth question in the blended learning questionnaire asked for the grade-level taught of the participating teachers. As seen in Table 4, the participating teachers are mostly teaching in middle and high school campuses as the CMO has only two elementary schools. Per the student numbers in middle school campuses of the CMO, the majority of the participants were from the middle school campuses. The statistics for grade-level taught are displayed in Table 4.

Table 4

Grade-Level Taught

Grade level	Frequency	Percent
Elementary school	23	20.2
Middle school (junior high)	50	43.9
High school (high)	41	36.0
Total	114	100.0

Participants were also asked about their teaching strategy and were given three options: teacher-centered, student-centered, and both teacher-centered and student-centered. As seen in Table 5, the majority of the teachers chose both student-centered and teacher-centered approaches. Only 4% of teachers chose the teacher-centered approach. The statistics for teaching strategy are displayed in Table 5.

Table 5

Teaching Strategy

Strategy	Frequency	Percent
Both teacher-centered and student-centered	75	65.8
Student-centered	35	30.7
Teacher-centered	4	3.5
Total	114	100.0

Experience with the instructional technology was the sixth question in the questionnaire. Respondents were asked to enter the years of their experience with instructional technology in the survey. After the data collection was over, the results were placed into the following three groups: Group 1: 0 to 4 years, Group 2: 5 to 9 years, and Group 3: 10 or more years. The resulting sample weighted toward the participants with 5 to 9 years of experience. Twenty nine percent of the teachers reported 10 or more years of experience with instructional technology while 35 % of the participants reported 0 to 4 years of experience with instructional technology. The statistics for experience with instructional technology are displayed in Table 6.

Table 6

Experience With Instructional Technology

Experience with technology	Frequency	Percent
Group 1 (0 to 4 years)	40	35.1
Group 2 (5 to 9 years)	41	36.0
Group 3 (10 or more years)	33	28.9
Total	114	100.0

Finally, participating teachers were asked about the duration of blended learning professional development. The collected data were then recorded to three groups: Group 1: 0 to 1 hour, Group 2: 2 to 4 hours, and Group 3: 5 or more hours. Thirty one percent of the teachers reported that they received 5 or more hours of training. Thirty seven percent of the teachers were provided 0 to 1 hour of blended learning training. The rest of the participants, 32 % of the teachers, reported that they received 2 to 4 hours of blended

learning training. The statistics for duration of professional development are displayed in Table 7.

Table 7

Duration of Professional Development

Groups	Frequency	Percent
Group 1 (0 to 1 hour)	41	36.0
Group 2 (2 to 4 hours)	37	32.5
Group 3 (5 or more hours)	36	31.6
Total	114	100.0

The total number of participants was 114 which was slightly higher than 53% of the total population for this study. Per the nature of the measuring instrument, all of the questions were to be answered to be able to proceed in the survey. As a result, all of the participating teachers' entries were saved and used in the data analysis phase of this study. After answering the questions related to the characteristics, respondents were asked to self-assess themselves on the blended learning adoption levels. LoA was used as a tool for this process. The tool had nine descriptors and each descriptor was provided as a radio button. Table 8 has all of the descriptors in addition to the frequencies and percentages for each of them.

Table 8

Levels of Blended Learning Adoption

Categories	LoA descriptors	Frequency	Percent
No or limited knowledge / Do not use blended learning	I do not know enough about blended learning to determine whether or not it would be useful in my teaching.	10	8.8
	I know a bit about blended learning but did not have sufficient access to it to be able to incorporate its use in my teaching.	18	15.8
	I know enough about blended learning that I am preparing to use it in my teaching.	12	10.5
Knowledgeable / Do not use blended learning	I am quite knowledgeable about blended learning but did not have sufficient access to it to be able to incorporate its use in my teaching.	9	7.9
	I am quite knowledgeable about blended learning but did not think that it would be useful in my teaching.	7	6.1
	I no longer use blended learning in my teaching and have replaced its use with other strategies which will better meet my objectives for my teaching.	5	4.4
Knowledgeable / Use blended learning	I have used blended learning in my teaching and primarily focused on learning the skills necessary to use it properly and effectively.	20	17.5
	I used blended learning regularly in my teaching without much conscious thought and my use of it was fairly routine.	22	19.3
	I have collaborated with colleagues to develop ways in which we can use blended learning to better meet common instructional objectives and goals in our teaching.	11	9.6
	Total	114	100.0

Results

The results are reported in two sections. The first section includes the outcomes of the Kruskal-Wallis H and chi-square data analyses. The results of the two non-parametric tests indicated whether the selected teacher characteristics had any type of relationship with the level of blended learning adoption. Additionally, if there was a relationship, the post-hoc test results are displayed for each of the seven demographic and technographic characteristics. The outcomes of the data analyses for each teacher character are reported in a paragraph followed by a table retrieved from the SPSS software.

The second section of the results indicates the ordinal regression analysis results. Ordinal regression analysis was conducted to examine whether one or more of the independent variables predict the level of blended learning adoption. The outcomes of the ordinal regression analysis are reported and corresponding tables from the SPSS software are displayed in the second section of the results.

Statistical Assumptions

For the Kruskal-Wallis H test, there are four assumptions that need to be met in order to obtain valid results (Laerd Statistics, 2018). The independent variables should include two or more groups that are categorical and independent from each other. The second assumption is that the dependent variable should be measured at the ordinal level. Also, the observations should be independent. Lastly, the distributions in each group should have the same shape. The corresponding variables; years of teaching experience, highest level of college education, experience with instructional technology, duration of

professional development, and level of blended learning adoption of this study have met the listed assumptions so the Kruskal-Wallis H test will be employed.

For the chi square tests, Laerd Statistics (2018) lists two assumptions to be met in order to employ the tests. The first one indicates that the two variables should be measured at an ordinal or nominal level. The second assumption indicates that the two variables should have two or more categorical groups. The variables subject taught, grade-level taught, teaching strategy, and levels of blended learning adoption have met these assumptions. McHugh (2013) adds more specific assumptions for the chi square tests. According to the author, expected cell counts should be 5 or more in at least 80% of the cells and none of the cell counts should be less than one. It is difficult to meet this assumption if there are more than 20 cells in the chi square analysis (McHugh, 2013).

Laerd Statistics (2018) lists four assumptions to be met for an ordinal regression analysis. The first one indicates that the dependent variable should be measured at an ordinal level. Second assumption states that one or more independent variables should be continuous, categorical, or ordinal. The third assumption is there should not be any multicollinearity between the independent variables. The last assumption is having the proportional odds for the type of ordinal regression analysis used in this study. The aforementioned assumptions pertaining to the ordinal regression have been met.

Research Questions

The first research question asked “Are there between-group differences between participating teachers in terms of their selected characteristics (years of experience, highest level of college education, subject and grade level taught, teaching strategy,

experience with instructional technology, and duration of professional development) and their level of blended learning use, as measured by the Level of Adoption (LoA) survey?" Seven characteristics of the participating teachers; years of experience, highest level of college education, subject taught, grade-level taught, teaching strategy, experience with instructional technology, and duration of professional development were addressed in this research question. Kruskal-Wallis H test was employed to examine between-group differences between participating teachers' years of experience, highest level of college education, experience with instructional technology, and duration of professional development and their levels of blended learning adoption. The primary reason for the use of Kruskal-Wallis H was those four characteristics were ordinal variables and the data values were ranked in an increasing order. The nominal level independent variables; subject taught, grade-level taught, and teaching strategy were analyzed with chi square tests as those tests were appropriate to analyze the nominal level data. The results for the Kruskal-Wallis H and chi square tests for each characteristic of participating teachers are shown below.

Years of Experience

The respondents entered their years of experience and those entries were placed into three groups. A Kruskal-Wallis H test was conducted to examine between-group differences in levels of blended learning adoption by years of teaching experience. As presented in the Table 9, the Kruskal-Wallis H test revealed no significant difference in levels of blended learning adoption across three different groups of teachers years of experience, $\chi^2(2) = 3.651$, $p = 0.161$.

Table 9

Kruskal-Wallis H Test for Years of Experience and Levels of Blended Learning Adoption

	Years of experience	*N*	Mean rank	Kruskal-Wallis H	*df*	Asymp. sig.
LoA category	Group 1: 0 to 4 years	31	48.60	3.651	2	0.161
	Group 2: 5 to 10 years	40	61.28			
	Group 3: More than 10 years	43	60.41			
	Total	114				

Note. * $p > 0.05$.

Level of College Education

Respondents of the survey were asked to choose one of the following to indicate their highest level of college education; Bachelor's Degree, Master's Degree, Education Specialist, Doctorate Degree, and Post-doctorate Degree. None of the participating teachers chose the post-doctorate degree; as a result, it was omitted from the data analysis. As the data type was ordinal, a Kruskal-Wallis H test was conducted and the test revealed no significant difference in levels of blended learning adoption across four different groups of teachers' highest college degree, $\chi^2(2) = 3.326$, $p = 0.344$. The results are displayed in Table 10.

Table 10

Kruskal-Wallis H Test for Highest College Degree and Levels of Blended Learning Adoption

	Highest college degree	*N*	Mean rank	Kruskal-Wallis H	*df*	Asymp. sig.
LoA category	Bachelor's degree	46	53.02	3.326	2	0.344
	Master's degree	60	60.86			
	Education specialist	5	47.50			
	Doctorate degree	3	75.67			
	Total	114				

Note. * $p > 0.05$.

Subject Taught

Participating teachers were asked about their subject area in which they were teaching at the time of the research. The drop-down menu of options indicated the following content areas; English Language Arts, Mathematics, Science, History, Foreign Language, Arts, Computer, Physical Education, Special Education, and Elementary Level (multiple subjects). None of the respondents chose physical education as their content; as a result, that area was omitted from the data analysis. As the area of content was a nominal variable, a chi square test was conducted to examine the relationship between the subjects that the respondents are currently teaching and the teachers' levels of blended learning adoption. According to the outcomes of the chi square test, the relation between these variables was significant, $\chi^2(16, N = 114) = 29.535, p = .0021$. The results are displayed in Table 11.

Table 11

Chi-Square Test for Subject Taught and Levels of Blended Learning Adoption

	Value	*df*	Asymptotic significance (2-sided)
Pearson chi-square	29.535[a]	16	0.021
Likelihood ratio	33.867	16	0.006
N of valid cases	114		

a. 18 cells (66.7%) have expected count less than 5. The minimum expected count is 1.11.

As seen in the footnote section of the table above, 18 cells (66.7%) out of 27 cells had cell counts less than 5. One of the assumptions stated by McHugh (2013) indicated that at least 80% of the cells should have 5 or more counts. Additionally, it would be difficult to meet this assumption if there are more than 20 cells. The chi square test that was employed for the subject taught was inappropriate as it did not meet the assumptions. As a result, another chi square test needed to be employed with new variables.

Teachers were given nine content areas to choose from; English, math, science, history, art/music, computer, special education, foreign language, and elementary level (multiple subjects). In order to reconfigure the data to employ an appropriate chi square test, elementary level (multiple subjects) was eliminated from the subject taught dataset and the rest of the eight content areas were combined into two categories; core and non-core. The primary reason for the elimination of the elementary level (multiple subjects) was the fact that the elementary teachers of the CMO usually teach multiple subjects and I wanted to identify differences among subjects taught. Additionally, the level of elementary school teachers' blended learning adoption was already examined and

compared with middle and high school teachers in grade-level taught section of this chapter. As a result, another chi square test was employed with the following content area categories; core classes (English, math, science, and history) and non-core classes (art/music, computer, foreign language, and special education). Table 12 has all of the values.

Table 12

*Subject Taught * Level of Adoption Crosstabulation*

Subject taught		LoA category			
		1	2	3	Total
Core	Count	23	14	35	72
	% within subject taught	31.9%	19.4%	48.6%	100.0%
	% within LoA	74.2%	73.7%	71.4%	72.7%
	% of total	23.2%	14.1%	35.4%	72.7%
Noncore	Count	8	5	14	27
	% within subject taught	29.6%	18.5%	51.9%	100.0%
	% within LoA	25.8%	26.3%	28.6%	27.3%
	% of total	8.1%	5.1%	14.1%	27.3%
Total	Count	31	19	49	99
	% within subject taught	31.3%	19.2%	49.5%	100.0%
	% within LoA	100.0%	100.0%	100.0%	100.0%
	% of total	31.3%	19.2%	49.5%	100.0%

The outcomes of the chi square test indicated that, the relation between these variables was not significant, $\chi^2(2, N = 99) = 0.084$, $p = .959$. Table 13 has the results.

Table 13

Chi-Square Test for Subject Taught and Level of Adoption

	Value	*df*	Asymptotic significance (2-sided)
Pearson chi-square	.084[a]	2	0.959
Likelihood ratio	0.084	2	0.959
N of valid cases	99		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 5.18.

Grade-Level Taught

Respondents of the survey were given three options for their grade-level taught; elementary school, middle school, and high school. Additionally, if a participating teacher was teaching in more than one setting, the teacher would choose one of the options based on the number of classes that are taught in each setting. This information was provided in the survey. As the data type was nominal, a chi-square test of independence was performed to examine the relation between grade-level taught and levels of blended learning adoption. The relation between these variables was significant, $\chi^2(4, N = 114) = 11.573, p = .0021$.

Table 14

Chi-Square Test for Grade-Level Taught and Levels of Blended Learning Adoption

	Value	*df*	Asymptotic significance (2-sided)
Pearson chi-square	11.573[a]	4	0.021
Likelihood ratio	11.129	4	0.025
N of valid cases	114		

a. 1 cell (11.1%) has expected count less than 5. The minimum expected count is 4.24.

In order to prevent from committing a type 1 error, the exact *p* values for each analysis need to be determined. The exact *p* values are calculated in SPSS and displayed in Table 15. As seen, there are nine different analyses; as a result, the *p* value (.05) needs to be adjusted by those nine analyses. After the calculation, the adjusted *p* value is obtained as .0055. After the comparison of each exact *p* value and adjusted *p* value (.0055), only one analysis has the significance with the exact *p* value of .00067. All of the results related to the chi square post hoc test are displayed in Table 15.

Table 15

Chi Square Post-hoc Test for Grade Level Taught

Grade level taught		LoA category 1	2	3	Total
Elementary school	Count	15	2	6	23
	% within Grade-level taught	65.2	8.7	26.1	100.0%
	Adjusted residual	3.40	-1.30	-2.20	
	p value	0.00067	0.19360	0.02781	
High school	Count	11	9	21	41
	% within subject taught	26.8	22.0	51.2	100.0%
	Adjusted residual	-1.40	0.70	0.80	
	p value	0.16151	0.48393	0.42371	
Middle school	Count	14	10	26	50
	% within subject taught	28.0	20.0	52.0	100.0%
	Adjusted residual	-1.40	0.40	1.00	
	p value	0.16151	0.68916	0.31731	
	Count	40	21	53	114
	% within grade-level taught	35.1%	18.4%	46.5%	100.0%

Note. * $p < .0055$ Adjusted $p = .05 / 9 = .0055$

Teaching Strategy

The participants of the survey were asked about their teaching strategy and were given three options; student-centered, teacher-centered, and both student-centered and teacher-centered. As the teaching strategy was operationalized as a nominal variable, a chi square test was performed to examine the relation between teaching strategy and levels of blended learning adoption. The relation between these variables was not significant, $\chi^2(4, N = 114) = .928$, $p = .921$.

Table 16

Chi-Square Test for Teaching Strategy and Levels of Blended Learning Adoption

	Value	*df*	Asymptotic significance (2-sided)
Pearson chi-square	.928[a]	4	0.921
Likelihood ratio	0.970	4	0.914
N of valid cases	114		

a. 3 cells (33.3%) have expected count less than 5. The minimum expected count is .74.

As seen in the footnote section of Table 16, three cells (33.3%) have counts less than five. One of the assumptions stated by McHugh (2013) indicated that at least 80% of the cells should have 5 or more counts. As a result, the test did not meet this assumption and became inappropriate for this study. The teaching strategy data of the respondents needed to be reconfigured for a new chi square test. Out of 114 participating teachers, only four of them chose the option of teacher-centered as their teaching strategy. For the new chi square test, the option of teacher-centered was eliminated. The options of student-centered and both student-centered and teacher-centered were used in the new test. Table 17 has all of the values.

Table 17

*Teaching Strategy * LoA Category Crosstabulation*

Teaching strategy		LoA category			
		1	2	3	Total
Student-centered	Count	13	6	16	35
	% within teaching strategy	37.1%	17.1%	45.7%	100.0%
	% within category	34.2%	30.0%	30.8%	31.8%
	% of total	11.8%	5.5%	14.5%	31.8%
Both student-centered and teacher-centered	Count	25	14	36	75
	% within teaching strategy	33.3%	18.7%	48.0%	100.0%
	% within category	65.8%	70.0%	69.2%	68.2%
	% of total	22.7%	12.7%	32.7%	68.2%
Total	Count	38	20	52	110
	% within teaching strategy	34.5%	18.2%	47.3%	100.0%
	% within category	100.0%	100.0%	100.0%	100.0%
	% of total	34.5%	18.2%	47.3%	100.0%

The outcomes of the new chi square test indicated that there is not a significant relationship between the teachers who chose student-centered and both student-centered and teacher-centered in terms of their level of blended learning adoption, $\chi^2(2, N = 110) = .157$, $p = .924$. Table 18 has the results.

Table 18

Chi Square Test for Teaching Strategy and LoA

	Value	*df*	Asymptotic significance (2-sided)
Pearson chi-square	.157[a]	2	0.924
Likelihood ratio	0.156	2	0.925
Linear by linear association	0.110	1	0.741
N of valid cases	110		

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 6.36.

Experience With Instructional Technology

One of the selected characteristics of the teachers for this study was the years of experience with instructional technology. As the data was ordinal, a Kruskal-Wallis H test was conducted to examine between-group differences in levels of blended learning adoption by years of experience with instructional technology. The Kruskal-Wallis H test revealed no significant difference in levels of blended learning adoption across three different groups of teachers' years of instructional technology experience, $\chi^2(2) = 3.970$, $p = 0.137$.

Table 19

Kruskal-Wallis H Test for Instructional Technology Experience and Levels of Blended Learning Adoption

	Instructional technology experience	*N*	Mean rank	*Kruskal-Wallis H*	*df*	Asymp. sig.
LoA category	0 to 4 years	40	49.79	3.970	2	0.137
	5 to 9 years	41	61.18			
	10 or more years	33	62.27			
	Total	114				

Note. * $p > 0.05$.

Duration of Professional Development

Finally, the respondents were asked to enter the hours of professional development that they were provided during their employment in the CMO. As the data was ordinal and the values were ranked in an increasing order, a Kruskal-Wallis H test was conducted to examine the relationship between participating teachers' duration of professional development regarding blended learning and their levels of blended learning adoption. According to the results, there was a statistically significant difference in levels of blended learning adoption across three aforementioned groups of teachers' duration of professional development, $\chi^2(2) = 23.999$, $p = 0.000$.

Table 20

Kruskal-Wallis H Test for Duration of PD and Levels of Blended Learning Adoption

	Duration of PD	*N*	Mean rank	Kruskal-Wallis H	*df*	Asymp. sig.
LoA category	0 to 1 hour	41	42.17	23.999	2	0.000
	2 to 4 hours	37	56.28			
	5 or more hours	36	76.21			
	Total	114				

Note. * $p < 0.05$.

As $p < .05$ ($p = .000$), there is a significant difference between the groups. In order to determine which group differed from each other, a Dunn post-hoc analysis was performed. The results of the Dunn post-hoc test are displayed in Table 21.

Table 21

Dunn Post Hoc Test for Pair wise Comparisons of Duration of Professional Development (PD)

Duration of PD (3 groups)	Test statistics	Std. error	Std. test statistic	Sig.	Adj.sig.
Group 1 – Group 2	-14.113	6.910	-2.042	0.041	0.123
Group 1 – Group 3	-34.038	6.961	-4.890	0.000	0.000
Group 2 – Group 3	-19.925	7.134	-2.793	0.005	0.000

Asymptotic significances (2-sided tests) are displayed. The significance level is .05. Significance values have been adjusted by the Bonferroni correction for multiple tests

As seen in the pairwise comparison table above, Group 1 (0 to 1 hour) and Group 3 (5 or more hours) are significantly different from each other. Additionally, Group 2 (2 to 4 hours) and Group 3 (5 or more hours) are significantly different from each other. However, Group 1 (0 to 1 hour) and Group 2 (2 to 4 hours) are not significantly different from each other. Figure 1 displays the pairwise comparison of the duration of PD groups.

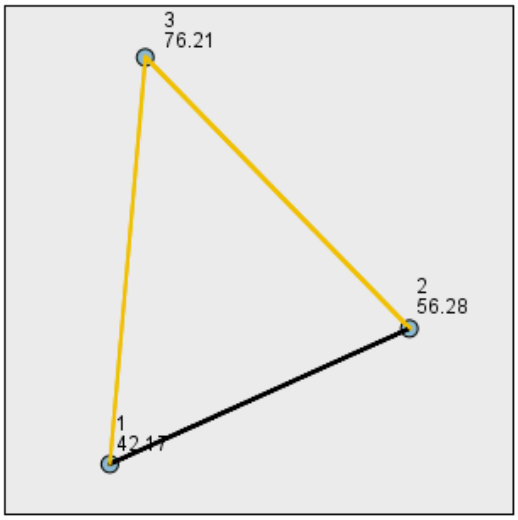

Figure 1. Pairwise comparison of the duration of PD groups.

As seen in Figure 1, the orange lines show the significance between the groups. Group 3 is significantly different from Group 1 and Group 2. However, there is not a significant difference between Group 1 and Group 2. The black line in the figure above shows that relationship.

The second research question asked “Do one or more of the selected teacher characteristics (years of experience, highest level of college education, subject taught, grade-level taught, teaching strategy, experience with instructional technology, and duration of professional development) predict the level of blended learning adoption?” As the dependent variable has an ordinal level of measurement, ordinal regression analysis was employed to determine if one or more of the selected characteristics predict the level of blended learning adoption.

The model fitting information in Table 22 has the -2 Log Likelihood for the Null Model and the Full Model which contains the full set of predictors. Additionally, Table 22 indicates the likelihood-ratio test that determines if there is a significant improvement in fit of the Final model relative to the Null model. In this case, the results are significant in fit of the Final model over the null model [$\chi^2(7) = 31.038$, $p < .001$].

Table 22

Model Fitting Information

Model	-2 Log Likelihood	Chi-Square	*df*	Sig.
Intercept Only	228.280			
Final	197.242	31.038	7	0.000

Link function: Logit.

The Goodness of Fit information in Table 23 includes Pearson and Deviance chi square tests to determine if the model exhibits good fit to the data. According to Field (2018) and Petrucci (2008), non-significant test results are indicators of a model that fits the data well. As seen in Table 23, both Pearson chi square test [$\chi^2(203) = 205.828$, $p = .431$] and Deviance chi square test [$\chi^2(203) = 190.075$, $p = .733$] are non-significant; as a result, the model fits the data well.

Table 23

Goodness-of-Fit

	Chi-Square	*df*	Sig.
Pearson	205.828	203	0.431
Deviance	190.075	203	0.733

Link function: Logit.

Table 24 displays the regression coefficients and significance tests for each of the independent variables in this model. As seen in the significance column, duration of professional development is a significant predictor of blended learning adoption.

Table 24

Parameter Estimates

							95% Confidence Interval	
		Estimate	Std. Error	Wald	df	Sig.	Lower Bound	Upper Bound
Threshold	[Levels of BL adoption = 1]	2.686	1.058	6.446	1	0.011	0.612	4.759
	[Levels of BL adoption = 2]	3.651	1.085	11.320	1	0.001	1.524	5.777
Location	Years of teaching experience	-0.237	0.464	0.261	1	0.610	-1.146	0.673
	Highest level college degree	0.043	0.141	0.095	1	0.758	-0.234	0.321
	Subject taught	0.050	0.088	0.325	1	0.568	-1.220	0.222
	Grade-level taught	0.530	0.291	3.333	1	0.068	-0.039	1.100
	Teaching strategy	-0.229	0.225	1.040	1	0.308	-0.669	0.211
	Instructional technology experience	0.296	0.447	0.438	1	0.508	-0.580	1.172
	Duration of PD	1.200	0.267	20.229	1	0.000	0.677	1.723

Link function: Logit.

Duration of professional development is a significant positive predictor of blended learning adoption. For every one unit increase on the duration of professional development, there is a predicted increase of 1.2 in the log odds of a teacher being in a higher category on blended learning adoption. As a result, a teacher receiving more hours of blended learning professional development is more likely to adopt blended learning.

Summary

The first research question asked if there are there between-group differences between participating teachers in terms of selected characteristics and their levels of blended learning use, as measured by the LoA survey. According to the outcomes of Kruskal-Wallis H and chi square tests, there are between-group differences between participating teachers in terms of their grade-level taught ($\chi^2(4, N = 114) = 11.573, p = .0021$) and duration of professional development ($\chi^2(2) = 23.999, p = 0.000$) and their level of blended learning adoption.

The outcomes of the ordinal regression analysis which was employed for the second research question indicated that the duration of professional development is a significant predictor of the teacher's level of blended learning adoption. The remaining six selected characteristics were not found to be significant predictors of the levels of blended learning adoption.

Chapter Five will include the discussion regarding the findings and interpretations of the outcomes. Additionally, limitations of the study, recommendations for future studies, and social change implications will be discussed in chapter five. Finally, a take home message that captures the key essence of the study will be provided.

Chapter 5: Discussion, Conclusions, and Recommendations

Introduction

The purpose of this quantitative survey study was to explore the relationship between selected characteristics of teachers and the levels of blended learning adoption in STEM-focused charter schools. The characteristics of the teachers that were selected for this study were years of teaching experience, highest level of college education, subject taught, grade-level taught, teaching strategies, experience with instructional technology, and duration of blended learning PD. The levels of blended learning adoption of the participants were measured by the LoA survey (Appendix A).

The participants of this study were K to 12 teachers who were employed by the CMO, which was the focus of the study. One hundred and fourteen teachers, representing 54% of the entire faculty members of the CMO, took the blended learning adoption questionnaire. The respondents of this study were teachers in elementary, middle, and high school campuses of the organization. The participating teachers taught one of the following content areas: English, math, science, history, art/music, foreign language, computer, special education, and multiple subjects in elementary level. All of the respondents had at least a bachelor's degree as one of the requirements of their teaching credentials. Fifty-three percent of the participating teachers held a master's degree. Eight of the 10 campuses of the CMO had a middle school program; as a result, the majority of the participating teachers were from the middle school campuses (44%). Sixty-six percent of the respondents chose both teacher-centered and student-centered approaches as their

teaching strategy. Only 4% of the participating teachers stated that they incorporated teacher-centered strategies in their classes.

For the analysis of the survey results, three statistical tests were employed. Kruskal-Wallis H tests were employed to examine between-group differences between participating teachers' years of experience, highest level of college education, experience with instructional technology, and duration of professional development and their levels of blended learning adoption. Chi square tests were used to determine the relationship between participating teachers' subject taught, grade-level taught, and teaching strategy and their levels of blended learning adoption measured by the LoA survey. Finally, an ordinal regression analysis was employed to determine if one or more of the selected teacher characteristics predicted the level of blended learning adoption.

Interpretation of Findings

This section contains the interpretation of findings relative to the literature and framework. The first research question included the seven selected teacher characteristics as independent variables; as a result, the interpretation of findings regarding the first research question consists of seven paragraphs, one for each characteristic. The interpretation of findings for the second research question includes the duration of PD as it turned out to be the only predicting variable for the level of blended learning adoption. Lastly, the interpretation of the theory and instrument are reported separately.

Interpretation: Research Question 1

The first research question asked if there are between-group differences between participating teachers in terms of their selected characteristics (years of experience,

highest level of college education, subject and grade level taught, teaching strategy, experience with instructional technology, and duration of professional development) and their level of blended learning adoption, as measured by the LoA survey. All of the seven characteristics of the participating teachers were addressed in this research question. The following paragraphs indicate the outcomes of the statistical analyses for all of the teacher characteristics and the comparisons of the outcomes of this study as well as the studies that were mentioned in the literature review section of Chapter 2.

Years of Experience

The survey respondents of this study were asked to enter their years of teaching experience. The entries were then placed into three groups: Group 1: 0 to 4 years, Group 2: 5 to 10 years, and Group 3: More than 10 years. The Kruskal-Wallis H test revealed no significant difference in levels of blended learning adoption across the three groups, χ^2 (2) = 3.651, p = 0.161. These results are in alignment with the findings of Gil-Flores et al. (2017), who researched the impact of years of experience on the use of ICT in the classrooms. According to Gil-Flores et al., years of experience do not play a significant role in technology integration in the classrooms. On the other hand, the findings of this study contradicted the outcomes of Cox (2013), who explored the technology integration experience of tenured teachers with at least 10 years of teaching experience and discovered that teaching experience had a negative significant association on the use of technology. Cox attributed this negative association to the fact that more tenured teachers were not able to receive same amount of preservice technology integration trainings compared to less experienced teachers. In the qualitative study, Cox interviewed three

tenured teachers with more than 10 years of teaching experience. Compared to the sample size of this study, it included significantly smaller number of participants. Additionally, Cox listed the research site's location and the student population (at risk adolescents who struggle with barriers such as homelessness, poverty, mental illness, and addiction) as contextual variables that could have impacted participants' technology integration. As a result, the settings of the sites of the two studies could be the factors for the contradicting outcomes.

Level of College Education

Another Kruskal-Wallis H test was employed to explore if there was a significant difference in levels of blended learning adoption across the four groups of college education (Bachelor's, Master's, Education Specialist, and Doctorate) entered by the survey respondents. According to the outcomes, there was no significant difference in levels of blended learning adoption across the groups, χ^2 (2) = 3.326, p = 0.344. This is in alignment with the findings of Brunk (2008) and Stammen and Aronson (2008). According to these researchers, the education level of a teacher as an extrinsic factor that had no impact on the technology integration in the classroom (Brunk, 2008; Stammen & Aronson, 2008).

Subject Taught

In order to explore the between-group differences between participating teachers in terms of their subjects that they are currently teaching and their level of blended learning adoption, a chi square test was employed as the area of content was a nominal variable. In order to meet the assumptions to employ a chi square test, nine content areas

were combined into two categories: core and noncore. Additionally, the option of elementary level (multiple subjects) was eliminated to meet the test assumptions. According to the outcomes of the chi square test with the reconfigured data, the relation between these variables was not significant, X^2 (2, N = 99) = 0.084, p = .959. This outcome is not consistent with the findings of Howard et al. (2015), who found that mathematics teachers reported lower frequencies of technology integration. Similarly, these results are not in alignment with the findings of Hsu (2016), who found that English Language Arts teachers were the ones who integrated the technology the most.

Grade-Level Taught

Another chi square test was employed to explore the between-group differences between participating teachers in terms of their grade-level taught and level of blended learning adoption. The results indicated that the relation between these variables was significant, X^2 (4, N = 114) = 11.573, p = .0021. A posthoc test was conducted to locate the differences, and the findings indicated that a significantly higher percentage of elementary school teachers (65%) chose the first category of the levels of blended learning adoption, which was defined as “No or limited knowledge / Do not use blended learning.” These results are not in alignment with the findings of Hechter and Vermette (2013), who found that upper level teachers had more problems with the access and time for technology integration than lower level teachers.

Teaching Strategy

The survey respondents were asked to choose one of the following options to indicate their teaching strategy: student-centered, teacher-centered, or both student-

centered and teacher-centered. Because teaching strategy was operationalized as a nominal variable, a chi square test was used. In order to meet the assumptions to employ a chi square test, the option of teacher-centered was eliminated. According to the outcomes of the chi square test with the reconfigured data, the relation between these variables was not significant, X^2 (2, N = 110) = .157, p = .924. These results are not in alignment with the findings of Sang et al. (2011) as they indicated that the teachers who used a student-centered approach were more likely able to integrate technology effectively compared to the teachers who use teacher-centered strategies. The factor for the contradicting outcomes may be that Sang et al. analyzed the technology integration of two types of teachers, student-centered and teacher-centered. However, the outcomes of this study indicated the between-group differences of the teachers, divided into three groups: student-centered, teacher-centered, and both student-centered and teacher-centered, in terms of their levels of blended learning adoption. Additionally, the data of two groups (student-centered and both student-centered and teacher-centered) were used in the chi square analysis to meet the test assumptions.

Experience With Instructional Technology

Experience with instructional technology was one of the selected teacher characteristics of this study. The survey respondents were asked to enter their years of experience with instructional technology. The entries were then placed into three groups: Group 1: 0 to 4 years, Group 2: 5 to 9 years, and Group 3: 10 or more years. The Kruskal-Wallis H test revealed no significant difference in levels of blended learning adoption across three different groups of teachers' years of instructional technology

experience, χ^2 (2) = 3.970, p = 0.137. These results are not in alignment with the results of Gil-Flores et al. (2017), who indicated that experience with instructional technology was associated with the effective use of technology in classrooms.

Duration of Professional Development

The last selected teacher characteristic for this study was the duration of PD. Respondents were asked to enter the amount of blended learning training hours. The entries were then placed into three groups: Group 1: 0 to 1 hour, Group 2: 2 to 4 hours, and Group 3: 5 or more hours. According to the results of a Kruskal-Wallis H test, there was a statistically significant difference in levels of blended learning adoption across three aforementioned groups, χ^2 (2) = 23.999, p = 0.000. In order to locate the difference, a Dunn posthoc analysis was performed. According to the outcomes of the Dunn posthoc test for pairwise comparisons of duration of PD, Group 3 that included the respondents who chose 5 or more hours as the duration of PD was significantly different than Group 1 (0 to 1 hour of PD) and Group 2 (2 to 4 hours of PD). The Dunn posthoc test also indicated that Group 1 and Group 2 were not significantly different from each other in terms of blended learning adoption. These results are in alignment with the outcomes of Gorozidis and Papaioannou (2014) and Hilliard (2015) as both of the studies' outcomes indicated that one of the key components of successful blended learning implementation in secondary schools was proper teacher training. Additionally, these findings were similar to the positive relationship between the professional development and effective technology integration found by Ruggiero and Mong (2015).

Interpretation: Research Question 2

The second research question examined if one or more of the selected teacher characteristics (years of experience, highest level of college education, subject taught, grade-level taught, teaching strategy, experience with instructional technology, and duration of professional development) predict the level of blended learning adoption. As the dependent variable has an ordinal level of measurement, ordinal regression analysis was employed to determine if one or more of the selected characteristics predict the level of blended learning adoption. The ordinal regression analysis revealed significant evidence of relationship between the participating teachers' duration of professional development and their levels of blended learning adoption. As a result, duration of professional development was a significant positive predictor of blended learning adoption. Using other words, a CMO teacher receiving more hours of blended learning professional development was more likely to adopt blended learning.

Interpretation of the Theory

The findings of this study revealed that a significantly higher percentage of elementary school teachers (65%) chose the first category of the levels of blended learning adoption which was defined as "No or limited knowledge / Do not use blended learning". This outcome could be attributed to the discrepancies in the school-wide implementation strategies. The outcomes of this study also indicated that the duration of professional development was the only predictor of the blended learning adoption level. Unlike the first outcome, this finding revealed that there is a need of developing more effective organization-wide blended learning professional development plan.

The theoretical base for this study was CBAM as it was appropriate for describing the teachers' development as they learn about blended learning and stages of implementation process (Hall, 1976; Hall et al., 1979). In this study, the CBAM theory was found to be very useful in providing a lens through which to evaluate the teachers' blended learning adoption. Additionally, the instrument for this study was LoA which was created with the foundational bases of LoU and the SoC dimensions of CBAM (Orr & Mrazek, 2010). The primary reason for the use of LoA tool was the fact that it promotes self-reflection. The instrument was very useful as it provided benchmarks for comparisons of the blended learning adoption levels. The LoA involved the participating teachers to self-reflect on the level of blended learning adoption using the benchmarks. The LoA survey was developed as a data-gathering instrument to assist the researchers in collecting information about the adoption process of an innovation (Orr & Mrazek, 2010). As it was stated by the authors of the instrument, the LoA was found to be very helpful in identifying the levels of blended learning adoption of the participating teachers.

Limitations of the Study

This study is limited to one CMO that is currently operating 10 different schools in Southern California during the academic year of 2019-2020. The CMO has approximately 211 full-time teachers in addition to 90 administrators, office personnel, paraprofessionals, psychologists, librarians, counselors, and janitorial staff. The nonteaching staff members of the CMO including the administrators were not included in this study; therefore, 211 full-time teachers were emailed the LoA survey. Out of 211 teachers, 114 of them (54%) completed the survey. As a result, this study is limited to

one CMO and 54% of its teaching staff and this is one of the primary limitations to the generalization of the outcomes.

One of the potential limitations of this study is the self-reflection of the participants on their blended learning adoption level. Even though the participants were assured that the participation in this study was voluntary and anonymous in order to minimize the potential threat to interval validity, the outcomes are based on the participating teachers' self-reflective statements which can be considered as a potential limitation of this study. For future studies, triangulating the self-reflection statements of the participating teachers through use of observations and interviews can be utilized as a way of assuring the validity.

Limitations of this study include that only one model of blended learning is focused; station-rotation. This can be attributed to fact that the CMO that employs the teachers who were surveyed in this study promotes the station-rotation model of blended learning due to the sizes of the classrooms and teaching approach. Also, the participating teachers of this study limit the generalization to non-charter school teachers and teachers of the schools without STEM-focus. Additionally, the characteristics of the teachers who did not take the survey may have a relationship with the levels of blended learning adoption and those were not represented in this study. As a result, it limits the generalizability to the entire teaching faculty.

Another limitation for this study is the method of statistical analysis. The number of independent variables was seven; therefore, ordinal regression analysis was used to determine whether one or more of the independent variables predict the levels of blended

learning adoption. Additionally, Kruskal-Wallis H and chi square tests were employed in order to examine the effects of selected teacher characteristics on the levels of blended learning adoption. Constantine (2012, p. 2) states, “The potential power and added complexity of regression analysis are best reserved for either predicting outcomes or explaining relationships. The prediction of outcomes on the basis of current characteristics is possible without regard to the causal relationships among variables.” Possible relationships between the variables were used for prediction for this study. As a result, causal relationships between the variables were not obtained.

Recommendations

In this study, I explored the relationship between selected characteristics of teachers and levels of blended learning adoption in STEM-focused charter schools. A different study that has the focus of non-STEM focused charter schools can be conducted to improve the generalizibility of the findings. In order to obtain more valid results, future studies should also include larger sample sizes. Additionally, other blended learning models different than station rotation model should be included in the future studies to obtain more reliable outcomes in regards to the level of blended learning adoption and its relationship with the teacher characteristics.

As the outcomes of this study indicated that professional development is the predictor of blended learning adoption, a suggestion for a future research would be the further analysis of the barriers to an effective professional development plan. A future research on the professional development for adopting an educational innovation would also provide insight into the lack of planning and strategies to increase the duration of the

training. Additionally, a qualitative study that gains an understanding of opinions and motivations behind the elementary school teachers' lack of blended learning adoption would be instrumental. Finally, recommendations for future studies include a longitudinal study that explores the effectiveness of blended learning on the students' academic outcomes as it would be helpful for teachers to see the trends.

Implications

The outcomes of this study may contribute to a positive social change by providing insight into a problem that can be faced by many schools. As the findings of this study indicated that the duration of blended learning training has a positive significant relationship with the level of blended learning adoption, the CMOs may make informed decisions in regards to their practices with the professional development. Providing proper training to teachers regarding the effective use of blended learning may have an impact on the overall implementation within the CMO. The increased use of blended learning may help today's learners receive individualized instruction and reduce their academic achievement gaps. As a result, providing personalized instruction based on the unique needs of learners and helping them close their academic achievement gaps are essential to make a social change impact.

Additionally, the findings of this study indicated that there are between-group differences between participating teachers' grade-level taught and duration of blended learning training and their levels of blended learning adoption. The CMO leaders may use the outcomes of this study to inform their decision-making process regarding the professional development and create faculty development strategies. The school

administrators may devise a plan to address content-based challenges and create solutions to overcome the barriers to effective blended learning implementation. In order to address the differences with the levels of blended learning adoption within the grade-levels, school administrators may brainstorm ideas and come up with strategies to disseminate the best practices. As a result, the outcomes of this study are important for the CMOs as they may assist the decision-makers in reshaping their practices in regards to professional development, academic planning, and teacher hiring.

Finally, this study may contribute to positive social change as it provides information for CMO leaders, policy makers, school administrators, and change agents so that they can use the information and reference it when developing programs and strategies to increase the level of blended learning adoption. With the increased adoption of blended learning, the teachers can better support the students and provide tools and resources to address their academic needs.

Conclusion

The outcomes of this study indicated the importance of professional development when it comes to adopting an educational innovation. According to the findings, the duration of professional development is a significant positive predictor of blended learning adoption. Similarly, a teacher receiving more hours of blended learning professional development is more likely to adopt blended learning. The remaining six selected teacher characteristics; years of teaching experience, highest level of college education, subject taught, grade-level taught, teaching strategy, and experience with

instructional technology were not found to be significant predictors of the levels of blended learning adoption.

The world is rapidly changing and the learning needs of the students cannot be exempt from these changes. As it requires differentiation of instruction supported with the 21st century technology to better serve the students with special needs, English language acquisitions, and diverse learning styles, it is essential to gain knowledge of blended learning and know how to effectively implement it. Teachers play a vital role in the growth of society and it is apparent that they need professional development and proper training to be able to adopt an educational innovation. As a result, it is the CMO officials' and school administrators' responsibility to identify the challenges that hinder the effective implementation of blended learning. Additionally, the school leaders and policy makers should devise research-based plans for creating venues for proper training and developing strategies to make sure the teachers receive necessary training for an effective blended learning adoption and implementation.

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Appendix A: LoA Descriptors

Nine-Point Level of Adoption (LoA) Scale – Blended Learning Adoption

Level	Descriptor
1	I do not know enough about blended learning to determine whether or not it would be useful in my teaching.
2	I know a bit about blended learning but did not have sufficient access to it to be able to incorporate its use in my teaching.
3	I know enough about blended learning that I am preparing to use it in my teaching.
4	I have used blended learning in my teaching and primarily focused on learning the skills necessary to use it properly and effectively.
5	I am quite knowledgeable about blended learning but did not have sufficient access to it to be able to incorporate its use in my teaching.
6	I am quite knowledgeable about blended learning but did not think that it would be useful in my teaching.
7	I used blended learning regularly in my teaching without much conscious thought and my use of it was fairly routine.
8	I have collaborated with colleagues to develop ways in which we can use blended learning to better meet common instructional objectives and goals in our teaching.
9	I no longer use blended learning in my teaching and have replaced its use with other strategies which better will better meet my objectives for my teaching.

Appendix B: Letter of Cooperation

4/10/2019

[redacted]

Los Angeles, CA 90012

To Whom It May Concern:

Omer F Polat has requested permission to collect research data from faculty members teaching at [redacted]ublic Schools. My executive team and I have been informed of the purposes of the study and the nature of the research procedures. We have also been given an opportunity to ask questions of the researcher during his presentation here at the home office. Mr. Polat assured us in the presentation that he will have the responsibility for adhering to ethics guidelines for human subjects research and preserving anonymity of participating teachers and the institution.

As the CEO and Superintendent of [redacted]lic Schools, I am authorized to grant permission to have the researcher recruit research participants from our schools. Omer F Polat is also permitted to collect research data during school hours at our schools.

If you have any questions, please contact me at [redacted]xt. 100 or at [redacted]schools.org .

Sincerely,

[redacted]

CEO & Superintendent

Appendix C: Research Questionnaire

The Use of Blended Learning Questionnaire

This questionnaire includes 7 demographic questions followed by the Levels of Adoption (LoA) Survey.

* Required

How many years of teaching experience do you have? *

Choose

What is your highest level of college education? *

Choose

What are you currently teaching? *

- ◯ English Language Arts
- ◯ Mathematics
- ◯ Science
- ◯ History
- ◯ Foreign Language
- ◯ Arts/Music
- ◯ Computer
- ◯ Physical Education
- ◯ Special Education
- ◯ Elementary Level (multiple subject)

Which school level can best describe where you teach? (if you are teaching at any of the two options below, choose the one that you teach more) *

- ◯ Elementary School
- ◯ Middle School (Junior High)
- ◯ High School (High)

Which teaching strategy are you using in your classroom? *

- ◯ Teacher Centered
- ◯ Student Centered
- ◯ Both teacher centered and student centered

For how long you have been using instructional technology in your classes? *

Choose

For how many hours of blended learning training (PD) you have been provided since you started to work for the organization? *

Choose

Which of the following best describes your level of blended learning use? *

- 1- I do not know enough about blended learning to determine whether or not it would be useful in my teaching.
- 2- I know a bit about blended learning but did not have sufficient access to it to be able to incorporate its use in my teaching.
- 3- I know enough about blended learning that I am preparing to use it in my teaching.
- 4- I have used blended learning in my teaching and primarily focused on learning the skills necessary to use it properly and effectively.
- 5- I am quite knowledgeable about blended learning but did not have sufficient access to it to be able to incorporate its use in my teaching.
- 6- I am quite knowledgeable about blended learning but did not think that it would be useful in my teaching.
- 7- I used blended learning regularly in my teaching without much conscious thought and my use of it was fairly routine.
- 8- I have collaborated with colleagues to develop ways in which we can use blended learning to better meet common instructional objectives and goals in our teaching.
- 9- I no longer use blended learning in my teaching and have replaced its use with other strategies which will better meet my objectives for my teaching.

SUBMIT

Appendix D: Survey Permission

Re: Permission to use the LoA Survey

Meadows, Jeff <XXX@uleth.ca>
Wed 7/25/2018 12:31 PM
To:

- Omer Polat <XXX@waldenu.edu>

4 attachments (7 MB)
Winter&Dodou_2012.pdf; Analyzing_Data_Measured_by_Individual_Likert-Type_Items_35-04-31.pdf; Likert 1932.pdf; NinePoint_GenericTechAdoption.docx;

Omer,

You are most welcome to use whatever might be useful for you from our LoA research, and we'd be pleased to keep in-touch with you on this.

I've attached a plethora information and documentation about our development and different iterations of the Level of Adoption (LoA) instrument, as well as a couple of related articles regarding statistical analysis of quasi-ordinal data such as ours. Here are the links to a couple of our publications that might be helpful:
http://www.cjlt.ca/index.php/cjlt/article/view/26391 (DOI: http://dx.doi.org/10.21432/T2588B)
http://www.editlib.org/p/32590
http://www.editlib.org/p/31726

Additionally, here's a bit of background about the evolution (or at least our "genetic modifications" :-) of the LoA over the past years. The initial instrument had only eight levels, based on the original work of Hord, Hall, et al. Following from discussions around our original projects, consideration of additional literature related to adoption of innovation, and feedback from colleagues; we added two additional categories to represent other (we posit) modalities of adoption. Most recently, we re-revised our instrument to a nine-point scale which we think removes some obfuscation, and additionally allows for analysis of "use" and "adoption" as related but separate constructs. Please note that while our research has tended to focus specifically on the adoption of educational technologies for instruction, we posit that it would be applicable to the adoption of any educational innovation (as was in fact the intent of the original LoU & SoC research of Hord & Hall we reference). We suggest that our version is primarily designed and intended to inform a Community of Practice (CoP) at various points along a collaborative journey to the adoption (or rejection) of innovation. It is thus primarily developed to be a self-reflective and self-reporting instrument. To that end, I have also attached a "generic" version of the instrument – you could insert whatever innovation and aspects of that innovation you (and/or your CoP) are investigating, where we have focused on technologies.

In our administrations of these various instruments (as they have evolved over time) we affix the same identical eight, nine, or ten point scale (nine in our very latest iteration) to a statement of adoption of (in our case) a specific educational technology, and then ask respondents to choose only one of the level descriptors from a single-choice-only radio-

button list in exactly the same way (for example) a five-point Likert scale (Strongly Disagree", "Agree", "No Opinion", "Agree", "Strongly Agree") would follow a statement of opinion. We suggest a specific educational innovation (such as "integration of use of social media for teaching/learning activities", for example) and then ask respondents to select the appropriate statement from the list provided to represent their personal self-perceived "level" adoption of specifically this innovation. While the list is clearly "ranked", we use radio buttons only, to avoid inadvertently attaching any implied "evaluation" of their selection. We preface the instrument by clearly stating that there are no "better" answers and that each choice represents a valid professional and personal decision regarding the adoption of any particular innovation or aspect of innovation (technology – in our case, but could be any educational practice or innovation).

We have not calculated reliability coefficients, effect sizes, etc for a couple of reasons:

- Our primary intent in using this tool has been to provide aggregated self-reflective information back to communities of professional practice to help inform collaborative and collegial discussions and decisions regarding professional development and or systemic change.
- The secondary purpose is to provide individual respondents with a description of their own level of adoption and a means of self-comparison to the aggregate (mean/median) adoption of their local community of professional practice.
- As this is a self-reported reflective assessment, and actually nominal rather than truly ordinal data, we have been reticent to posit that we can legitimately apply highly rigorous analyses to the numeric results generated. The "scale" (1-8,1-9, 1-10) used is at best only "quasi-ordinal" and may not be appropriate for, nor withstand, examination by rigorous statistical analyses intended to be applied to ratio/scalar data.

To this end:

A. The validity of the instrument primarily depends on the researcher's skill in framing accurate and focused questions. The general descriptors from the CBAM/LOU are not used directly in any specific application as an assessment instrument, but rather are utilized to frame very precise questions related to key components of a specific or particular innovation or practice. For example; if participants had been engaging in a PD program and plan aimed at using curriculum mapping to define assessment for learning, specific questions about vital components of this practice would begin with a very specific stem followed by specific response choices.

It is critical, in our view, to ensure that the questions accurately describe the kinds of behaviours and changes in professional praxis which need to be to assessed, and are as specific as possible. This is a tedious task, but generalized descriptors cannot provide the kind of accurate detail needed to create good data. The response choices must be identical for each different question related to the innovation being studied. Further, it is important to use identical "radio buttons" or "check boxes" to identify choices rather than numbers (0, 1, 2, 3, etc.) so that there is no implied hierarchy of responses. The "levels" of the LoA do not imply a hierarchical progression, but rather a nominal description of the state of a community's adoption of an innovation.

B. Questions concerning reliability are certainly appropriate. There are a couple of ways one might be able to respond to this concern. Firstly, it is important to create a supportive, collaborative, and intellectually and emotionally secure professional community of learners. It is critical for respondents to know (a) that responses are anonymous (on-line survey tools to this, but other “blind” techniques work as well), and (b) that it’s “OK” to be at whatever level one is at. It is critical to stress with respondents that this tool is being used to evaluate programs not people. In that way, non-users are actually empowered to voice disinterest in a program by indicating a low level of use. This connects back to the need to spend time writing very good stems and responses. Secondly, but no less importantly, if one can collect related data (teacher artifacts, login summaries, participation counts, attitude surveys, participation surveys, classroom observations and the like) it is possible to triangulate data sets to support the LoA results. It is also critical to maintain transparency in dissemination of results. In the ideal case, if a PD program could be cooperatively and collaboratively initiated, planned and implemented, the participants would want to answer honestly in order to be able to assess a PD program over which they have ownership as members of a community of practice. Never-the-less, a well-constructed LoA can at the very least provide a good measure of perceptions of engagement with an innovation. As mentioned, I’ve included a couple of articles (one by Likert himself) justifying the application of limited statistical analysis to data of this nature.

The LoA can be used to collect data over time, sampling a population at various points throughout the implementation of an innovation in practice; and that is one of the strengths of this type of tool. If the stems and responses are framed properly, the same survey can be repeated at various times during a project and the results can provide good longitudinal data about change in professional practice. One of the articles additionally refers to the online, real-time aggregation and dissemination of data – which is a critical component of addressing the issue of "transparency" with and within the membership of a community of practice.

Jeff

Jeff Meadows
Teaching Development Coordinator, Teaching Centre
Sessional Instructor, Faculty of Education
University of Lethbridge

> On Jul 25, 2018, at 10:05 AM, Omer Polat <XXX@waldenu.edu> wrote:
>
> Hello Mr. Meadows,
>
> My name is Omer Polat and I am a PhD student at Walden University. Currently, I am working on my dissertation. My topic is The Relationship between Teacher Characteristics and Blended Learning Use in STEM Focused Charter Schools. As my study has a quantitative

approach, I was looking for an instrument that would allow me to measure the use of blended learning for the participating teachers. Concerns Based adoption Model (CBAM) is the framework that I use as a lens for my study.
>
> I read many articles and dissertations about CBAM and its dimensions; SoC, LoU, and IC. SoC's questionnaire is a great tool, but it doesn't fit for my research as it measures the stages of concern. LoU helps provide qualitative data as it uses the face to face interviews. I read your article "Developing the level of adoption survey to inform collaborative discussion regarding educational innovation" and liked how you developed Levels of Adoption (LoA) survey. The descriptors you adapted are perfectly indicating the levels of adoption. Even though, you examined the process of the implementation of educational innovations over time, the survey can be used in my study for blended learning use.
>
> The reason for this email is that is it OK if I can get a copy of your LoA survey and use it in my study? I truly appreciate your work and thank you in advance.
>
> Please feel free to contact me at XXX@waldenu.edu or my chair, Dr. Bauder at XXX@mail.waldenu.edu.
>
> Sincere regards,
> Omer Polat

Appendix E: CITI Program Completion Certificate

CITI PROGRAM

Completion Date 12-Nov-2019
Expiration Date N/A
Record ID 33747402

This is to certify that:

Omer Polat

Has completed the following CITI Program course:

Student Researchers (Curriculum Group)
Student Researchers (Course Learner Group)
1 - Basic Course (Stage)

Under requirements set by:

Walden University

CITI
Collaborative Institutional Training Initiative

Verify at www.citiprogram.org/verify/?w13ba33fa-faeb-455c-873e-0ead04fc999f-33747402