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Success Stories: Community College Teachers Using Technology to Engage Online Students

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This is to certify that the doctoral dissertation by

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Walden University
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Abstract

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MS Ed, The State University of New York at Potsdam, 1985

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Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

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Abstract

For online students to be engaged in learning process, best practices include teachers using appropriate technology. However, it is unclear how some teachers who initially face challenges to adopting new teaching technology have overcome those challenges, adjusted their instructional practices, and adopted innovative technology to successfully engage students online. The purpose of this case study was to describe how teachers overcame challenges of using instructional technology tools for online learning. Rogers's diffusion of innovations theory and Kolb's experiential learning model provided the framework for this study. The research questions explored why teachers initially resisted the use of technology tools in online courses, how that resistance reflected Rogers' characteristics of innovation and what factors contributed to adoption of tools and reflected Kolb's stages of experiential learning. Six community college online teachers, who successfully engage their students using tools external to their learning management systems and working at 2 sites in the Western United States provided insight through participant journals, interviews, and course reviews. Analysis involved open coding and categorization of emergent themes. Two key findings for this study emerged. Community college teachers who overcame barriers to integrate new online tools participated in diverse types of professional development and training. Factors that contribute to teachers' willingness to adopt specific technology tools included convenience, interactivity, benefit to student learning, and applicability to real-life experiences. Results of this study may contribute to positive social change by supporting teachers with professional development to increase online student engagement, learning, and retention.

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Dedication

This work is dedicated to my family.

I am grateful to my siblings who supported me in different ways including offering a quiet, secluded place to research, think, and write; spending countless weekends helping me relocate in the midst of this writing effort; and providing motivation at crucial times.

I could not have completed this without the inspiration of my incredible children - my daughter, who wisely would say "Just do it!", and my son who continually offered his encouragement and support.

I appreciate my late mother who shared her joy of writing and my late father who shared the rewards of working with community college students and faculty.

There are parts of each of you in this work.

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Chapter 1: Introduction to the Study

Introduction

In this study I examined community college teachers' developing use of technology to engage the growing number of online students. The number of students enrolled in online courses continues to increase (p. 45), while online student course persistence and course grades are significantly lower than that of their peers in similar face-to-face courses (Jaggars & Xu, 2016; Johnson & Mejia, 2014). Engaged students are more successful as indicated by higher retention and success rates (Britt, 2015; Center for Community College Student Engagement [CCCSE], 2015). The research shows that for students to be engaged in the learning process, teachers must use best practices and select the appropriate tool for the appropriate purpose (Buzzetto-More, 2015; Camus, Hurt, Larson, & Prevost, 2016; Khechine, Lakhal, Bytha, & Pascot, 2014; Wegmann & McCauley, 2014). Learning management systems (LMS) include integrated tools designed to engage students supporting their success. In this study, I explored the factors influencing teachers' adoption of technology to successfully engage online students as they move into the online teaching environment and strive to improve student success.

The results of this study help to fill a gap in the research related to what is understood about how teachers develop expertise in using technology to engage online students and to provide information that may be used to improve teacher effectiveness, student engagement, and student learning. Knowledge from this study of the technology adoption factors can inform the design of technology training for new teachers as well as those transitioning from face-to-face to online teaching environments. Information from

this study also points to the need for improved design of current and new professional development opportunities for teachers. The information from this study may influence the development of both new teacher training programs and professional development for current teachers leading to more effective online teachers and more engaged and therefore successful students.

This study has social implications for improved professional practice, furthering innovative instruction and learning, and positive social change. The practice of teaching happens in the classroom but is supported by policies that are developed through the leadership of administrators and provide for ancillary support. At the community college level, administrators, distance education coordinators (DECs), and instructional development coordinators may use the findings from this study to develop responsive and innovative programs that encourage and support teachers as they adopt new online teaching technology, including the use of tools designed to engage students in the online classroom and increase student success.

Policies that support innovative instruction and learning will lead to increased use of technology tools, including existing tools that teachers can use with new strategies, or new tools that they can use to support student engagement in the online classroom. Information from this study may be used to support the development of responsive and innovative professional development programs that encourage and support teacher adoption of best practices in online instruction to improve student engagement and learning. Educational systems are graded on student success, but online students have lower success rates than face-to-face students (Jaggars & Xu, 2016; Johnson & Mejia,

2014). This study provides more information on how community college teachers perceive professional development influencing their ability to be effective, and therefore may inform teacher training programs that could better support teachers' learning to use technology to engage students, leading to increased student success.

This chapter is an introduction to the study and begins with background information on the benefits and challenges of technology adoption in the online teaching and learning environment, a description of the research gap that I addressed in this study, and an explanation of why this study was needed. A description of the research problem is followed by the purpose of this case study. Next is an introduction to Rogers's (2003) diffusion of innovations theory (DoI), that provides the conceptual framework for this study, and Kolb's (1984) experiential learning model (ELM), that is used with the study participants in relation to the research questions. Connections of the study design to the research questions are explained and terms that are considered ambiguous are defined. Assumptions concerning the study participants, the study scope, and delimitations, as well as the limitations, and the effect of that design on the significance of the study for future use follows. The chapter concludes with a section on the significance of the study and its impact on social change.

Background

Reports continue to show an increase in online student enrollment (Allen & Seaman, 2017) though with lower success rates for online students as compared with the rates for students in face-to-face classes (Allen & Seaman, 2015; C. B. Gregory & Lampley, 2016; Johnson & Mejia, 2014; D. Xu & Jaggars, 2014). Researchers have

identified that online student engagement, as indicated by higher retention and success rates, is an important component of student success (Britt, 2015; CCCSE, 2015). Online teaching and learning environments are often provided using a LMS. A LMS is a commercial or open-source web-based software application that presents an online teaching and learning environment in which students can interact with their teacher, fellow students, and content, through access to course content, course activities, assessment tools and reports of learning progress and student activities (Adobe, 2009; Kasim & Khalid, 2016). Examples of LMS platforms include Blackboard, Canvas, D2L, Moodle, and SaP3. Judicious use of new technology in the online teaching and learning environment, including the use of LMS tools can increase success by engaging students with their teacher, their classmates, and the course content (Buzzetto-More, 2015; Camus et al., 2016; Khechine et al., 2014; Wegmann & McCauley, 2014). Common LMS tools that facilitate engagement include discussion boards which provide students an area to interact asynchronously among themselves and with the teacher in text, audio, or video format; wiki pages on which students and teachers can collaborate in multiple formats; and communication tools such as chat windows that offer synchronous interaction opportunities in multiple formats.

However, there are challenges faced by teachers surrounding their decision to adopt new technology. Rogers's DoI theory (2003) presents four elements of the diffusion process: the innovation, communication channels, time, and social system. Three of those elements correlate with challenges that teachers have stated they encounter

when faced with adoption of new technology used for teaching and learning, including the use of LMS platforms.

1. Communication channels (Ball, Ogletree, Asunda, Miller, & Jurkowski, 2014; Mitchell, Parlamis, & Claiborne, 2015),
2. time (Esterhuizen, 2015; Esterhuizen, Blignaut, & Ellis, 2013; Fray-Aiken & Campbell-Grizzle, 2016; Howard, 2013; Sato, Sohn, Chen, Adebowale, & Jourdain, 2015), and
3. social system (Huss, Sela, & Eastep, 2015; Pundak & Dvir, 2014).

Along with those challenges, literature has provided examples of environmental factors that influence teachers' technology adoption and can be identified as significant to a potential adopter's experiential learning stage. Those factors are administrative support (Mbatha, 2015; Porter, Graham, Spring, & Welch, 2014; Sincar, 2013), professional development (Farber, 2013; Kyalo & Hopkins, 2013; Pettersson & Olofsson, 2015), and peer interaction (Hall Jr, 2013; Smith & Sivo, 2012).

Research shows that successful teachers overcome the challenges to adopting new technology in online learning environments. Within the state community college system from which the participants were drawn for this study, successful adoption of technology in the online environment, and in particular the LMS tools which are designed to increase student engagement by providing regular effective contact and interaction, can be indicated by the teacher's individual course alignment with an adopted course design rubric. However, what is not understood is how some teachers overcome those challenges and subsequently successfully adopt new technology. This study helps to fill that gap by

providing insight into understanding how teachers who have overcome those challenges are categorized by Rogers's elements of innovation (2003) what motivated their decision, and how the timing of their decision is reflective of Kolb's stages of experiential learning (1984).The findings from this study provide knowledge to support development of teacher training and encourage increased use of tools and strategies to further engagement of students to improve their success.

Problem Statement

The problem that I addressed in this study was the lack of research about how some teachers who initially face challenges to adopting new teaching technology have overcome those challenges, adjusted their instructional practices, and adopted innovative technology to successfully engage students online. The number of students enrolled in online courses continues to increase (Allen & Seaman, 2017), while online student course persistence and course grades were significantly lower than that of their peers in similar face-to-face courses (Johnson & Mejia, 2014; D. Xu & Jaggars, 2014). Student engagement is universally considered to be a primary component of student success: engaged students are more successful as indicated by higher retention and success rates (Britt, 2015; CCCSE, 2015). Online student engagement is facilitated with tools that are either integrated or embedded within the LMS platform. For teachers however, there are challenges to adopting new technology such as online tools. While there is much research on defining student engagement and describing best practices for teachers to engage students, what is not yet understood is why teachers initially resist using instructional tools designed to engage online students teachers make the decision to use LMS tools

such as discussion boards, collaborative wiki pages, and web-based media interactive communication channels within the online environment to increase student engagement and the factors that contribute to their eventual adoption of instructional tools designed to engage online students. Addressing this gap in research (Lawrence & Tar, 2018) leads to a better understanding of how some online teachers experience success in overcoming their initial resistance to technology tools to engage students in the online classroom.

Purpose of Study

The purpose of the study was to describe how teacher resistance to the use of instructional tools in online courses reflects Rogers's (2003) characteristics of innovation and how their progressive use of instructional tools reflects Kolb's (1984) stages of experiential learning. Addressing this gap leads to a better understanding of how some online teachers experience success in overcoming the initial challenges to technology adoption and implement tools within their LMS designed to engage students in the online classroom.

Research Questions

There were two central research questions and three related questions that I used to guide this study.

Central Research Questions:

1. How does teachers' resistance to the use of technology tools in online courses reflect Rogers's characteristics of innovation?
2. How does teachers' progressive use of technology tools reflect Kolb's stages of experiential learning?

Related Research Questions:

1. Why do teachers initially resist using technology tools designed to engage online learners?
2. What factors contribute to teachers' willingness to adopt technology tools designed to engage online learners?
3. What do course object reviews reveal about how teachers are using technology tools for student engagement?

Conceptual Framework

The research of Rogers (2003) and Kolb (1984), which informed the research design for this study, also informed the conceptual framework for this study. As the need for online teachers continues to grow to support the projected increase in online courses (Allen et al., 2013), the challenge will be to attract more teachers to transition from traditional on-ground classrooms to the online instructional environment. I used two conceptual models in this study to understand the reasons that some teachers overcome their resistance to using technology tools to engage students in online learning.

I chose Rogers's (2003) DoI theory because online instruction fits Rogers's definition of an innovation. The following are the four characteristics of diffusion of a new idea through communication that apply to this study:

Innovation. Although online education is no longer a new activity, for teachers who have never taught online, the activity is an innovation because it is new in "knowledge, persuasion, or the decision to adopt" (Rogers, 2003, p. 12).

Communication channels. Interactions with students, peers, administrators, and technical experts assume different formats and happen instantly and over time.

Time. Within educational systems, school terms define time. The academic calendar influences the process of decision-making and the rate of adoption. Rogers described adopters by the speed of the participants' behavior as innovators, early adopters, early majority, late majority, and laggards.

Social system. I included the multilayered social system in educational institutions in this study. Decisions regarding adoption of innovation may have ramifications at multiple points for both teachers, their peer group, and for the educational institution.

A selection criterion for participants for this study was that they were categorized as adopters, no matter the speed of their adoption. I used the four DoI characteristics concerning the reasons for participant resistance, the events that precipitated their decision to adopt the innovation, and the speed of their adoption to inform my data analysis and interpretation. These DoI characteristics provided direction for the research questions and is further described in Chapter 2.

Kolb's (1984) ELM provides a piece of the conceptual framework for this study. Kolb noted, "Learning is a process whereby knowledge is created through the transformation of experience" (p. 38). The ELM is particularly appropriate for examining the practice of teaching as a learning activity in which practitioners complete the same activity repetitively (e.g. teaching a particular concept every semester) but under different circumstances (e.g. a different group of students or a different learning platform such as on-ground or online). The ELM includes four stages of learning in a repetitive cycle.

Using Kolb's model, transformative learning may begin with Stage 1, which involves learners' engagement with a new activity. That engagement generates Stage 2, which involves reflection that can include learners seeing themselves taking part in that activity. During Stage 3, learners take actions to prepare for their implementation of the activity. By the time learners are at Stage 4, active experimentation, they may have integrated enough new information to apply the new knowledge and succeed at the activity immediately, or subsequent attempts may be successful after multiple practice sessions and modifications to their activities, which involves repeating some of the ELM stages.

During the data collection activities, I analyzed the participants' information concerning their use of new technology to place them at appropriate points on the ELM when the actual decision to adopt took place. In Chapter 2, I offer a more detailed description of the conceptual framework and how I used it in data analysis.

Nature of Study

In this study, I used a qualitative, multiple case study design to examine how community college teachers decide to use technology tools to engage students in online learning. Using the design description from Yin (see 2014), I researched both *how* and *why* questions; I had no influence over the events, and the situation was contemporary. I used strategies to strengthen the study reliability and external validity (see Merriam & Tisdell, 2016), including multiple sources of data, peer review, and sample diversity.

I examined the change process that teachers at a community college experience as they make decisions to use technology tools to engage students in online learning. The participants in this study included six teachers at two community colleges located in the

western region of the United States. I collected data from multiple sources including participant reflective journals, individual interviews with participants, and online course object reviews. Coding and categorization of data determined emergent themes and discrepant data, using the lens of Rogers's (2003) DoI theory and Kolb's (1984) ELM to analyze and interpret the findings.

Definitions

The following terms were significant to this study:

Adoption: In the context of the Diffusion of Innovation theory (DoI), adoption is "a decision to make full use of an innovation as the best course of action available (Rogers, 2003, p. 473).

Barriers: In the context of the Diffusion of Innovation theory (DoI), factors that inhibit the adoption of an innovation (Rogers, 2003).

Diffusion: In the context of the Diffusion of Innovation theory (DoI), the process during which "innovation is communicated through certain channels over time among the members of a social system" (Rogers, 2003, p. 474).

Learning Management System (*LMS)*: A LMS is a commercial or open-source web-based software application that presents an online teaching and learning environment in which students can interact with their teacher, fellow students, and content, through access to course content, course activities, assessment tools and reports of learning progress and student activities (Adobe, 2009; Kasim & Khalid, 2016). Examples of LMS platforms include Blackboard, Canvas, D2L, Moodle, and SaP3.

Online Student Engagement: Teacher-initiated activities that take place in an online classroom and result in student interactions with the teacher, with classroom peers, and with the content (Dixson, 2015; Kahu, 2013).

Resistance: In the context of the Diffusion of Innovation theory (DoI), description of attitude that prevents a person from overcoming a barrier to change their behavior or implement a new idea that they consider an innovation. "An innovator has a low threshold of resistance to adopting a new idea…"(Rogers, 2003, p. 364),

Technology: For this study, technology refers to a hardware and software design for an action that will achieve a specific outcome in support of online teaching and learning (Rogers, 2003).

Tools / *LMS Tools* (for engaging online students): Web-based tools, integrated or externally linked to a LMS designed to provide a specific function including those that. facilitate engagement in the online teaching and learning environment such as discussion boards, rubrics, assessment feedback tools, and email/messaging applications (Rogers, 2003).

Assumptions

This case study is based on several assumptions, following the guidance from Merriam and Tisdell (2016) that "qualitative research is generally based on the assumption that 'reality' is constructed by individuals, in light of their experiences;" (see p. 45). First, I assumed that participants' interview responses, oral and written, were honest and truthfully represented the knowledge and understanding participants held regarding adopting tools in the online teaching and learning environment. Although

participants discussed events that happened in the past as well as aspects of their current practice, I assumed they were able to accurately describe events and articulate explanations for their behaviors. I also assumed source documents such as participant reflective journals were accurate and representative of the participants' responses to the study inquiries. I assumed that course object reviews were accurate representations of the participants' instructional activity. These assumptions were necessary to this case study design because the participants were voluntarily taking part in interviews and the participant reflective journals provided supporting evidence for the interview responses and course object reviews.

Scope and Delimitations

This scope of this study was community college teachers in a western state public system who use online tools to engage students. This study was further delimited by the participants, the time the study is conducted, and resources. The participants in this study included six teachers at two community colleges located in the western region of the United States. The participants were initially selected by the DECs serving as study gatekeepers at each college, based on the criteria defined by Rogers's (2003) DoI theory as innovation adopters; that is, the participants had adopted the use of tools to engage students in the online teaching and learning environment. Therefore, community college teachers who were not innovation adopters were not included in the scope of this study. I did not include 4-year university teachers in this study. In relation to time, I collected and analyzed all data during the 2018–2019 academic year, therefore the data were not longitudinal but instead required teachers to recall reasons for decisions they had made in

the past. The study was also limited by financial resources. I conducted this study within my home state, though outside of my own institution.

Transferability of the findings from this study can inform future research in the field of engaging online students using technology. The knowledge gained from this study may provide insight as to how to support teachers in the process of being introduced to innovative practices in the online teaching and learning environment. Insights from this study can support the design of new tools that may support student success in the online teaching and learning environment.

Limitations

There are two notable limitations to this study design: the single researcher and the small number of participants. While interviews and prepared documents may provide "richly descriptive" (see Merriam & Tisdell, 2016, p. 17) information, because I was be solely responsible for collection, analysis and interpretation of the data, there was a possibility of researcher bias (see Yin, 2014). However, I followed suggestions from Yin (2014) and Merriam and Tisdell (2016) to minimize bias including using multiple sources, creating an orderly research database, and cross-checking data and analyses both electronically and with critical colleagues. I discuss these strategies in depth in the Chapter 3 discussion of evidence of trustworthiness. The other limitation was the narrow parameters used to select the participants and the final small group of participants. A larger sample would provide a better saturation of the population. However, in this exploratory study, the purpose was achieved within the study's domain of community college teachers using online tools to engage students (see Yin, 2014).

Significance

The significance of a study is determined in relation to advancing knowledge in the field, to improving practice in the field, to encouraging innovative strategies, and to contributing to positive social change. In relation to an original contribution to research, this study advances knowledge about the journey instructors make from being resistant to the use of engaging technology to being successful practitioners. Concerning improved professional practice, administrators, DECs, and instructional development coordinators can use the findings from this study to develop responsive and innovative programs that encourage and support teachers as they adopt new online teaching technology, including the use of tools designed to engage students in the online classroom and increase student success. In relation to furthering innovative learning and instruction, the findings of this study support increased use of technology tools, including existing tools that teachers can use with new strategies, or new tools that they can use to support student engagement in the online classroom. In relation to positive social change, this study supports the development of responsive and innovative professional development programs that encourage and support teacher adoption of best practices in online instruction to improve student engagement and learning.

Summary

While the number of students enrolled in online courses continues to increase (Allen & Seaman, 2017), online student course persistence and course grades are significantly lower than that of their peers in similar face-to-face courses (Jaggars & Xu, 2016; Johnson & Mejia, 2014). Though technology provides ways to engage online

students in the online teaching and learning environment to increase their success, there is a lack of research on how to encourage teachers to adopt that new technology. In this chapter, I introduced the qualitative case study design that I used to close that research gap with new information. The background section included a summary of the research literature related to this study. In the problem statement, I focused on the lack of research on how and why successful teachers have met the challenges to adopting new technology for the online teaching and learning environment. The purpose of this study was to describe how teacher resistance to the use of instructional tools in online courses reflects Rogers's (2003) characteristics of innovation and how their progressive use of instructional tools reflects Kolb's (1984) stages of experiential learning. Both Rogers (2003) DoI theory and Kolb's (1984) ELM informed the research design for this study, initially providing adoption scenarios that helped identify the challenges teachers face (DoI) and through the analysis of collected data, information about the teachers' experiential learning stage (ELM) that facilitated their successful adoption.

The participants in this study were community college teachers who had successfully adopted the use of technology designed to engage students in the online teaching and learning environment. I collected data through interviews, journals, and observations of online course courses. Coding and categorization of data determined emergent themes and discrepant data. I also discussed the assumptions and limitations. The significance of this study is that it contributes to advanced knowledge about the journey instructors make from being resistant to the use of engaging technology to being successful practitioners, professional practice with findings to encourage and support

teachers, to innovative learning and instruction through advocacy for increased use of technology tools, and to positive social change with ideas for development of responsive and innovative professional development programs that encourage and support teacher adoption of best practices in online instruction in order to improve student engagement and learning. In Chapter 2 I include a review of literature beginning with the current but limited material on defining and measuring online student engagement, information on tools that can facilitate the types of online engagement, explanations of the challenges that teachers face in the adoption of new technology as characteristics by Rogers (2003) DoI theory, and finally information about factors that can influence technology adoption by teachers.

Chapter 2: Literature Review

Introduction

In this study, I addressed the problem of lack of research concerning how some teachers who are initially resistant to adopting new teaching technology have overcome their initial resistance and adjusted their instructional practices to successfully engage students online. The number of students enrolled in online courses continues to increase (Allen & Seaman, 2017), while online student course persistence and course grades were significantly lower than that of their peers in similar face-to- courses (Jaggars & Xu, 2016; Johnson & Mejia, 2014). LMS include innovative tools designed to engage students supporting their success; engaged students are more successful as indicated by higher retention and success rates (Britt, 2015; CCCSE, 2015). Therefore, the purpose of this study was to describe how teacher resistance to the use of instructional tools in online courses reflects Rogers's (2003) characteristics of innovation and how their progressive use of instructional tools reflects Kolb's (1984) stages of experiential learning. Addressing this gap in research leads to a better understanding of how some online teachers experience success in overcoming their initial resistance to technology tools to engage students in the online classroom.

The sections in this chapter include a description of the literature search strategy, a detailed description of the frameworks used as the foundation for both identifying the reasons for resistance to adoption of new technology and the stage of experiential learning at which a user experiences an event that propels them to decide to adopt new technology, and a thorough literature review. The literature review topics include online

student engagement, tools for engagement of online students, challenges to adopting innovative technology in the online learning environment, and factors influencing technology adoption in the online teaching environment. The chapter ends with a summary.

Literature Search Strategy

I conducted an initial search of peer reviewed sources through the Walden Library to access multiple databases including the following: Academic Search Complete, Computers & Applied Sciences Complete, Education Research Complete, ERIC, Library, Information Science & Technology Abstracts, Military & Government Collection, Political Science Complete, and the Teacher Reference Center. As I continued the search, I used Google Scholar alerts to locate additional sources that may not have been available through the library.

I revised key terms and phrases, as well as search limiters, as the search was refined to identify resources appropriate for this literature review. Multiple search iterations included the following: *accreditation, administrative, adopt*, asynchronous communication, cohort, colleague*, community college, cost, course management system (CMS), discussion forum, distance education, experiential learning (cycle), financ*, fund*, higher ed*, Kolb, learning management system (LMS), new technology, online tools, online tools, peer*, preparation time, resist* (to change), Rogers, student engagement, support, synchronous communication, teach, teacher time,* and *technology*. I evaluated at least 3,550 resources including peer-reviewed articles and original source books, 112 initially selected 112, and added 48 as the basis for this literature review.

Conceptual Frameworks

I used the research of Rogers (2003) and Kolb (1984) as the framework for this study exploring the phenomenon of successful technology adoption by community college teachers who have learned to use tools to engage students in the online learning environment. Initially, I used the characteristics of innovation defined by Rogers (2003), to identify the categories of adopters of teachers' use of instructional tools in online courses. Subsequently, I explained the teachers' progressive use of instructional tools using Kolb's (1984) stages of experiential learning. As the need for online teachers continues to grow in order to support the projected increase in online courses that continues in contrast to the decline in campus-based courses (Allen, Seaman, Poulin, & Straut, 2016), the challenge is to attract more teachers to transition from traditional on-ground classrooms to the instructional online environment. Teaching in the online environment includes the use of technology that may be unfamiliar to teachers accustomed to the traditional classroom environment. The focus of this study was the technology adoption successes of college teachers. I used both Rogers's (2003) DoI theory and Kolb's (1984) ELM to understand how some teachers were able to overcome their resistance to using technology tools for engaging students in online learning.

Diffusion of Innovations Theory

I applied Rogers's (2003) DoI theory for the first conceptual framework for this study. Rogers formulated his theory while examining the diffusion of agricultural innovations in a rural area previously studied by one of his own doctoral program teachers. This work led to the publishing of the first edition of the DoI in 1962. In the

current and fifth edition, the theory has been updated to be applicable to the digital environment. The basis for the DoI theory is an explanation of the process that takes place when innovations are adopted throughout a social system. Specific to this framework are several assumptions and definitions that illustrate how DoI applied to the topic of this study.

Diffusion. Within DoI theory, Rogers defines diffusion as the "process in which an innovation is communicated through certain channels over time among the members of a social system" (Rogers, 2003, p. 474). Because the DoI theory is defined as a process, it is appropriate for this study of adoption. Rogers's definition is further quantified to include the four main elements of the process that are aligned specifically to this study as follows:

1. Innovation or New Idea. For a practice to be considered an innovation within the DoI theory, it is not the newness of the phenomenon but the perception by potential users that the practice is new in "knowledge, persuasion, or the decision to adopt" (Rogers, 2003, p. 12). Rogers refers specifically to the hardware and software aspects of technology when describing innovative ideas. For teachers who are new to online teaching and employing the tools of an LMS, both hardware and software will be used in new and innovative ways.
2. Communication channels. Within the DoI theory, diffusion occurs when communication content is primarily concerned with the innovation or new idea (Rogers, 2003). For this study, this description included individual

communication, such as emails, phone calls, or face-to-face conversations between students, peers, administrators, and technical experts, as well as group communications, such as in a workshop, webinar, or a digital newsletter.

3. Time. Time has three aspects in the DoI theory: (a) the measurement of time from the user's knowledge of the innovation to the completion of their innovation decision process as defined below, which in this study is determined by a schedule determined by the educational administrator; (b) the relative time that the adopter takes within the system to adopt the innovation, called the adopter category, and for this study guided the selection of participants; and (c) the rate that an innovation is adopted within a system, which in this study was also determined by an external schedule (Rogers, 2003). Users in the earlier adopter categories, as defined below, react more quickly to mass communication while individual communication is more effective for later adopters (Rogers, 2003).
4. Social system. The social system is a group with structure and norms, composed of members engaged in a process with a common goal, which in this study was the multilayered social system in educational institutions including the teachers who have the option to transition from traditional to online learning environments (Rogers, 2003). Decisions regarding adoption of innovation may have ramifications at multiple points for teachers, for their peer group, and for the educational institution.

Adopter categories. Rogers (2003) settled on the current system of adopter categories in an effort to standardize the various terms and categories at use in the field of diffusion theory. These categories identify members of the social system, in this case teachers, by their level of innovativeness. As shown in Figure 1, Rogers used the mean and standard deviation to divide a normal distribution curve into five categories based on the relative time during the adoption process at which the member adopted the innovation (Rogers, 2003).

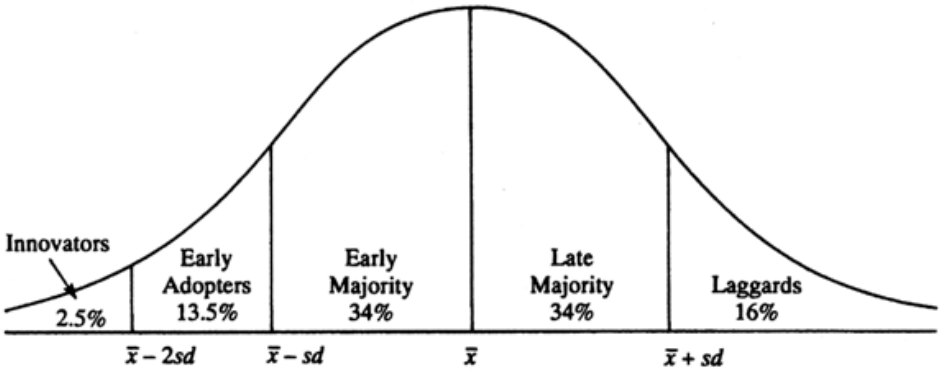

Figure 1. Adopter categorization on the basis of innovativeness. From Diffusion of Innovations, 5E by Everett M. Rogers. Copyright © 1995, 2003 by Everett M. Rogers. Copyright © 1962, 1971, 1983, by Free Press, a Division of Simon & Schuster, Inc. Reprinted with the permission of Free Press, a Division of Simon & Schuster, Inc. All rights reserved.

Innovation-Decision Process. The decision-making process involved in innovation adoption is characterized by Rogers (2003) as having five steps: knowledge of the innovation; persuasion; decision to implement or opt-out; implementation, if appropriate; and confirmation of the decision. The length of time an individual takes to complete the process increases based on adopter categorization, according to Rogers (2003).

The current research study benefited from the DoI theory in several ways. I used the DoI theory to provide the vocabulary that underpins the environment for a diffusion of innovation study. In this case, the four elements of the process are aligned to this study. The innovation that is online teaching, is the model for adoption. The communication channels through which knowledge was shared at the beginning and throughout the process was identified when mentioned as having influence on the participant. Time was considered as a parameter for the process and for its effects on

individuals. Finally, the DoI theory provided a method for identifying teachers as study participants according to their adopter categories and identified the elements that were considered to be barriers by the participants. I used the DoI theory as the framework for the first part of this study.

Experiential Learning Model

While I used Rogers's (2003) DoI theory for the vocabulary and framework for examining the innovative aspects of online teaching and characterizing potential study participants, I used Kolb's (1984) ELM as the framework for the participant interview questions and subsequent thematic analysis. Within the ELM, transformational learning occurs through experience (D. A. Kolb, 1984), when a learner has the opportunity to follow experience with reflection, relate the experience to the learner's own situation, and make a choice to actively apply the new knowledge, as shown in Figure 2. The ELM is particularly appropriate for examining the practice of online teaching as a learning activity in which practitioners complete the same activity repetitively, e.g. teaching a particular concept every semester, but under different circumstances, e.g. teaching separate groups of students or using multiple learning platforms such as on-ground or online.

Specific to the ELM is the description of a four-stage learning cycle as shown in Figure 2. The cycle may be entered and exited at any stage, modified by factors in the learner's environment and the individuals' learning preferences. The learner moves through two continuums in the process: the perception continuum has at one end feelings generated during concrete experience and at the other end, thoughts about the experience

in the abstract; and the opposing processing continuum which runs from observing others engaged in the experience or self-reflection about the experience to the active experimentation stage when the learner completes the process by taking action after consideration of the results (D. A. Kolb, 2015).

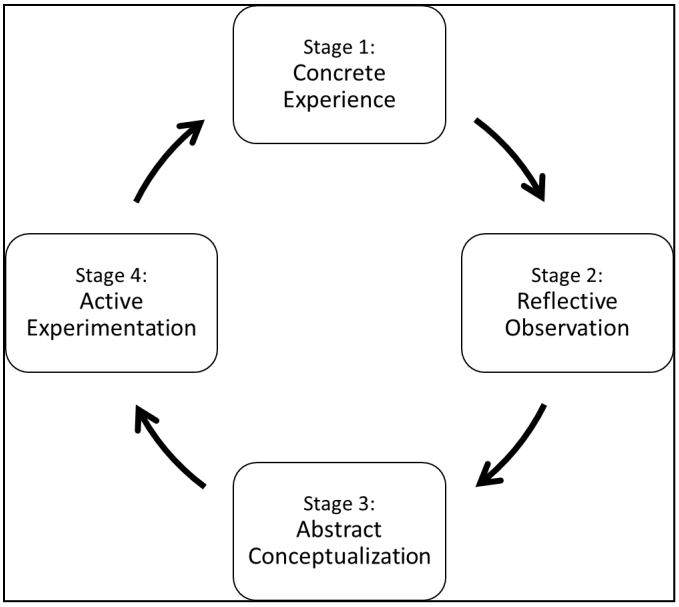

Figure 2. The four stages of Kolb's experiential learning model from Kolb, D. A. (1984). *Experiential learning: Experience as the source of learning and development*. Upper Saddle River, NJ: Prentice Hall. Adapted with permission.

Stage 1: Concrete Experience (Feeling). Learners who prefer concrete experience, find that hands-on activities in situations similar to real-life along with personalized feedback from helpful teachers supports learning (D. A. Kolb, 2015). In this study, hands-on activities with helpful feedback occurred during a facilitated face-to-face workshop or online webinar.

Stage 2: Reflective Observation (Watching). For learners who prefer reflective observation, teachers who actively guide discussions and act as subject matter experts contribute to their learning (D. A. Kolb, 2015). An example for this study was a

professional development experience that included observing an online class session or an online tool in an LMS, followed by participation in a facilitator-led discussion. Consideration of learning new technology, or of converting a face-to-face class for an online environment, often includes self-reflection about a teacher's willingness and ability to learn new technology.

Stage 3: Abstract Conceptualization (Thinking). Case studies and theoretical readings, teachers who share their own experiences, as well as simulations, are helpful for learners who prefer learning with abstract conceptualization (D. A. Kolb, 2015). They reflect on the new experience, and if they are successful at seeing themselves modify their behavior to take part in the new experience, they take actions to prepare for their implementation of the activity. Examples of that behavior for this study included participation in seminars with peers who were online instructors at the time, using tools to engage their students.

Stage 4: Active Experimentation (Doing). For learners who prefer active experimentation, projects and peer feedback are helpful; lectures are not (D. A. Kolb, 2015). When learners reach Stage 4, active experimentation, they may have integrated enough new information to apply the new knowledge and succeed at the activity immediately, or subsequent attempts may be successful after multiple practice sessions and modifications to their activities, which involves repeating some of the ELM stages. Online teachers who have adopted the use of tools within a LMS, tools that they may not employ in a face-to-face classroom, may be at this stage.

These stages not only reflect a process through which learners progress as they encounter new ideas and put them into action to get results, but also form the basis for Kolb's later development of a Learning Style Inventory (A. Y. Kolb & Kolb, 2005; D. A. Kolb, 2015). The current research study benefited from this framework in several ways. Kolb (1984) described the job of an educator as "not only to plant new ideas, but also to dispose or modify the old ones" (p. 29). The rate of disposing or modifying the old ideas categorized the participant according to Roger's (2003) DoI theory. I analyzed participant reflective journal entries to discover how the participants reflect Rogers's (2003) adopter characteristics as they met the challenges of technology adoption and what activities, external or internal, propelled them to different stages of the ELM cycle (D. A. Kolb, 2015). In the guided interviews, I explored the participants' challenges to adopting technology and how they overcame those challenges as described by Rogers (2003). Those experiences identified which activities occurred at the different stages of Kolb's ELM (D. A. Kolb, 2015). I organized the results by the participants' stages of learning to provide the foundation for analyzing and interpreting study data.

Summary

In the preparation and delivery of material, teachers move through the stages of the ELM at different rates or in different sequences. Because teachers need to adjust their practice when adopting new technology, I used the ELM as a model for examining the factors that characterized the participant for their DoI adopter category, identifying any stage of the ELM at which a future adopter was stuck, and determining the type of activity that assisted the adopter to move towards completion of all stages of the process.

I used Kolb's work with learning styles and learning situations to provide information about what types of activities are preferred as categorized by learning style.

In this study, as I analyzed participants' interviews and journal notes, I used Kolb's situational factors to identify the helpfulness of experiences. This information is used in Chapter 5 to support the development of responsive and innovative professional development programs that encourage and support teacher adoption of best practices in online instruction to improve student engagement and learning.

Online Student Engagement

Student engagement is universally considered to be a primary component of student success: engaged students are more successful as indicated by higher retention and success rates (CCCSE, 2015). Particular to the online environment, students who are engaged are less likely to feel isolated (Dixson, 2015; Glazier, 2016) and more likely to express satisfaction (ASHE & Meyer, 2014; Rueda, Benitez, & Braojos, 2017). While the number of students enrolling in an online course at the college level continues to increase (Allen et al., 2016), online student success rates are consistently lower than those for face-to-face students (Jaggars & Xu, 2016; Johnson & Mejia, 2014). The application of best practices to engage online students potentially may increase student success. However, to measure the effectiveness of best practices, it is necessary to agree on how to identify student engagement in the online environment.

Defining Online Engagement

Though student engagement is important to student success, there is a lack of agreement on how to define student engagement in higher education online classes

(Dixson, 2015; Kahu, 2013). Multiple conceptual frameworks have been used in attempts to assess student engagement including the behavioral approach that looks at student behavior within the parameters of institutional practice and the learning environment; and the psychological-sociological approach that includes self-reported student satisfaction; and sociological-political approach includes activities that engage students in activities that relate to career planning and goal-setting (Kahu, 2013; National Survey of Student Engagement, 2015). However, in many cases, studies examine student engagement for all college students without distinguishing between those in face-to-face and online classes. In this study, I focused on literature that examined teacher-initiated student activities in the online environment.

While literature points to the ethical responsibility to engage online students (Lee, Pate, & Cozart, 2015; Strawser, Buckner, & Kaufmann, 2015), accreditation necessitates documentation of online engagement. Successful accreditation recommendation includes compliance with state regulations and requirements for federal aid as evidenced by "regular and substantive interaction" (Accrediting Commission for Community and Junior Colleges [ACCJC], 2013, p. 2) and "regular and effective contact" ("Education Act," 2007, Section 55204) between teachers and students, with emphasis on classroom activities that are teacher initiated.

Combining the information from literature and legal sources provides three elements that should be included in the definition of online student engagement. The first element is interaction between online students and the teacher. Within the psycho-social framework that includes satisfaction as a self-identified indication of engagement, online

students have identified a preference for feeling satisfaction, as measured by engaging in activities with their teachers (Bolliger & Martin, 2018; Yu-Chun, Walker, Belland, Schroder, & Yu-Tung, 2014). The second element in the literature that is important for engaged online learning is student-student interaction. In a limited mixed-methods study, Madland and Richards (2016) found that graduate students who interacted cooperatively with an assigned peer, felt a lessened sense of isolation and an increased commitment to persist in the course and complete work in a timely manner. Engaging online students with content through active learning is the third type of engagement activity identified as important to student satisfaction. In a pilot study within an online course, Li and Guo (2015) used guest lecturers to not only increase student engagement in the realm of socio-political relevance to future career plans, but also required students to participate in discussion and reflection activities in an attempt to engage them more fully with the content. In the pilot study, students who took part in the enhanced activities, reported having a greater understanding of the content and feeling more engaged. The constructivist approach used teacher-initiated activities to engage students, though required additional preparation on the part of the course facilitators.

In this study, the emphasis was on identifying best practices of teachers in an online classroom. The process included identifying teacher-initiated activities designed to elicit student engagement as demonstrated by student-teacher, student-student and student-content interactions. Therefore, the operable definition of online student engagement activities was teacher-initiated activities that take place in an online

classroom and result in student interactions with the teacher, with classroom peers, and with the content.

Measuring Online Engagement

After defining online student engagement, the next step is to find ways to measure or describe engagement to inform teacher behavior so that student engagement can be improved. Keeping in mind that student engagement is a component of student success, and student success rates are universally lower in online courses, increasing engagement should contribute to an increase in overall success rates. There are tools for measuring overall self-reported student engagement in community colleges using student surveys (CCCSE, 2016) and faculty perceptions of student engagement (The Community College Faculty Survey of Student Engagement [CCFSSE], 2015). While there is no universally accepted tool for validly measuring online student engagement, the online engagement strategies questionnaire (OESQ) compared both student and faculty perceptions of engagement (Henrie, Halverson, & Graham, 2015; Martin & Bolliger, 2018).

Efforts to meet the challenge of measuring overall college-level student engagement include collecting data from both teachers of online courses and from online students regarding how engagement is demonstrated. The results to this point, show some overlap from the two sources of information. Following that discussion, is a description of the progress being made on the development and validation of a tool to specifically measure online student engagement.

Teacher perceptions of student engagement. One way to measure student engagement is to look at teacher perceptions. When teachers and support staff of an

online vocational center were asked to identify first barriers to student success and then methods to overcome those barriers and increase engagement, they identified students' lack of knowledge about the online environment as an important factor hindering students (Yates, Brindley-Richards, & Thistoll, 2014). The importance of pre-assessment of online student readiness combined with face-to-face and/or online orientations is an established intervention for increasing student retention (Britto & Rush, 2013). Teachers have also indicated that well-organized and clearly designed courses were important for students, and that frequent student-focused interaction between teachers and students is necessary for students to be engaged (Yates et al., 2014). In another study, student focused activity was observed by teachers in both face-to-face and online sections of a science laboratory class (Harper, Burrows, Moroni, & Quinnell, 2015). Students spontaneously shared phone images of their progress in lab activities not only with classmates in both online and face-to-face sections of a course, but also with family and friends (Harper et al., 2015). Teachers have identified multiple factors to be important to mitigate barriers and increase student engagement in online classes; the use of orientations can help students prepare for the online environment, and course design that integrates frequent interactions between students and teachers and includes student centered activities can promote student engagement in the online environment.

Student self- reports of engagement. Another way to measure student engagement is examining student self-reports. In multiple instances, at different educational levels, and in various learning environments, students cited characteristics of technology, their teachers, and the interaction between technology and instruction as

factors influencing their level of engagement. First, students cite characteristics of technology of influencing their engagement. Within the learning platform, students appreciate course content that is easily navigable, presented with tools that are appropriate to the content, and accompanied by clear instructions (Chakraborty & Nafukho, 2014; Hew, 2016; H. Xu & Mahenthiran, 2016). However, how teachers behave in these online environments also influence engagement. In a study, though limited by its use of only Moodle LMS, the authors concluded that student satisfaction for using the LMS was "significantly influenced by the instructors' familiarity and knowledge about how to utilize Moodle as the platform of LMS" (H. Xu & Mahenthiran, 2016, p. 11).

Examples of teacher-initiated active student interactions include information shared to an entire group like announcements and discussion questions, as well as individual communication through assignment feedback and email replies. Student participation increased when the teachers' active participation increased (Hampel & Pleines, 2013). In a comparison study of undergraduate students in online classes, students showed a reticence towards participating in discussions in which teachers/tutors were not actively contributing (Hampel & Pleines, 2013). The authors reported that students cited a preference for active teacher participation in discussion forums, particularly when new material is being discussed, and student participation increased when the teachers' active participation increased (Hampel & Pleines, 2013). In a study of the effect of professional development on student engagement, 2,296 undergraduates, students cited the active participation of teachers "guiding discussions" (Bigatel &

Williams, 2015, p. 13) as an example of engaging behavior. A study of MOOCS also showed that factors that are effective in engaging online students in traditional courses, including instructor interaction in discussion forums and chats, are also effective in open online courses (Hew, 2016). Students found timely and constructive feedback to be an engaging factor in the online environment (Hampel & Pleines, 2013). An analysis of the schools responding to the 2007 National Survey of Student Engagement showed that students enrolled in credit courses leading to a degree, responded well to timely and constructive feedback. The authors concluded that teachers "make an important contribution to student learning by providing feedback that encourages students to work hard in order to meet those high expectations" (Lundberg & Sheridan, 2015, p. 14). The tone of communication was also important. A study of eight sections of undergraduate information science students found that teachers' use of humor and personal disclosure in their communications to students, decreased the barriers between the students and teachers, increased the students perception of the teachers' credibility, and therefore increased the students' engagement with the course (Imlawi, Gregg, & Karimi, 2015).

Research shows that teachers who have received professional development in how to engage online students make a difference in the student experience. In a study to measure the effectiveness of an online teaching professional development program that included practice in strategies to promote student engagement in the online environment, students were asked about their engagement in courses that were taught by teachers who did or did not take part in the professional development (Bigatel & Williams, 2015). Students expressed feeling a higher level of engagement in those courses where teachers

had participated in the professional development. Students also indicated that they were more engaged when course design encouraged peer interaction and included content that was relevant to real-world experiences, when their teachers cared about their students' success as illustrated by the amount and timeliness of feedback and encouraging behaviors, and when teachers were actively providing guidance in discussions. Therefore, professional development is one method for developing teacher skills and strategies identified by both teachers and students as effective for engaging students in the online environment.

Online Student Engagement scale. To increase online student engagement, a study in 2010 piloted the online student engagement (OSE) scale. In the study, 186 online students were given a survey tool to identify activities (student interaction with content, classmates, and instructors) they found engaging. While the results were not conclusive in determining that specific activities were more likely to engage students rather than providing multiple types of opportunities for students to engage with content, the study was the first use of the survey scale and the findings validated its use "as a reliable indicator of student engagement in the online learning environment" (Dixson, 2015, p. 148). Additionally, the study indicated that engaged students appreciated both activities that encouraged interaction with peers and multiple opportunities to engage with their teachers. However, the study was limited to student perceptions of engagement, similar to the design of the CCCSE.

A follow-up study used the same OSE scale but included the addition of online student activity as tracked by the LMS (Dixson, 2015). The student activity was divided

into two groups: observation-type behaviors such as reading emails and viewing discussion posts; and application-type behaviors such as replying to emails and making discussion posts. While observational behaviors did not correlate with self-reported student engagement, correlation between application behaviors and self-reported student engagement was significant. Additionally, observational behaviors correlated with application behaviors suggesting that course design should provide multiple observational opportunities that will lead to application activities for students. The study was limited by its small size and use of volunteers, but it still provided a validation of the scale and information about student activity that indicates engagement.

Similarly, based on the premise that student engagement positively affects student success, a 38-item survey of 155 students measured their perceptions of activities designed to engage students with content, classmates, and instructors. While the results showed that students appreciated activities with applicability to real-life situations, students found that opportunities to interact with their instructors were preferred.

Summary

There are several ways to define and measure online student engagement. What is known is that student engagement is an important component of student success and activities that facilitate student engagement with their instructor seem to be preferred. But what is not yet understood is why some online instructors have move ahead and adopted technology to engage students and how to support increased use of technology tools, including existing tools that teachers can use with new strategies, or new tools that they

can use to support student engagement in the online classroom. The gap that remains is important as online student enrollment continues to increase (Allen et al., 2016).

This study used case study methodology to examine how and why teachers use activities to engage students, in the real-life context of contemporary online courses. This study extended what is understood by increasing understanding about professional development to not only identify best practices and how teachers integrate them in the online environment, but also to support the development of those skills and strategies among more teachers.

Tools for Engagement of Online Students

Online student engagement occurs between the student and the teacher, between the student and classroom peers, and between the student and the course content. In the online classroom, each of these three types of interactions are facilitated with tools that are either integrated within the LMS platform or, for external web-based tools, they can be embedded into the platform. While some tools are available for immediate use, such as an email tool, others require configuration initiated by the teacher, such as discussion forums and topics.

A single tool can facilitate multiple types of interactions. For example, a discussion board may be used as an optional technical question and answer activity, or as an ungraded but required introductory ice breaker exercise – both activities that include interactions among students and/or teacher. Or, discussions can be required formal aligned with course objectives, graded, required, and rubric-based component of a lesson that is an individual interaction between one student and one teacher. The following

sections explore literature-based examples of LMS tools used to facilitate engagement opportunities for students.

Table 1 identifies the names of similar tools used by common LMS platforms. This table is limited to identifying tools that are included with the core LMS applications. In many cases, the name of the tool is also the function of the tool but is not necessarily the same across all LMS platforms, i.e. email is referred to as *email* in four of the five LMS platforms but referred to as *conversations* in the Canvas LMS. Additional external tools can also be added via Learning Tools Interoperability (LTI) or other programming methods, to maintain student interaction and privacy within the secure walls of the LMS, i.e. web-sharing applications can be added as a plug-in to an LMS with an institutional license. External tools which require students to work *outside* of the LMS, are not identified in Table 1.

Table 1

LMS Tools Identified by Platform

Tool Function	Blackboard	Canvas	D2L	Moodle	SaP3
Asynchronous Text Message	--	Conversation	Pager	Messaging	Messages
Audio (embed, link, download)	Insert media	Audio	Audio	Audio file	Audio
Blog	Blog	Wiki page	Blog	Blog	Blogs
Checklists	--	Requirements /Prerequisites	Checklists	Checklist	Checklist
Content	Page	Page	Content Files	Lesson	Lessons
Discussion	Discussions	Discussions	Forum w/topic	Forum	Forum w/topic
Email	Email	Conversations	Email	Email	Email
Grades	Grades	Grades	Grades	Gradebook	Gradebook
Group Workspace	Groups Tool	Groups Tool	Group workspace	Workshop	Groups
News (not RSS)	Announcement	Announcement	News	Announcement	Announcement
Poll	--	-only mobile app	-only external app	Choice	Polls
Profile	Profile	Profile	Profile	User profile	Profile
Quiz	Quiz	Quiz	Quiz	Quiz	Tests and Quizzes
Rubrics	Rubrics	Rubrics	Rubrics	Rubrics	--
Student Upload	Assignment	Assignments	Dropbox	Assignment	Dropbox
Survey	Survey	Quiz-Survey	Survey	Survey, Feedback	see Tests and Quizzes
Synchronous Text	Chat	Chat	Chat	Messaging	Chat
Video (embed, link, download)	Video	Video	Video	Video	Video
Wiki	Wiki	Wiki page	--	Wiki	Wiki

While there was a possibility of overlap in the discussion of tools, since they can be used in a variety of ways as Table 1 shows, the following discussion was organized according to the type of engagement the teacher's implementation promotes; either student-teacher engagement, student-student engagement, or student-content engagement.

Tools for Student-Teacher Interaction

The first category of tools for engagement is those used for student-teacher interactions. One type of student-teacher interaction is individual feedback a student receives directly from the teacher on rubrics associated with assignments completed as part of the course. Feedback comes in various forms and online teachers use a variety of tools. While students tend to participate more frequently in activities that they judge are either necessary for learning new content or for increasing their grade (Prestridge, 2014), receiving teacher feedback also increases participation (Martin, Wang, & Sadaf, 2018). Some teachers provide feedback within assessment rubrics associated with specific online assignments. Most LMS platforms include customizable rubric tools that can be designed to provide pre-loaded and individual assignment-specific feedback. There are conflicting results when students are surveyed about receiving information from a rubric. While there is agreement that rubrics provide helpful information (Jones & Blankenship, 2014), students in a hybrid class preferred receiving the rubric in a face-to-face session where they had a chance to ask questions and receive clarification (Atkinson & Lim, 2013), while other results conclude that students prefer being able to access their feedback rubric privately to allow for reflection (Parkin, Hepplestone, Holden, Irwin, & Thorpe, 2012). Rubric feedback, whether provided in written or multimedia format, and either in

immediate or asynchronous setting, provides an opportunity for student-teacher communication about a specific portion of an assignment. And, when LMS data for 334 undergraduate students in an online writing course was analyzed, the results showed that when feedback is visible to students at the same time they are viewing their grade, they are more likely to access that feedback (Laflen & Smith, 2017).

Another type of student-teacher interaction is the use of text-based, audio, or video tools for general feedback. Text comments can be included in feedback forms directly in the LMS or on the document itself. A limited study of 23 undergraduate students showed students preferred typed to handwritten feedback, not only because it was legible, but also because it was deemed to be more reflective and considered (Parkin et al., 2012). In a year-long study of student preferences for text-based feedback, students expressed preference for personalized detailed feedback, both positive or critical that indicated where they had made errors, if the feedback would help them improve their performance (Jones & Blankenship, 2014). Active feedback can also be delivered using audio tools integrated into the LMS. A limited study of 137 first-year undergraduate students, found no significant preference for either audio or text-based feedback (Fawcett & Oldfield, 2016). However, in a comparison study of four sections of an undergraduate business class, students who were provided audio rather than text group-feedback, gave significantly higher ratings for the statement “instructor seemed genuinely interested in whether students learned” (Dias & Trumpy, 2014, p. 13). In addition to text and audio feedback, providing video feedback using tools embedded in LMS contributes to teacher social presence. In a semester long study of undergraduate teacher candidates, while

students found text-based feedback more convenient to access anywhere, more efficient to skim, and more concise, they also felt more supported through the video feedback, as if they were having a friendly conversation with their teacher (Borup, West, & Thomas, 2015). In a study of 126 undergraduate and graduate students, students expressed a significant preference for video feedback and mentioned the individualized and supportive nature of the delivery (Henderson & Phillips, 2015). While there are a variety of ways teachers can provide feedback related to work completed in online courses, students appreciate and feel more engaged when they have direct and personal communication with their teachers.

Social, non-course related communication is another type of student–teacher interaction that can also affect student engagement. An example of non-course related communication is the teacher profile image and information that is usually included on a course homepage. Research suggests that most online students feel less isolated when they can view an image of the face of their teacher, and also their peers, in the online classroom, though some find it unnecessary or an invasion of privacy (Kear, Chetwynd, & Jefferis, 2014). In a study comparing three sections of the same class, the students who had an additional social media site discussion forum, complete with profile information and images, available to supplement their LMS forums, showed an increase in their amount of student activity leading the author to conclude that the students were more engaged (Kent, 2013). The students' social media site forum postings included links to course related learning materials and academic discussions without decreasing the amount of LMS discussion postings. A separate comparison study (Camus et al., 2016) of

two sections of the same course, one with discussions limited to the LMS forums and one with discussions on a social media site, had similar results concerning the of amount of interactions across the two types of discussion forums, but the difference in type of discussions was more pronounced than in the Kent (2013) study. Student postings on the social media site forum were more likely to consist of student-student discussions, while the LMS forum encouraged student-teacher interaction and seemed to be "a more effective tool for fostering other types of outcomes (e.g. integration and application of course material)" (Camus et al., 2016, p. 90). The demonstrated high participation rate of discussions in social media sites compared to LMS discussions has not been explained. Online teachers can leverage these non-course, teacher-student interactions to improve engagement in online courses without compromising the integrity of the interactions in the LMS. As mobile device use becomes more ubiquitous, teacher and student use of mobile devices in learning environments is also increasing which can contribute to additional teacher-student interactions (Shin & Kang, 2015). The increasing use of mobile devices by students is a factor for teachers to consider when designing course content and activities. In two more recent studies, mobile use facilitated effective direct communication between an individual student and teacher using SMS (short message service) and LMS mobile applications (Alden, 2013; Prestridge, 2014). The results of these studies indicate students' level of comfort with concise communications and their willingness to engage with teachers using technology that is also used outside the classroom in the students' everyday life. As mobile device use continues to grow, the

development of LMS mobile apps to connect teachers and students in educational environments will likely increase.

Web-based conferencing tools can be used to improve the student-teacher interactions and therefore improve engagement. In a comparison study of asynchronous chat and synchronous web-based conferencing, the conferencing that facilitates immediate interaction with teachers and among students also demonstrated an added benefit of increased performance (Riedel & Betty, 2013). Feedback from students in an online undergraduate nutrition class that added monthly synchronous sessions to the established course, showed that students appreciated the interaction with the teacher and fellow students, despite technical difficulties that occurred during the pilot implementation (Banna, Grace, Stewart, & Fialkowski, 2015).

Although tools that allow for personal student-teacher interactions engage students, tools that allow interaction to the entire group also engage students. When teachers provided information in group communication areas, such as discussion forums, it encouraged students to interact with each other focused on what the teacher felt was important (Joo, Andrés, & Shearer, 2014; Salter & Conneely, 2015). In a study of the effect of online course design features on student performance, students in classes where teachers regularly used tools such as announcements to interact with students, interviewed students reported a greater sense of commitment and performed at a higher level than classes where student-teacher interaction was not as high (Jaggars & Xu, 2016). In a pilot study to develop a workshop for online teaching best practices, student focus group members described being more engaged when the teacher was more engaged

as demonstrated by posting announcements and sending emails on a regular basis. Teacher initiated student-teacher interaction, both group and individual, course-related and social, encourages a relationship between the students and the teacher and facilitates continued communication and engagement for the duration of the course.

Tools for Student-Student Interaction

The second category of tools for engagement is those used for providing students the opportunity to have meaningful student-student interactions. Tools that support student-student learning activities have a shown to have a positive influence on student performance and provide an inclusive environment when accompanied by explicit guidelines explaining the purpose, requirements for participation (S. Gregory, 2015; Ioannou, Demetriou, & Mama, 2014), for both graded and non-graded activities (Lata & Luhach, 2014). When students contribute using text-based or multimedia tools, having a developed online presence such as a user profile or introduction, encourages communication, though some students are concerned about privacy (Kear et al., 2014; Schrameyer, Graves, Hua, & Brandt, 2016). Integrating social media-type tools that encourage informal communication while keeping activity within the LMS, can help to mitigate those privacy concerns. Student interaction occurs online through text-based formal and informal discussion areas, social media-type tools both external and internal to the LMS, and collaborative tools.

The online discussion is the hallmark of many online courses to encourage student-student interactions. Interactive activities such as discussion boards have been found to be helpful to understanding new concepts (Baleni, 2015) through participation

with peers, facilitated by the teacher (Salter & Conneely, 2015). However, the asynchronous nature of discussion tools brings with it both challenges and benefits. One challenge is the necessity of having to depend on peers to post original contributions before replying. This is an inconvenience when students are not able to continue discussions on their own schedule. Another challenge is faced by students who may be familiar with text-based online communication using informal platforms such as blogs but are not familiar with the more formal academic tome required for learning environments. However, the asynchronous nature of the discussion tool can also be a benefit for students who are only able to participate in an online course precisely because of the flexible schedule. In addition to the advantage of asynchronous discussions for students with schedules which limit the time of day they can participate in a class; asynchronous discussions provide built-in preparation time for students. In a comparison study of two sections of the same course, one face-to-face and one online, the asynchronous nature of the discussion board allowed students to carefully read their peers' postings, take time to research and form their ideas prior to posting, to return to the discussion multiple times, and to clarify their ideas as the discussion continued (Ingram & Steger, 2015; Wise, Hausknecht, & Zhao, 2014). Asynchronous discussions provide the benefits of both a flexible time schedule for participation and built-in preparation time. The asynchronous online discussion, no matter the tool used, provides students opportunities to interact with each other around the course content.

In addition to threaded discussion tools, text-based student-student interactions may also take place with informal tools both inside and outside the LMS. Multiple

comparison studies of LMS discussion tools and external social media discussion tools over a class term, showed a higher amount of participation on the social media sites, though the LMS discussions were more content-centered (Camus et al., 2016; Kent, 2013). The demonstrated high participation rate of discussions in social media sites compared to LMS discussions has not been explained. The participation pattern suggests that tools that are accompanied by clear instructions and explanations for their purpose, and modified to include student-centered activities, also encourage student-student interaction.

There are also several tools that online students use to work collaboratively in a virtual environment to complete coursework. Wiki pages, often contained within the LMS, can be student-centered in design by allowing students the freedom to create the format and style of the interaction rather than limiting them to a typical post- reply format of a discussion. Cloud platforms provide multiple types of collaborative tools that can be used by students to produce documents, including Google Docs and Microsoft Office 265; to store and access group files, including Google Drive, Microsoft OneDrive, and Dropbox; and to interact synchronously, including Google Hangouts, Microsoft Skype, Adobe Connect, and Zoom. While collaborative and group work is common in student environments and an increasingly valuable 21st century skill, use of these tools must be applied in a way that meets educational requirements to protect student information as required by Family Educational Rights and Privacy Act (FERPA) (Schrameyer et al., 2016). When collaboration tools are integrated appropriately within the LMS, student information and privacy is protected. When teachers incorporate tools, which are

integrated into the LMS, and that encourage student-student interaction and collaboration through text-based activities, social media-type activities, and multimedia platforms, students report more engagement with the course while their privacy and information remain protected within the educational environment.

Tools for Connecting Students to Content

Finally, the third category of tools is those that provide opportunities for student interaction with content. LMS platforms provide multiple tools that can be used to organize and deliver new content asynchronously and synchronously. The tools used in online courses to help connect student to content can be classified as text-based or audio and video tools. Students primarily access content in online classes through text-based tools. Text-based tools include html pages and the linked documents written and/or assembled by teachers or instructional designers. In data from a questionnaire combined with analytics from 26 teachers in two 8-week graduate classes, while the majority of students preferred accessing text-based instructions and organizational information, when provided with alternative formats for content, the 61% preferred using video to learn new content (Fidalgo & Thormann, 2017).

There are several tools in LMS platforms that provide text-based content for online students. First, LMS platforms provide a location for instructors to load instructional text directly into the platform as complete webpages. These pages might include teacher-generated content (similar to lecture notes) or include explanatory text to introduce linked external resources including open education resources (OERs), or the pages might provide links that direct students to external additional websites for content

instruction. The development and use of LMS analytics can help teachers use data to inform their design and use of content pages in efforts to improve student success (Gaftandzhieva, Doneva, Petrov, & Totkov, 2018; Jaggars & Xu, 2016).

Multimedia tools including video and audio files, can be embedded into a site for asynchronous access, and synchronous web-conferencing tools provide the option for live interaction with the teacher and among students. In addition to webpages loaded with content, some online teachers embed text-based slide presentations with audio tracks, so students can hear the instructors' voice-overs a text-based slide show (Reinecke & Finn, 2015). While audio slide shows are a one-way communication of content from teacher to student, the learning can be enhanced by using tools within the LMS to include interactive components alongside the online lectures. Using a video tool with embedded questions, or designing a course structure that requires questions to be answered before continuing to access the next resource, can increase student mastery when developing expertise with new concepts (Vural, 2013). Interaction with multimedia at a rate controlled by correctly answering embedded questions, showed better learning outcomes than watching a video without questions that reinforced the learning (Vural). Students who accessed new content through multimedia tools also perceived they were learning more and were more emotionally engaged, though the effect on grades was not examined (Buzzetto-More, 2015). In online courses, the primary ways students interact with course content is by reading webpages within the LMS, visiting links to content outside the LMS, but students who accessed content via multimedia tools felt more engaged.

The asynchronous online discussion, no matter the tool used, is the place where students are often asked to publicly interact not only with each other, but also with the content as evidence of having met course objectives. However, the asynchronous nature of discussion tools brings with it both challenges and benefits. One challenge is the necessity of having to depend on peers to post original contributions before replying. This is an inconvenience when students are not able to continue discussions on their own schedule. Another challenge is faced by students who may be familiar with text-based online communication using informal platforms such as blogs but are not familiar with the more formal academic tome required for learning environments. However, the asynchronous nature of the discussion tool is also a benefit for students who are only able to participate in an online course precisely because of the flexible schedule. Based on a comparison study of 24 graduate students in two groups of an online extension course, the authors recommend that instructors offer both synchronous and asynchronous opportunities for interaction as synchronous discussions may increase the sense of community while asynchronous discussions allow students to take time for reflection prior to engaging with their peers (Brierton, Wilson, Kistler, Flowers, & Jones, 2016)

While threaded discussions are most common in online courses, web-conferencing and other multimedia sharing tools are also used to facilitate student connection with content and have also been used with varying success to connect students with content as well as each other. Proper technology tools make globally connected projects possible (Lock, 2015). In a project that used an asynchronous multimedia-sharing tool to connect 150 students from two different countries and culture,

the combination of audio, visual, and text-based media enhanced the cultural knowledge and experience for the participants (Song & Donovan, 2013).

Web-based tools are also used in online classes where instruction and discussions are synchronous. A limited case study of the use of a web-based video-conferencing system to deliver synchronous instruction to nine students across multiple states showed it to be an effective modality for delivering new content with the added benefit of flexibility that allows students to attend the course from anywhere (Tonsmann, 2014). An added advantage mentioned by the students, compared to face-to-face delivery, was the ability to individually review the recorded presentations on their own schedule (Tonsmann). Synchronous chat has been used at multiple points in the presentation of new content, though more often chat is used to explain a task or make an appointment for a more in-depth communication (Schwartzman, 2013). Encouraging student participation in synchronous video-conferences through the use of text-message reminders increased attendance from 18% to 34% in a study of 849 students across 38 undergraduate courses (Basko & Hartman, 2017). The authors suggest using announcements, incentives or credits to encourage attendance. They also suggest sharing the information with students that they experienced a correlation between past student participation in the first course video-conference and course success (Basko & Hartman, 2017).

In a two-year study of the use of tablets for a collaborative activity, the initial recorded assignment instructions were followed by synchronous chat with the teacher to clarify the requirements and reassure students about the nature of the new type of assignment (Pymm & Hay, 2014).

Tools that help instructors record and post audio recordings in the LMS is another way that students can connect to content. While an LMS platform may be completely ADA compliant, the information placed on the platform must also be completely accessible to all students, as well as any tools used for interaction must also meet local, state, and federal accessibility standards and guidelines. This topic is germane in the context of multimedia tools when selecting tools for use with students, keeping in mind that students may not self-identify as needing accommodation.

Summary

All LMS platforms provide similar tools that teachers can use to interact with groups or individual students, promote student-student interaction, and facilitate effective learning by connecting students to course content. These platforms provide teachers the flexibility to select what tools to use and how to use them.

What is known is that teachers can increase student engagement through their selection of tools how they use them in course design for example in graded or non-graded forums and individual or group activities (S. Gregory, 2015; Rueda et al., 2017). Students choose to access materials that they themselves think will either be helpful to organizing their learning, are available online from anywhere, or that are part of a required and graded activity (Henderson, Selwyn, & Aston, 2017; Prestridge, 2014). The research shows that for students to be engaged in learning process teachers must use best practices and select the appropriate tool for the appropriate purpose (Buzzetto-More, 2015; Camus et al., 2016; Khechine et al., 2014; Wegmann & McCauley, 2014). While there is much research on defining student engagement and describing best practices for

teachers to engage students, what is not yet understood is how teachers select LMS tools to use and how they use them within the online environment to increase student engagement. The gap that remains is important as online student enrollment continues to increase (Allen et al., 2016). The findings from this study support the development of responsive and innovative programs that encourage and support teachers as they adopt new online teaching technology, including the use of tools designed to engage students in the online classroom and increase student success.

Challenges to Adopting Innovative Technology in the Online Teaching Environment

The DoI theory (Rogers, 2003) identifies the four main elements of the diffusion process as the innovation itself, and the factors of time, communication channels, and the social system that have influence on an adoption process. Current researchers have found that when a decision is being made at the administrative or classroom level concerning the adoption of a technological innovation, the last three factors continue to influence that decision for teachers in online education. The characteristics of different categories of adopters, beginning with the Innovators, also influence the significance of those factors in the adoption of technology, including teachers' initial decision concerning whether to consider teaching online. The following sections explore the three most significant factors of the diffusion process of technology adoption in the online teaching and learning environment, time, communication channels, and the social system, followed by an exploration of the challenges and solutions indicated by the current research.

Time

Time is the factor that is most often cited as a limitation when teachers consider implementing new technology such as multimedia tools for teaching or moving their course from face-to-face to an online teaching environment. In the process of adoption of new technology, time can be measured as the period from the user's knowledge of the innovation to the completion of their innovation decision process, the relative time that the adopter takes within the system to adopt the innovation, or the rate that an innovation is adopted within a system, (Rogers, 2003).

From current research, three themes emerge around the topic of time as a limiting factor in the adoption of innovation: additional time to learn new technology is added on to traditional teaching requirements, scheduling the time for professional development is difficult within an inflexible teaching schedule, and the impact of the time requirements could have a detrimental effect on student success and therefore school reputation. In a case study at a three-campus university in the RSA (Republic of South Africa) with 21 university teachers new to technology enhanced learning and their professional development trainer, involved in a pilot project to create a distance learning environment, the results pointed to the need for ongoing professional development to support faculty who find themselves needing to "increasingly race technology to compete for their students' attention…[and] the changing needs of technology-able students" (Esterhuizen et al., 2013, pp. 75-76). In a follow-up examination of 60,000 student teachers at the three-campus university in the RSA (Republic of South Africa), a noteworthy factor for lack of technology adoption by student-teachers was not only the time away from required duties that needed to be spent on learning the new technology, but also the

inconvenient time schedule of training programs designed to support that learning (Esterhuizen, 2015). This effort highlighted the fact that teachers who adopt technology require continuing support to remain abreast of new technology and best practices for integrating those technologies into their teaching environments.

In a three-year historical review of a technology adoption process at a three-college, five-faculty groups effort at the University of Technology, Jamaica, the time that needed to be spent away from daily requirements was cited as a challenge for teachers considering adopting new technology (Fray-Aiken & Campbell-Grizzle, 2016). A pilot study of the implementation of new language-teaching software in an eastern US college showed that course preparation was taking longer than expected, even when being undertaken by a team of teachers and specialists (Sato et al., 2015) and similar concerns were expressed by teachers in a European university radiology education program (Xiberta & Boada, 2016) and business teachers in an African public university (Lwoga & Komba, 2015). In a survey of 363 university faculty in the southeastern United States that examined faculty motivation to teach online, the extra time needed was the strongest barrier to adopting new technology (Wright, 2014). The results in these cases lead to the conclusion that the amount of time needed to train on the new technologies is often underestimated, further challenging the teachers with full-time teaching requirements.

When teachers are in the process of deciding whether to adopt new technology and consider the amount of time it will take from their regular requirements, they are thinking not only of their own personal requirements but also of the impact that engaging in the endeavor will have on their students. In a mixed methods study limited to eight

secondary school teachers in the US and Australia, teachers felt they might be putting student achievement at risk by embarking on a process to adopt new technology because the process could take away from their teaching preparation time (Howard, 2013). Similar concerns were addressed by teachers in a consortium of 19 American Midwestern universities cooperating in an online agricultural and law program (Centner, 2014) and by a survey of 137 engineering college lecturers in Israel (Pundak & Dvir, 2014). The teachers in the workgroup in Centner's (2014) study expressed a concern for engaging students by creating lessons that did more than just deliver material at a distance. The workgroup members acknowledged that to prepare students for careers, they needed to include opportunities for students to interact with each other and develop interpersonal communication skills (Centner, 2014). The time to create and facilitate engaging and high-quality activities was cited as a concern for the teachers in Centner's (2014) study. According to Pundak and Dvir's survey (2014), there are many colleges in Israel with no online courses, and 84% of the survey participants felt that they did not have the time to create an online course.

Existing research highlights time as the limiting factor most often cited when teachers are faced with an innovation adoption decision and that factor is expressed in three ways: a concern that there will not be enough time to learn new technology while meeting traditional teaching requirements, the challenge of scheduling time for professional development within an inflexible teaching schedule, and the impact that time away from traditional requirements could have a detrimental effect on student success and therefore school reputation. The factor of time is cannot be separated from the factors

of communication channels and the social system in attempts to mitigate the effects of these factors in the innovation decision process.

Communication Channels

After the issue of time, the second challenge to the technology adoption process, is related to communication channels. It is important that communication is timely and targeted for users who are involved in the process. Users in the earlier adopter categories react more quickly to mass communication while individual communication is more effective for later adopters (Rogers, 2003). Appropriate use of communication channels, from individual emails, phone calls, and face-to-face conversations as well as group communications such as workshops, webinars, and newsletters, can influence the rate of adoption of technology (Ball et al., 2014). Therefore, communications need to be planned with attention paid to the senders as well as the receivers. In a historical review of the adoption process in the Jamaican University study (Fray-Aiken & Campbell-Grizzle, 2016), the initial email communication originated from teachers who were designated as distance learning liaisons appointed to bridge gap between the college teaching groups and distance learning support offices. However, the study showed that if the liaisons were not familiar to the teacher groups and the role of these liaisons was not communicated to the teacher, so the emails received little or no attention (Fray-Aiken & Campbell-Grizzle, 2016). In this case, while the emails were thoughtfully targeted and individually sent to all appropriate teachers, because the teachers did not recognize the email originator as a peer, they ignored the emails. For individual communication, the relationship between the sender and receiver is significant in the innovation decision process.

While individual communications are important, other research highlights the impact of early mass communication signaling institutional support and acknowledging the teachers' role in leading technological change. A comparison study of two four-year institutions that attempted to adopt institution-wide online learning environments detailed the importance of teacher support (Mitchell et al., 2015). In a different study, a survey of health education teachers from universities within the American Association of Health Education Directory, researchers concluded that the teachers depended on communication not only to educate them initially about technology, in this case the distance education program, but also to inform them as technology was updated. In this survey, teachers cited communication as the most significant factor in the technology adoption process (Ball et al., 2014). Results from current research indicate that timely communication, designed for users based on user adopter characteristics, has a significant effect on teacher attitude towards a technology adoption process.

Social System

Along with time and communication issues, the social system has also been shown to be a challenge to adopting innovative technology in the online learning Environment. A social system is a group with structure and norms, comprised of members engaged in a process with a common goal, which in this study is the multilayered social system in educational institutions including the teachers who have the option to adopt new technology in their learning environments to those who are considering a complete transition from traditional to online learning environments (Rogers, 2003). Within the educational social system, there are three components that

have an impact during the innovation adoption process. The first is administrative support which is regulated from the top of formal social structures, and is indicated by the level availability of logistical, financial, and personnel resources. Also, within the educational social system is the implied level of academic preparedness that teachers bring to their vocation, and the fear that they might not be prepared to meet the challenge of innovative technology. The third component of the social system is the informal interaction among peers at various stages of the adoption process.

Administrative Support. Teachers reflect on the institutional cultural values when considering adopting a new teaching method or new technology. Institutional values can determine the amount of logistical, financial, and personnel support available during the process of technology adoption and can have an impact if normal work routines are going to be affected or re-appropriation of time and resources might be necessary. In the comparison study of two four-institutions that attempted to adopt institution-wide online learning environments (Mitchell et al., 2015), the authors identified teacher perception of cultural values as a possible point of resistance to the adoption . The authors recommend that administrative support demonstrated through validation of teacher concerns and communication that recognizes teachers as the leaders of educational change, is a necessary component of a successful innovation adoption process. The availability of administrative support for mitigating the challenge of time needed for adopting technology was expressed by the 21 teachers in a case study of a pilot project to develop a distance education program. In this case study, the researchers reported that teachers were concerned most immediately about the effect that time spent

learning new technology would have on their daily workload and dependent on administrative support, first for indicating that learning new technology is valued and second to facilitate practical means for providing opportunities for professional development (Esterhuizen et al., 2013). In other studies, administrative support is particularly important in the initial stages when online content is being prepared by providing additional personnel, for example in the form of a team of teachers, designers, and other technical experts (Huss et al., 2015; Pundak & Dvir, 2014; Sato et al., 2015). Results from current research indicate the importance of administrative support on teacher attitudes and success of technology innovation adoption from the inception stage, through the execution, and beyond.

Fear of Academic Unpreparedness. Another way social systems act as a challenge to the adoption of innovative technology in online learning is the existence of fear of academic unpreparedness felt by teachers. Teachers are concerned both about their lack of technology skills and the effect on their students. In multiple studies, of secondary and undergraduate level teachers cited the risk to student achievement of not having the time to prepare to learn and use new technology (Howard, 2013; Huss et al., 2015; Pundak & Dvir, 2014). The gap between teachers' current technological ability and that of their students will continue to widen without targeted professional development opportunities (Esterhuizen et al., 2013). An opposite situation was described by researcher Madlela (2015) in a study of teacher education students in a University within the University of South Africa (UNISA) system. The master teachers at the university noted that their own university did not have the infrastructure to support the use of

technology with their students once the students were engaged in practice teaching at distant locations. Nor did the distant locations have infrastructure in the local schools. In this case, neither the teachers nor their students had a level of academic preparedness that the master teachers felt was necessary to prepare both teachers and students to incorporate technology into their programs (Madlela, 2015). The fear of academic unpreparedness among teachers can become a source of teacher resistance to technology integration and adoption (Mitchell et al., 2015).

Peer Interaction. Along with informal interactions among peers have also found to influence teacher attitudes toward new technology adoption. In some studies, the establishment of teacher peers served as informal distance education liaisons to provide someone with whom teachers could discuss the proposed technology innovation. However, in some studies, because the liaison was not always from the same department and was often therefore unknown to their colleagues, the interaction was not successful (Fray-Aiken & Campbell-Grizzle, 2016). In examining the divergent experiences of two four-institutions that attempted to adopt institution-wide online learning environments the authors recommended the establishment and support of formal and informal groups and professional development opportunities to allow share their experiences and gain experience in developing technology competence (Mitchell et al., 2015). Interaction within different layers of the social system has an impact on teachers in the process of deciding whether to adopt new technology in the learning environment.

Relating Rogers's Diffusion of Innovations Theory to Technology Adoption

Careful consideration of the three elements of the diffusion process that influence the technology innovation adoption decision in education, time, communication channels, and social system, along with the characteristics of the different categories of adopters, aided in identifying and mitigating challenges to successful technology adoption. While time constraints, inappropriate or infrequent communications, and lack of attention to the social system can cause adverse reactions, planning that includes mitigation processes has shown to minimize negative experiences so as not to negatively impact their success (Esterhuizen, 2015; Mitchell et al., 2015).

Time is the factor that is most often cited as a limitation when teachers consider implementing new technology. Results from current research indicate that acknowledging that concern and providing support through additional personnel (Fray-Aiken & Campbell-Grizzle, 2016), scheduled professional development opportunities (Mitchell et al., 2015), and on-going institutional commitment (Esterhuizen, 2015), address that challenge for teachers and maximize the opportunities successful integration of new technology.

While lack of communication can leave teachers in the dark about potential technology integration at a department or institution level, communication channels when used early, often, and appropriately, support successful implementations (Ball et al., 2014). Recognizing that teachers have the potential to either lead educational technology transformation efforts or prevent them from taking place, initial communication from educational administrators that recognizes teachers' pivotal role and validates concerns while acknowledging that transformation is an individual choice, can help to engage

teachers in supporting and participating in innovation adoption (Mitchell et al., 2015). In this comparison study of the two US universities, the authors indicated that teacher attitude was the deciding factor in the success of the adoption effort at one university and the failure to adopt technology at the other (Mitchell et al., 2015). In the Jamaican university study, teacher attitudes were changed when a new dean established a support team for teachers that included instructional and content support staff and program administrators (Fray-Aiken & Campbell-Grizzle, 2016). As the authors explained, this provided a practical demonstration of administrative support and relieved some of the challenges impacting on the teachers' time, concern for their students' success, and fear of their own inability to provide quality learning content. According to the researchers, the establishment of peer mentors provided collegial support important within the social structure of the learning institution.

Identifying what support is available from administration, even if it is limited to a department, acknowledging the impact of time, and recruiting teachers with realistic expectations and positive attitudes towards technology adoption are some of the recommendations from pilot study of the implementation of new language-teaching software in an eastern US college (Sato et al., 2015). Those recommendations recognize the barriers that time constraints, inappropriate or infrequent communications, and lack of attention to the social system can place in the way of successful technology adoption and suggest steps for mitigation.

Summary

I used the DoI theory to provide a framework for identifying the three factors that teachers cite as challenges to the integration or adoption of new technology in their online classrooms: time, communication, and their social system. Current research describes steps that can be taken to mitigate those challenges at an institutional level and a department level, including a commitment to providing professional development opportunities. What is not known is how teachers make the decision to move forward to overcome the challenges identified within the DoI theory through professional development opportunities. Also unknown is if that decision can be influenced by actions taken at a specific time, with particular types of communication, and where within the social system those opportunities can be communicated to assist teachers in overcoming the challenges. Identifying how individual teachers have met and overcome identified challenges to integrating technology using Kolb's ELM to identify the stages of the ELM cycle at which those opportunities are most effective can help in the design and communication of professional development opportunities that encourage and support teacher adoption of best practices in the use of technology to engage students in online instruction.

Factors Influencing Technology Adoption in the Online Teaching Environment

The ELM (D. A. Kolb, 1984) is a four-stage cyclical model of transformational learning through experience. Within this framework, a learner progresses through distinct stages: Concrete Experience during which the learner can choose whether to engage in a new experience, Reflective Observation when the learner has a chance to reflect on the

new experience, Abstract Conceptualization when the learner has the time to relate the potential experience to the learner's own situation, and Active Experimentation when the learner can actively apply the new knowledge. The cycle that may be entered and exited at any stage as the learner makes choices about their level of readiness to engage in an activity. In the following sections, I describe current research that describes the three predominant factors that influence teachers' technology adoption in the online teaching environment: administrative support, professional development, and peer support and collegial interactions.

Administrative Support

The first factor influencing technology adoption in online teaching environments is related to the institutional attitudes toward online education. In a survey of academic leaders in the United States, 76.3% of administrators at institutions in the United States with less 2,500 online students and 90.3% at institutions with over 10,000 online students felt that online education would continue to play an important role in their mission and was included in the formal strategic plan for those larger institutions (Allen et al., 2016). Teachers' support for adoption of an innovation such as online instruction in the educational environment is crucial to the success of an effort on a system-wide basis. However, administrative backing is also necessary for the teachers' support at every stage of the adoption and ranges from the inclusion of teachers at the inception of the idea through ongoing tangible support with financial components.

Administrative support often begins with the involvement of teachers in the preliminary stages of an adoption effort. Results from a large-scale quantitative survey of

301 teachers to gauge the perceived benefits of using Web tools in education, indicated that a majority felt there were benefits to the use of Web tools for learning including the use of social networks for cooperative learning (97%), the availability of dynamic content (80%), and the potential for user participation (65%) (Mbatha, 2015). However, the same survey indicated that many of the perceived challenges stemmed from a lack of administrative support as demonstrated by the absence of an Internet communication policy (67%), inadequate infrastructure (100%), lack of trained staff (67%), and a perceived negative attitude (88%) towards the use of Web tools in the educational environment (Mbatha, 2015). These results led the researcher to call for a system-wide task force that addresses the design and support for the educational use of web tools and includes teachers at policy development stage to support the successful adoption of technology for pedagogical use (Mbatha, 2015). In a smaller scaled qualitative study, interviews with 11 administrators from US higher education institutions in a grant-funded program to explore and adopt blended learning, suggestions for a successful adoption included the identification of a role for teachers in the development of a shared vision for the effort (Porter et al., 2014). In a comparison study of the outcome two 4-year universities to develop online programs, the university that did not receive the support of faculty for the effort, beginning with the strategic vision, was ultimately unsuccessful (Mitchell et al., 2015). Each of these studies illustrate the importance of not only providing administrative support for the adoption of new technology but including teachers in the development stages of the institutional vision and the plans for the strategic implementation of the vision.

There is a tangible resource component of an effort to adopt technology, and administrative support is evident when infrastructure and equipment is provisioned appropriately. In a report on the effort to create an online professional development program for the delivery of teacher training to 30,000 active teachers in South Africa and two neighboring countries, a pre-condition of the implementation of the training program included administrative support as demonstrated by the availability of work spaces supported with secure and stable Internet access (Esterhuizen, 2015). For example, a challenge to the teachers' effort to use technology in their teaching in the UNISA study, was the perceived lack of administrative support as evidenced by the failure to provide safe and secure infrastructure and standards for the use of technology (Mbatha, 2015). Tangible administrative support in the form of appropriate communication infrastructure was also cited as a recommended practice by the study of administrators from the 11 US institutions in the grant-funded program (Porter et al., 2014). Financial support for hardware may be controlled at a level above the individual institution. In an illustrative study of six elementary school principals in Turkey who were the instigators of an effort to use technology to support their schools, their own supervisors withheld support and the effort failed for lack of hardware resources (Sincar, 2013). As highlighted by these studies, administrative support can be demonstrated through the provision of viable infrastructure and appropriate hardware. While teachers may look at their local administrators for support, the administrators themselves may also have a supervisory structure from which they need support to meet the local teachers' needs.

Administrative support is also demonstrated through providing additional staff to support teachers involved in new technology adoption and use. Interviews with 16 teachers over three terms involving an undergraduate introductory communication course being converted from face-to-face to a hybrid format, the initial conversion was completed by instructional designers without the input of the teachers (Freeman & Tremblay, 2013). The teachers reported feeling detached from the course material as well as from the students as they were now teaching a course that was not necessarily designed to match their ideas about the presentation of the course material or preferred method of communication. Analysis of the interview data led the authors to recommend that teachers work as partners with the instructional designers (Freeman & Tremblay, 2013). The partner relationship between teachers and instructional designers is supported by the case study of five online teachers at a United States university school of public health, to alleviate the challenges presented by the amount of time teachers would need to learn to teach online and fear of the unknown strategies needed for teaching online (Kidd, Davis, & Larke, 2016). A similar result pointing to the advantage of using support staff, in this case educational technologists, to help teachers design student interactions into their online classes, was found in a survey of 16 teachers moving from a face-to-face to an online teaching environment at a medical university and hospital in Sweden (Pettersson & Olofsson, 2015). While other administrative support may have a financial foundation, direct financial support to teachers was also mentioned as a recommendation in the forms of stipends and other financial incentives (Kidd et al., 2016; Porter et al., 2014).

Administrators may support the need for offering online classes as a prudent economic step or as a fulfillment of the mission. However, they also need the support of teachers for a successful system-wide adoption of an innovation such as the offering of online course. That support includes involving teachers in the development of the strategy, providing appropriate infrastructure, allotting staff support, and sometimes offering additional financial incentives.

Professional Development

The availability of professional development to assist teachers involved in technology adoption is crucial at all stages of adoption. Appropriate professional development helps to mitigate the challenges of time required to learn a new skill and fear being unable to learn a new skill that are so often cited as obstacles to a technology adoption process and is tangible demonstration of institutional support.

Although teachers in some studies report that they use technology for everyday tasks, they are unsure of how to transfer that knowledge for pedagogical use. In the UNISA study of 300 teachers, the teachers reported that they used technology for social networking purposes with peers and students but needed training to learn how to transfer that knowledge to pedagogical use (Mbatha, 2015). As one teacher in a post-professional doctoral program in the eastern United States explained in the self-report of her conversion to online teaching, “I felt I had to make the flat screen of my computer become three-dimensional” (Farber, 2013, p. 275). While the use of technology may be ubiquitous in daily life, teachers may need support to transfer that use into an effective learning platform in a formal educational environment.

In the examination of the professional development effort for teachers in South Africa and two neighboring countries, some teachers required basic technology training prior to being able to use technology for learning (Esterhuizen, 2015). Similarly, in the Swedish university hospital study, some teachers acknowledged that they used technology outside of the educational environment and had a comfort level, while others needed basic technology training prior to learning about the pedagogical applications for technology and the researchers' acknowledged that need in their conclusions (Pettersson & Olofsson, 2015). The need for adoption of technology with both technical and pedagogical training to address the different levels of teachers' expertise was found in a US study (Porter et al., 2014). Studies done around the globe have shown that for teachers to be best prepared for online teaching, they not only need help with technology but also with training in pedagogy shown to be effective in the online environment.

Providing technology support through hands-on training on the actual platform that teachers were learning to use was brought up often in the literature. Quantitative questionnaire data from 120 medical school teachers highlight the importance of using the same learning platform that the teachers would be required to use with their students during the teachers' professional development (Kyalo & Hopkins, 2013). These teachers reported feeling positive about the use of the technology and the flexibility afforded by attending training at a distance (Kyalo & Hopkins, 2013). In the same way, five online teachers at a United States university school of public health, who received their professional development online, reported that the use of the online platform was beneficial in helping the teachers experience online learning from a student point of view

(Kidd et al., 2016). Placing potential online teachers in the role of an online student so that the teacher can have the benefits of the student experience, is also a recommendation from the comparison study of the outcome two 4-year universities to develop online programs (Mitchell et al., 2015).

Current research on the state of professional development for teachers during a technology adoption effort shows that teachers share fears concerning the time needed to learn a new skill and their own technical ability to succeed. They also come to professional development opportunities at various levels of technical expertise. Different types of professional development are beneficial for some teachers and not for others, and it is helpful to provide multiple types training, including one-time, long-term, and a balance between theoretical and practical (Kidd et al., 2016). The predominant theme is that continuing and different types of professional development is needed for teachers with multiple levels of technology experience to provide "seamless support" (Esterhuizen, 2015, p. 135) before, during, and after a formal technology adoption effort.

Peer Support and Collegial Interaction

Multiple studies have used the technology acceptance model (TAM) to classify factors that influence technology adoption by teachers by their impact on perceived ease of use and perceived usefulness. Both the perceived ease of use and usefulness is often communicated by colleagues. An Internet-based survey of 61 teachers at a US university school of business and management found that while TAM was an accurate predictor of the adoption of an innovate technology, both formal and informal communication among faculty helped to foster a positive approach to the adoption of new technology for

teaching (Hall Jr, 2013). Results from a British study of 517 teachers taking part in a reading skills professional development program and using TAM as a foundation, found that if professional staff facilitated the development of online teacher communities both during and after the training it would allow teachers to take advantage of the continuing informal collegial support that those communities can provide (Smith & Sivo, 2012). In an online survey of 249 university pre-service education faculty from across the United States, peer influence concerning perceived usefulness was a significant factor in the adoption of web-based learning tools (Alsadoon, 2018).

In addition to studies using TAM, there are other examples of the importance of peer support as a factor that influences teachers' adoption of technology. In the Swedish university hospital study, researchers mentioned the importance of the social system stating that innovation adoption "is not implemented in a vacuum" (Pettersson & Olofsson, 2015, p. 360). Some teachers acknowledged that through talking with colleagues, they found "proof" that the innovation of online teaching worked as an effective teaching modality (Pettersson & Olofsson, 2015, p. 374). Finally, findings from the administrators in the Porter et al. (2014) study included the use of champions or early adopters from among teachers to act as liaisons in the early and continuing stages to provide attract more support for the technology adoption. Teachers can benefit from peer interaction during a technology adoption process in the form of informal discussions about colleagues' experiences, formal discussions during training sessions, and from continued support of colleagues designated as liaisons for technical or pedagogical assistance.

Adoption Related to Kolb's Model

The ELM stages reflect a process through which users progress as they encounter innovative ideas and put them into action to get results and as described by Kolb (1984), the job of an educator is "not only to plant new ideas, but also to dispose or modify the old ones" (p. 29). The adoption of new technology for teaching online, whether converting a face-to-face course to an online or hybrid course, or developing a new course for the online environment, requires teachers to modify their practice. In this study, the participants were teachers adjusting their practice when adopting innovative technology. The ELM is particularly appropriate for examining the practice of online teaching as a learning activity in which practitioners complete the same activity over time, e.g. teaching a concept every semester, but under different circumstances, such as teaching separate groups of students the same concepts using different modalities. Current research results indicate that for teachers, whose support is needed for successful adoption of widespread innovation such as a move to offering online classes (Mitchell et al., 2015), there are three predominant factors that influence teachers' adoption of new technology in the classroom: administrative support, professional development, and peer support and collegial interactions. The ELM provides a structure for examining those factors that influenced teachers' decision-making, identifying any stage of the ELM at which a future adopter was stuck, and determining the type of activity that assisted the adopter to move towards completion of all stages of the process. Kolb's work with learning styles and learning situations provides information about what types of activities

are preferred as categorized by learning style. As teacher interviews and journal notes are analyzed, Kolb's situational factors were used to identify the helpfulness of experiences.

The ELM cycle provides a structure for identifying stages of transformational learning and is applicable as a framework when exploring factors that influence not only the teacher's decision to adopt technology, but also at what stage of the ELM cycle that decision was made. What is known is that teachers adopt innovate technology at different rates and the timing of those adoptions may be classified by the stages of the ELM cycle. What is also known is that there are some interventions that can have a positive impact on the adoption.

What is not known is if there is a relationship between interventions taken to increase teachers' adoption of innovative technology and the stage of the ELM cycle at which the intervention takes place. This study provided an opportunity to identify both the interventional factor that influenced the teachers' decision to adopt new technology and the associated stage of the ELM cycle at which the teacher made the decision. Using this information, the findings from this study support the development of responsive and innovative programs that encourage and support teachers as they adopt new online teaching technology, including the use of tools designed to engage students in the online classroom and increase student success.

Summary

This chapter was a literature review. The literature search strategy section included an explanation of the databases and key terms were used to identify the articles included in the review. I described the research of Rogers (2003) and Kolb (1984) and

how each provided a framework for this study. Initially, I used characteristics of innovation defined by Rogers's DoI theory (2003), to identify the categories of adopters of teachers' use of instructional tools in online courses and identify the elements that are considered to be barriers by the participants. Next I explained teachers' progressive use of instructional tools using Kolb's ELM (1984). The literature review topics included online student engagement, tools for engagement of online students, challenges to adopting innovative technology in the online learning environment, and factors influencing technology adoption in the online teaching environment.

Through the process of the literature review, I identified several themes and gaps. Annual reports show that the number of students enrolled in online courses continues to increase (Allen & Seaman, 2017), while study results indicate that online student success as demonstrated by course persistence and course grades remain significantly lower than that of their peers in similar face-to- courses (Jaggars & Xu, 2016; Johnson & Mejia, 2014). Researchers have identified that online student engagement, as indicated by higher retention and success rates, is an important component of student success (CCCSE, 2015; Center for Community College Student Engagement [CCCSE], 2015). For students to be engaged in the learning process, teachers must use best practices and select the appropriate tool for the appropriate purpose (Buzzetto-More, 2015). In the online classroom, LMS provide integrated tools in a flexible environment that allow teachers to customize the experience to suit their own teaching style and content (Buzzetto-More, 2015; Camus et al., 2016; Khechine et al., 2014; Wegmann & McCauley, 2014). Current research shows that when teachers decide to modify their teaching practice to adopt new

online technology and tools, they must overcome three factors that challenge that adoption: time, communication, and their social system, all identified by Rogers's DoI theory (2003). The gap that remains is an understanding of how teachers who have overcome those challenges are categorized by Rogers's characteristics of innovation (2003), what motivated their decision, and how the timing of their decision is reflective of Kolb's stages of experiential learning (1984).

Therefore, the purpose of this study was to describe how teacher resistance to the use of instructional tools in online courses reflects Rogers's (2003) characteristics of innovation and how their progressive use of instructional tools reflects Kolb's (1984) stages of experiential learning. This case study of individual teachers who have successfully modified their teaching practice examined why and how teachers decide to use new technology to engage online students within the framework of overcoming resistance and identified at what stage of experiential learning the decision was made. The information from these success stories identified best practices to inform professional development to encourage and support online teachers.

In the following chapter on research methodology I describe how the study was designed to investigate that research gap. This research methodology includes a discussion of the research design and rationale, the role of the researcher, participant selection, instrumentation, and recruitment, participation, and data collection. A thorough description of the data analysis plan is also included as well as a discussion of issues related to trustworthiness in qualitative research and ethical procedures.

Chapter 3: Research Method

The purpose of this case study was to describe how teacher resistance to the use of instructional tools in online courses reflects Rogers's (2003) characteristics of innovation and how their progressive adoption of instructional tools reflects Kolb's (1984) stages of experiential learning. To accomplish that purpose, I examined why teachers initially resist using instructional tools designed to engage online students and the factors that contribute to their eventual adoption of instructional tools designed to engage online students. While characteristics of exemplary online instructors have been identified (Baran & Correia, 2017; Frazer, Sullivan, Weatherspoon, & Hussey, 2017; Kirwan & Roumell, 2015), the gap that remains is the lack of research about the journey that initially resistant instructors take as they eventually convert to using technology tools to engage their online students in course learning (Lawrence & Tar, 2018). Increased understanding of why teachers choose to adopt new technology could inform the design of responsive and innovative professional development programs that encourage and support teacher adoption of best practices in online instruction. Addressing this gap leads to a better understanding of how some online teachers experience success in overcoming their initial resistance to technology tools to engage students in the online classroom.

In this chapter I begin with an explanation of the case study design and its applicability for this study including my role as the study's sole researcher. I follow with a description of the procedures for selecting the participants and for collecting and analyzing data. I conclude with a discussion of issues relating to trustworthiness and ethical procedures.

Research Design and Rationale

In this case study, I used two central research questions and three related research questions to explore how teachers develop expertise in using technology to engage online students and to provide information that may be used to improve teacher effectiveness, student engagement, and student learning. These research questions can be described as both how and why questions and are not conducive to being studied using a quantitative design (see Yin, 2014).

Central Research Questions:

RQ1: How does teachers' resistance to the use of technology tools in online courses reflect Rogers's (2003) characteristics of innovation?

RQ2: How does teachers' progressive use of technology tools reflect Kolb's (1984) stages of experiential learning?

Related Research Questions:

Related Research Question 1: Why do teachers initially resist using technology tools designed to engage online learners?

Related Research Question 2: What factors contribute to teachers' willingness to adopt technology tools designed to engage online learners?

Related Research Question 3: What do course object reviews reveal about how teachers are using technology tools for student engagement?

I selected a multiple case study design for this study. The participants in this study included six teachers from two community colleges, Green Valley College (pseudonym) and Red Desert College (pseudonym), which are located in the western region of the

United States. Exemplar multiple case studies of community college faculty have been designed using three sites with one, three, five, or six participants at each site. I modeled my participant numbers after those studies (Millner-Harlee, 2010; Paterson, 2017; Yao & Grady, 2006). The case is defined as the change process that teachers at a community college experience as they make decisions to use technology tools to engage students in online learning. Yin (2014) explained case study in a two-part definition. He first defined the *scope* of a case study as a method that "investigates a contemporary phenomenon (the "case") in depth and within its real-world context, especially when the boundaries between phenomenon and context may not be clearly evident" (Yin, 2014, p. 16). In this study, I examined the phenomena of teacher resistance, adoption decision, and usage of new technology, I used data gathered from teachers who were confronting choices about their use of technology in their online teaching environments. In the second part of the definition, Yin (2014) described the *features* of case study research including the consideration of several variables of interest, the use of multiple sources of data, and the use of theoretical foundation for data analysis, as helping to distinguish it from other methods. The features of this study align with Yin's (2014) definition as the study considered the variables of initial resistance, adoption decision, and external influencing factors. Sources of data were participant reflective journals, guided interviews, and course object reviews. Finally, I used both Rogers's (2003) DoI theory and Kolb's (1984) ELM cycle during data coding and analysis. Multiple case study is the form of case study selected and this is appropriate as the literature review suggests that this study may find

multiple cases that will be literal replications with some similarities in the answers to the how and why research questions within the conceptual framework (Yin, 2014).

I considered other qualitative designs for this study including ethnography and phenomenology. I did not select ethnography because while the data in this study includes rich description, this study was not conducted through a cultural lens necessary when examining a phenomenon from a cultural insider's view that signifies an ethnographic approach. I did not select phenomenology because I was not looking at what was common about an experience of a group, but rather the individual experiences of the participants (see Merriam & Tisdell, 2016, p. 25). For this study I considered multiple cases, using multiple data sources in which differences and similarities may influence multiple phenomena, rather than examining a single defined phenomenon over time. I also rejected single case study as a possible methodology because this study included multiple bounded cases, the multiple study sites. This allowed for cross-case analysis and strengthened the transferability of the results. Multiple case study is the form of case study selected and this is appropriate as the literature review suggested that this study will find multiple cases that will be literal replications with some similarities in the answers to the how and why research questions within the conceptual framework (Yin, 2014).

Role of the Researcher

For this qualitative study, I served as the sole investigator. This role involved selecting the design, the gatekeepers, the study sites, and the participants; determining the data sources; creating the data analysis instruments; and developing the procedures for

recruitment, participation, and data collection. In addition, I was exclusively responsible for all data analysis and for using strategies that improved the trustworthiness of this qualitative research.

As I was the sole researcher, the possibility of researcher bias existed because I am a community college faculty member and I recruited community college faculty to participate in the study. However, the research sites were at colleges outside of my district, so the participants and I had no professional relationship. I followed strategies suggested by Merriam and Tisdell (2016) to minimize the risk of researcher bias during the instrumentation design stage using an expert peer review examination process, during the interview process through the use of clarification questions to minimize the risk of unclear interpretation, and at the coding and analyzing stage using peer expert scanning of raw data for alignment with results . My role as researcher did not conflict with my present position as community college faculty. The research sites are at colleges outside of my district and the participants and I had no professional relationship.

Methodology

This section begins with a description of the process for participant selection at the various sites and the role of the DECs who served as gatekeepers at those sites. I describe the three instruments that have been developed for use in this study and the process for their expert review. That is followed by an explanation of the multi-step procedures for recruitment, participation, and data collection as prescribed by the internal review board (IRB). Finally, I explain the two-step data analysis plan that includes both a

within-case analysis for each site, and a cross-case analysis with a focus on the central and related research questions.

Participant Selection

The primary criterion for participation in this study was that the participants were community college teachers who were currently using additional LMS tools in an online course. These teachers completed the adoption process to successfully integrate the tools into their LMS. Documentation of their process provided information helpful to this study in understanding how some teachers are able to overcome their resistance to using technology tools for engaging students in online learning.

At each research site, DECs or their equivalent, provided a list of potential participants for this case study. The DECs have knowledge of technology use by faculty who teach online at their individual colleges and who have modified their teaching practice by adopting the use of LMS tools, as identified in Table 1, that are designed to engage students. The DECs have access to the online courses and share responsibility for the training and professional development of the online instructors. Therefore, they have knowledge of which instructors have adopted LMS tools and are using them successfully in their online classes.

For this multiple case study, case was defined as the change process that teachers at a community college experience as they make decisions to use technology tools to engage students in online learning. I recruited a total of six participants from two community college sites following Yin's (2014) guidance and numbers from similar studies (Millner-Harlee, 2010; Paterson, 2017; Yao & Grady, 2006). Yin (2014) advised

that rather than pre-determining a sample size, researchers in multiple case study design should concentrate on the strength of the replication as the study progresses. The sampling strategy for this study was two-tier purposeful sampling. The case was the change process and the first-tier sampling occurred with the selection of individual study sites. After the college DECs identified participants based on the study criteria, I initiated the second-tier sampling (see Merriam & Tisdell, 2016) and contacted them by email. More details on the procedures for how I contacted and recruited participants are detailed in the Procedures for Recruitment, Participation, and Data Collection section.

Instrumentation

Using Yin's (see 2014) guidance that using multiple sources to collect and analyze data may lead to converging evidence and strengthen the external validity of the study, I created three instruments: (a) a participant reflective journal, (b) an interview guide, and (c) a course object review data collection form. For each of these instruments, I asked an expert panel of three colleagues who serve or have served in the capacity of DECs and with advanced degrees in education to examine the journal prompts and interview questions for ambiguity of meaning from the possible participant perspective and review the alignment of these instruments to the research questions.

Participant Reflective Journals. I constructed the first two participant reflective journal prompts to categorize the DoI adopter category into which each participant fit. This aligned with my first central research question. I constructed the second two participant reflective journal prompts to allow me to determine the reasons for their resistance as described by Rogers (2003) and the literature review, which aligns with my

second central research question. I then focused my questions in the interview based on how the participants answered the journal prompts. Critical experts reviewed the questions that I designed to provide clarification during the guided interview. Merriam and Tisdell (2016) described the advantage of using a few broad, open-ended questions to provide general information from which the researcher can follow up with probing questions to provide more detailed information. Table 2 shows an alignment of the participant reflective journal questions to the central research questions for this study.

Table 2

Alignment of Participant Reflective Journal Questions to Research Questions

Central Research Questions	1	2
Participant Reflective Journal Questions		
1: In relation to your professional colleagues, how would you describe the timing of your decision to use LMS tools and why?	X	
2: In relation to your professional colleagues, after you made the decision to use LMS tools, how would you describe the timing of your implementation of LMS tools in your course? What factors, if any, had an influence on that timing?	X	
3: In your experience, what have you found are the advantages of using LMS tools?		X
4: In your experience, what have you found are the disadvantages of using LMS tools?		X

Interview Guides. I used guidance from Merriam and Tisdell (2016) on conducting effective interviews for qualitative research to create the interview guides for collecting qualitative data about participant's thoughts and feelings concerning events within their individual environments. Interview questions ranged from highly structured,

for example questions that were asked to provide demographic data, to unstructured in which the questions were open-ended and provided the basis for further questioning, such those I developed for the reflective journal. Because the interviews followed my coding of the participant reflective journals, I tailored the questions to build on the information from the journal, clarify information that was unclear or confirm information that was shared, and focus in to provide more detail to answer the research questions. “The process of data collection and analysis is recursive and dynamic” (Merriam & Tisdell, 2016, p. 169).

I developed the guided interview questions to align with the related research questions. Table 3 provides the four guided interview questions and their alignment to the related research questions for this study, and Appendix C includes the interview protocol with sample potential follow up questions for each guided interview question.

Table 3

Alignment of Guided Interview Questions to Research Questions

Research Questions	Related Research Question 1	Related Research Question 2	Related Research Question 3
Guided Interview Questions			
1: Following up on the timing of your decision to use LMS tools, what specific events, if any, influenced the timing of your decision?	X		
2: Following up on the timing of your implementation of the use LMS of tools, what specific reasons, if any influenced the timing of your implementation?		X	
3: Following up on the advantages and/or disadvantages of using LMS tools, you explained that a specific tool was particularly appropriate for your students or content. Please share more about that?		X	
4: Following up on the advantages and/or disadvantages of using LMS tools, you explained that a specific tool did not work with your teaching style or students or content. Would you please share more about that?	X		
5: Following up on the advantages and/or disadvantages of using LMS tools, you explained that a specific tool did not work with your teaching style or students or content. What other tools have you found and why are they more suitable?		X	

Course Object Review Data Collection Form. The next instrument I developed is called the Course Object Review Data Collection form and is found in Appendix D. This form was used to record information from within the LMS course and was designed to collect data to answer Related Research Question 3. As shown in Appendix D, I used this form to collect data on which tools teachers used, the timing within the course as the tools were used, how often tools were used, and the types of engagement the tools elicit. In conjunction with the participant reflective journals and interviews, the observation allowed for confirmation the use of LMS tools as the participant described and provided information about how the tools are being used. This observation is aligned to Related Research Question 3 as shown in Table 4.

Table 4

Alignment of Course Object Reviews to Research Questions

Research Questions	Related Research Question 1	Related Research Question 2	Related Research Question 3	Central Research Question 1	Central Research Question 2
Course Object Reviews					
Verify use of tools, the timing of their use, the frequency of use, and the type of engagement.			X		

Procedures for Recruitment, Participation, and Data Collection

In relation to recruitment, participation, and data collection, this was a multi-step process. After receiving IRB approval (#07-30-18-0109006), I communicated with DECs serving as gatekeepers, who have returned signed Letters of Cooperation, for names and contact information of potential participants who meet the criteria for the study. I sent an

invitation by email with a Letter of Informed Consent to the potential participants and contacted those who agree to participate by email or phone to schedule the date for receipt and return of the participant reflective journal, the date and time for the guided interview, and a date for observing the courses or artifacts. I conducted online audio and video interviews and recorder both the audio and video in my private office using a video-conferencing tool within one week of the return of the participant reflective journal. I conducted online observations from my private office and scheduled within one week after the interviews. Participant reflective journals, interview recordings, and observation notes are stored as digital files on a removable drive in a locked desk in my office. The files will be stored for five years. At the end of the five-year period, the drive will be digitally erased and mechanically destroyed. Coding and analysis took place in my private office, using Atlas.ti software. I sent "thank you" emails to all participants and followed up to share the tentative results.

Data Analysis Plan

In this multiple case study, there were two stages of analysis though the coding was a continuous process beginning with the receipt of the first participant reflective journal and continuing throughout the data collection process. In the first stage, I coded responses using pre-identified themes that arose from the literature review that align both with Rogers's (2003) DoI theory characteristics of adopters and/or challenges to adoption and with Kolb's (1984) ELM cycle. I analyzed the data from each site in the context of characteristics unique to the site itself. This first stage analysis, referred to as within-case analysis (Merriam & Tisdell, 2016), resulted in both similarities and differences among

the participants that led to additional levels of coding. In this case, the conceptual framework included elements of time in both Rogers's (2003) DoI theory and Kolb's (1984) ELM cycle that appeared in the data and was appropriate for a time-series analysis (Yin, 2014). In the second stage of analysis, referred to as cross-case analysis, I considered parallels among the different cases for recurring themes, or the lack of parallels, depending on the data. To fulfill the purpose of this study, I considered cross-case themes that helped answer the central and related research questions.

To ensure a high-quality analysis, I followed four principles (see Yin, 2014). First, I considered all the data and used clarifying questions to ensure understanding, Second, I included discrepant data and entertained alternate explanations. Timely check-ins with expert peers verified the alignment of the raw data with the end results. Third, I remained focused on the significant issues that arose from the data. Finally, I kept in mind the information that resulted from the literature review and my own data collection while taking actions to mitigate researcher bias. At the end of the process, the tentative results and conclusions were shared with the participants and stakeholders.

Evidence of Trustworthiness

Trustworthiness is important to qualitative research and particularly, according to Merriam and Tisdell (2016), when that research impacts practitioners who have an effect on people such as teachers who employ strategies that influence students' ability to learn content. The following paragraphs explain the four areas of trustworthiness that are significant to this study. I provide general information about each area and the strategies that I employed to ensure that trustworthiness was maintained.

Credibility

For qualitative research, Merriam and Tisdell (2016) defined credibility in terms of the internal validity of the data and findings; in other words, how well the data represents reality. For this study, credibility was assured at various stages and in multiple ways. The initial data was collected from each participant through questions in a reflective journal. Those questions were examined by collegial experts in a peer review process to assure they were free from bias while designed to accurately elicit answers to the related research questions. During the coding process, the data from these journals and from the interview questions, was scanned by expert peers to check that the results accurately reflected the raw data. The use of data from multiple sources including the journals, interviews, and course object reviews, also provided a check on internal validity by allowing comparison of data from multiple sources to check that the results are consistent.

Transferability

Transferability refers to the external validity of the findings. While internal validity refers to the validity of the raw data to the results, external validity takes this aspect of trustworthiness to another layer looking at the relationship between the results of the study and how well those results can be applied to another situation (see Merriam & Tisdell, 2016, p. 253). Merriam and Tisdell (2016) discussed the focused characteristic of qualitative research that looks at a particular population and the challenges of applying the results from a particular group to another population. They suggest that the decision of applicability is up to the eventual reader of the study. That impresses a responsibility

onto the initial researcher to provide enough detailed information about the participants for future readers of the study to be able to make an informed decision concerning transferability to another situation. In this case, I provided that detail through descriptions of the participants, while maintaining their anonymity, the process for selecting the participants, and the confidential data the participants provided about their situation. Another strategy to increase transferability is to increase variability of the participants while still maintaining the characteristics significant to the study. I accomplished that by using multiple sites from which to draw the participants. The necessity of transferability was inherent in the purpose of this study, which includes a contribution to my field in the design of responsive and innovative professional development programs to encourage and support teacher adoption of best practices in online instruction through a better understanding of how some online teachers experience success in overcoming their initial resistance to technology tools to engage students in the online classroom.

Dependability

A study is considered to have the characteristic of dependability if another researcher could use the same raw data and reach similar conclusions. Merriam and Tisdell (2016) described multiple strategies that can increase a study's dependability including the use of expert peer examination, collection of data from multiple sources, and the researcher's use of an audit trail. In this study, expert peers were used at two points: they reviewed the questions and topics for both the participant reflective journal and the individual interviews and reviewed the initial two participants' raw data after it was thematically coded. The strategy of triangulation was demonstrated using multiple

sources of data including the reflective journal, the interviews and the observation of online courses. I kept an audit trail through my own reflective journal to record my thoughts during the selection of participants and collection of data, as well as notes about the process of coding the data and as interpretive decisions were made.

Confirmability

The characteristic of confirmability is the aspect of trustworthiness most closely related to the researcher's bias. To maximize confirmability, I refrained from interpreting unclear responses during interviews, instead asking clarifying questions to encourage the verbalization of the participants' authentic ideas. During the coding process, I had peer experts spot check to ensure I was not making assumptions regarding the meaning of data. Finally, I ensured that discrepant data was included as it appeared.

As the sole researcher, I took seriously my responsibility to refrain from imposing any personal bias. I diligently applied the strategies discussed by Merriam and Tisdell (2016) to maximize the trustworthiness of this study and increase the credibility, transferability, dependability, and confirmability of the findings of this study. The purpose of this study includes contribution to my field by providing information that can be applied to other similar situations in support of support teacher adoption of best practices in online instruction. The value of these findings would have been minimized without the apparent evidence of trustworthiness throughout the process.

Ethical Procedures

The trustworthiness of qualitative research depends on how researchers follow ethical procedures. Merriam and Tisdell (2016) give special consideration to protection of

human participants and data collected during research that takes place in the online environment and point out four issues that arise in the online environment. The ubiquitous nature of online access can tempt all users to forget that although online communications are easy to use, they belong to the author, who retains the right to the privacy of those communications.

First, the researcher has a responsibility to ensure that informed consent to use online communication is being given by a user who is at least 18 years old (Merriam & Tisdell, 2016). In this study, interactions took place with the participants remotely. Therefore, I relied on the gatekeepers to forward only the names of participants who meet the requirements for age.

Second, I ensured the confidentiality of the online materials including data collected from the instruments and the course object review procedure. In this study, all material is owned by the study participants and I ensured the participants' information remained confidential. I was the only person collecting, codifying, and analyzing the raw data, and throughout the process retained it on a secure server in an account that requires double authentication consisting of a user name and password combination as well as one-time information sent to my cell phone and required to be passed to the server for access. It is now stored as digital files on a removable drive in a locked desk in my office. The files will be stored for five years. At the end of the five-year period, the drive will be digitally erased and mechanically destroyed.

The third issue concerns the potential private nature of some collected data procedure (Merriam & Tisdell, 2016). While interview questions and participant

reflective journals elicited original answers, some observed information could be available in possible public online sites. For this study, information relating to names of study sites or demographics of participants is not significant. Therefore, using participant numbers for identification of participants, I ensured that any information I reported in the results and discussion is not able to be identified and linked to an individual or to a study site.

The fourth and final issue concerns the debrief procedure (Merriam & Tisdell, 2016). I shared a one- to two-page summary of the tentative results with the participants electronically to provide the opportunity to "make comments or ask questions, and to ensure that no harm has occurred" (Merriam & Tisdell, 2016, p. 187). Again, because I was the sole researcher and the only person collecting, coding, and analyzing the raw data, I ensured that participants' identification and the school sites remained confidential.

In my role as a community college faculty, I am an equivalent professional colleague of the faculty DECs who served as gatekeepers. I did not have any conflict of interest with them or with any faculty participants who took part in this study.

In addition to following the guidance of Merriam and Tisdell (2016) with regard to human participants in an online study, I followed ethical procedures by applying to the IRB at Walden University to ensure protection of human participants in accordance with Walden University standards and U.S. federal regulations including the procedures for contacting and selecting participants, the collection of data, and the process for sharing results with the stakeholders at the conclusion of the study. Approval ensured that the benefits of the study outweigh any potential risks in accordance with the ethical

principles of Beneficence, Justice, and Respect for Persons, as defined by accepted Human Research Protections statutes. Participation in the IRB process precluded any contact with potential participants prior to approval.

Summary

In this chapter I began with an explanation of the multiple case study design and its applicability for the scope and features of this study. I presented my role as the sole researcher along with the challenges to that role and strategies I have taken to mitigate those challenges. I followed that with an explanation of the procedures for selecting participants that meet the criterion for this study. I presented the three data collection instruments with tables illustrating the alignment of the instruments to the central and related research questions and a discussion of methods for data analysis. The value of a study is minimized unless evidence of trustworthiness and ethical procedures are apparent throughout the study from the treatment and protection of human subjects to the appropriate treatment of data. I concluded this chapter with a discussion of issues relating to trustworthiness and ethical procedures.

In the following chapter I presented the study results beginning with a description of the setting, demographics, and participant selection process. I follow with a description of the data collection process, and a presentation of the data analysis process. Finally, I discussed the themes and patterns of the results and the key findings.

Chapter 4: Results

The purpose of this case study was to describe how teacher resistance to the use of instructional tools in online courses reflects Rogers's (2003) characteristics of innovation and how their progressive use of instructional tools reflects Kolb's (1984) stages of experiential learning. To accomplish that purpose, I investigated the use of LMS tools by community college teachers by collecting responses to reflective journal questions, interviewing the teachers about their experiences with the tools, and observing their online class sites.

While characteristics of exemplary online instructors have been identified (Baran & Correia, 2017; Frazer et al., 2017; Kirwan & Roumell, 2015), the gap that remains is the lack of research about the journey that initially resistant instructors take as they eventually convert to using technology tools to engage their online students in course learning (Lawrence & Tar, 2018). Why teachers choose to adopt new technology could inform the design of responsive and innovative professional development programs that encourage and support teacher adoption of best practices in online instruction and lead to a better understanding of how some online teachers experience success in overcoming their initial resistance to technology tools to engage students in the online classroom.

This study had two central research questions and three related questions.

Central Research Questions

1. How does teachers' resistance to the use of technology tools in online courses reflect Rogers's (2003) characteristics of innovation?

2. How does teachers' progressive use of technology tools reflect Kolb's (1984) stages

of experiential learning?

Related Research Questions

1. Why do teachers initially resist using technology tools designed to engage online learners?

1. What factors contribute to teachers' willingness to adopt technology tools designed to engage online learners?

2. What do course object reviews reveal about how teachers are using technology tools for student engagement?

In this chapter I present the results beginning with a description of the setting, demographics, and participant selection process. I follow with a discussion of the data collection process for each type of instrument will follow. Presentation of the data analysis process includes a description of the coding process, identification of emergent themes, and consideration of discrepant data. Evidence of trustworthiness will address credibility, transferability, dependability, and confirmability consistent with Chapter 3. Finally, I present results related to patterns and themes, discrepant/non-confirming data, and the research questions, along with relevant direct quotes.

Setting

For this multiple case study, I recruited the participants from two community colleges located in the western region of the United States. The Green Valley College site has approximately 2,500 annual full-time equivalent students enrolled in Distance Education (DE) courses and approximately 300 faculty teaching online. Red Desert

College has approximately 150 annual full-time equivalent students enrolled in DE courses and approximately 30 faculty teaching online. At both colleges, faculty may be teaching both online and face-to-face classes during a term. Both colleges have courses with multiple schedule options which also apply to online classes including short-term, early-start, late-start, and semester classes.

Demographics

For this study, I purposely selected and included four teachers from one college and two from another for a total of six participants. At both colleges, the faculty member or administrator serving as the distance education coordinator served as the study gatekeeper. The coordinators had first-hand knowledge of their colleagues who were teaching online and provided a list of names and contact information for teachers who met the inclusion criteria for potential study participants in that they were community college teachers who were currently using LMS tools in an online course. I sent an initial email invitation to all of the teachers on the lists from both of the colleges. If there was no response, I followed up with additional emails and provided my phone number to facilitate coordination.

Case 1: Green Valley College

From the Green Valley College gatekeeper, I received a list of 14 names. After the initial email, five potential participants replied that they could not participate, four replied they could possibly, two replied they would definitely participate, and three did not reply. After a follow-up email, there were two more positive responses. A third email produced no further response. The result was four participants who agreed to complete

the three-part process: P1, P2, P3, and P4. P1 is an adjunct professor; P2, P3, and P4 are full-time. Because of the size of the participant pool, I am not providing additional participant characteristics to ensure confidentiality.

Case 2: Red Desert College

From the Red Desert College Gatekeeper, I received a list of five names. After the initial email, two replied they could possibly participate, one replied they would definitely participate, and two did not reply. After a follow-up email, one possible participant returned a positive response. A third email produced no further response. The result was two participants who agreed to complete the three-part process: P5 and P6. Both P5 and P6 teach full-time. Again, for this case, because of the size of the participant pool, I am not providing additional participant characteristics to ensure confidentiality.

Data Collection

For this multiple case study, I collected data for each of the six participants, from three sources: (a) participant reflective journals that the teachers filled out on their own schedule, (b) individual interviews completed using a video conferencing system, and (c) a tour of the online course to demonstrate the use of LMS tools.

Upon receipt of a positive response from a participant, we coordinated a time schedule by email. For example, one participant did not want to begin the process until after grading was complete and one wished to wait because of personal schedule constraints. When the schedule was agreed on, I emailed the consent form to the participant with a request to reply. Based on our agreed upon schedule, upon receiving the acknowledgement of consent, I emailed the reflective journal questions to begin the

process. All of the emails followed the request-reply method of including the previous emails in the chain. This ensured that participants always had the information necessary to contact me or follow-up with the Walden IRB office at any time. I tracked the communications with each participant using a spreadsheet that included all communication from the original request to participate through the completion of the course observation and the emailing of the final summary.

To begin the process, I emailed the four reflective journal questions to each participant on the agreed-upon date. The email included a reminder that I would follow-up with them in one week, or according to our agreed upon schedule. I followed up with each participant. As events unfolded, some of our schedules changed with requirements. When I received the completed responses, I reviewed them to identify additional probes to add to the interview protocol to clarify their journal responses. At that time, I coordinated with the participant for a date and time for the second and third steps of the process, interview and the course tour. Every participant chose to schedule the course tour immediately following the interview. I used the time between the receipt of the journal responses and the interview to customize the interview questions based on the journal responses (see model in Appendix C).

I conducted the interviews via web-conference from my office. Each participant received an email invitation to my private web-interview space, where I made sure to be available earlier in case they were ahead of schedule. The interviews were recorded locally, and I used video software to record the audio with machine captioning for editing. I scheduled one hour for the interviews and 30 minutes for the course tour.

However, the interviews actually ranged in time from 30 minutes to an hour, and the course tours lasted between 30 and 45 minutes.

As mentioned, the course tours followed immediately after each interview. In preparation for the observation, I noted the activities that the participant described as demonstrating the use of technology, to confirm the use of those in the online classroom. During the course tours, the participants logged into their online class site, shared their screen for me to see, and then took me through their class showing their use of the LMS tools we discussed. In some instances, we also looked at their application of other LMS tools that we had not yet discussed. If I had any points to clarify from the interviews, we were able to do that, as well. When the course tour was complete, I thanked the participant and reminded them that I would email the tentative results.

In all cases, the participants chose to follow the interview immediately with the course tour rather than set a time for a separate meeting. The participants said this arrangement was more convenient for them. This was an advantage to me as the interviewer, as well, as any questions I had during the interview were immediately answered during the course tour.

Data Analysis

I analyzed the data in two stages: In the first level, I began with the reflective journal. I coded the responses and used the information to customize the guided interview questions to ensure that I was satisfied the participant understood the questions and to follow-up for more detail as appropriate (see Appendix D). In the second level of data analysis, I compared the results from the two individual sites to identify and explain

themes that were either specific to a particular site or common across both sites (Merriam & Tisdell, 2016).

Within-Case Data Analysis

Reflective journal data analysis. When I received the participant reflective journal responses, I used Atlas.ti and followed a line-by-line method to code the text using preidentified themes that arose from the literature review. Those themes included the adoption characteristics of the timing of a participant's decision to adopt and implement new technology, communication surrounding the technology, and any interaction with the participant's community. I monitored adoption challenges including the participant's assessment of the suitability of the technology to their content, students, and online environment. I also used open coding (Merriam & Tisdell, 2016, p. 204) to account for new themes if they occurred.

Guided interview data analysis. For each participant, I first corrected the guided interview transcripts by listening to the recording and editing the text. For example, particular acronyms were corrected, such as changing LM s to LMS. I then analyzed the interview responses in relation both to the themes that were created from the literature and framework, and with the option to create in-vivo themes as I coded the data.

Observation data analysis. I used the observations to confirm the information that the participants described in the journals and interviews. In all cases, every activity that was described in the journal or interview was also demonstrated during the course observations. Additionally, the observations provided opportunities for other activities to be observed that the participants forgot to mention in the journal or the interview. For

example, in P3's class, there was an ice breaker activity in the first week that used Google Maps. P3 provided an instructional video so the students could learn how to use the tool in a low-stakes, non-graded, though required activity. During the observation, I saw that this same tool was used again in a later week when the students completed a graded activity to reinforce content material. The instructional video was still available for any student to use when completing the graded assignment.

Cross-Case Data Analysis

Through this comparison, I identified themes that were specific to a particular site or common to both (see Merriam & Tisdell, 2016). I identified four a priori themes that were common to both sites, one a priori theme appearing only in the Green Valley College data, two common emergent themes, three emergent themes that were specific to only Green Valley College, and one discrepant item**.**

Evidence of Trustworthiness

Trustworthiness is important to qualitative research and particularly, according to Merriam and Tisdell (2016), when that research impacts practitioners who have an effect on people such as teachers who employ strategies that influence students' ability to learn content. The following paragraphs explain the four areas of trustworthiness that are significant to this study. I provide general information about each area and the strategies that I employed to ensure that trustworthiness was maintained.

Credibility

For qualitative research, Merriam and Tisdell (2016) defined credibility in terms of the internal validity of the data and findings; in other words, how well the data

represents reality. For this study, credibility was assured at various stages and in multiple ways. I collected the initial data from each participant through questions in a reflective journal. Those questions were previously examined by collegial experts in a peer review process to assure they were free from bias while designed to accurately elicit answers to the related research questions. During the coding process, expert peers scanned the data from these journals and from the interview questions, to check that the results accurately reflected the raw data. The use of data from multiple sources including the journals, interviews, and course object reviews also provided a check on internal validity by allowing comparison of data from multiple sources to check that the results are consistent.

Transferability

Transferability refers to the external validity of the findings. While internal validity refers to the validity of the raw data to the results, external validity takes this aspect of trustworthiness to another layer looking at the relationship between the results of the study and how well those results can be applied to another situation. Merriam and Tisdell (2016) discussed the focused characteristic of qualitative research that looks at a particular population and the challenges of applying the results from a particular group to another population. They suggest that the decision of applicability is up to the eventual reader of the study. That impresses a responsibility onto the initial researcher to provide enough detailed information about the participants for future readers of the study to be able to make an informed decision concerning transferability to another situation. In this case, I provided that detail through descriptions of the participants, while maintaining

their anonymity, the process for selecting the participants, and the confidential data the participants provided about their situation. Another strategy to increase transferability is to increase variability of the participants while still maintaining the characteristics significant to the study. I accomplished that by using multiple sites from which to draw the participants. The necessity of transferability was inherent in the purpose of this study to include a contribution to my field in the design of responsive and innovative professional development programs that encourage and support teacher adoption of best practices in online instruction through providing a better understanding of how some online teachers experience success in overcoming their initial resistance to technology tools to engage students in the online classroom.

Dependability

A study is considered to have the characteristic of dependability if another researcher could use the same raw data and reach similar conclusions. Merriam and Tisdell (2016) described multiple strategies that can increase a study's dependability including the use of expert peer examination, collection of data from multiple sources, and the researcher's use of an audit trail. In this study, expert peers were used at two points: they reviewed the questions and topics for both the participant reflective journal and the individual interviews and also reviewed the raw data for the first two participants after it was thematically coded. The strategy of triangulation was demonstrated using multiple sources of data including the reflective journal, the interviews and the observation of online courses. I kept an audit trail through my own reflective journal to

record my thoughts during the selection of participants and collection of data, as well as notes about the process of coding the data and as interpretive decisions were made.

Confirmability

The characteristic of confirmability is the aspect of trustworthiness most closely related to the researcher's bias. To maximize confirmability, I refrained from interpreting unclear responses during interviews, instead asking clarifying questions to encourage the verbalization of the participants' authentic ideas. During the coding process, I had peer experts spot check, to ensure I was not making assumptions regarding the meaning of data and advise as appropriate. Finally, I ensured that discrepant data was included as it appeared.

As the sole researcher, I took seriously my responsibility to refrain from imposing any personal bias. I diligently applied the strategies discussed by Merriam and Tisdell (2016) to maximize the trustworthiness of this study and increase the credibility, transferability, dependability, and confirmability of the findings of this study. The purpose of this study includes contribution to my field by providing information that can be applied to other similar situations in support of support teacher adoption of best practices in online instruction. The value of these findings would have been minimized without the apparent evidence of trustworthiness throughout the process.

Results

With the data gathered, transcribed, and coded, and with attention to evidence of trustworthiness, I analyzed data according to six pre-identified themes that arose from the literature review and the conceptual framework. During the coding process, I used open

coding to allow for the identification of emergent themes. I completed the analysis using Atlas.ti to count the number and sources of references sources for each theme and the connection of the themes to the research questions. In the following sections, I presented thematic results for each of the two cases individually, followed by a cross-case analysis for thematic similarities and differences with attention to emergent themes. I also addressed the question of discrepant information. Finally, I discussed the results for each of the three related research questions and two central research question.

Within-Case Thematic Analysis for Green Valley

The literature review and conceptual framework provided six themes for analysis. I identified and coded data for two of the three themes that referred to challenges to adoption of technology. The themes were (a) timing, (b) communication, which did not occur in the Green Valley College data, and (c) social considerations. I identified an emergent theme from Green Valley College as a challenge was accessibility. Three themes referred to reasons for successful adoption of technology and they were (a) administrative support, (b) professional development, and (c) peer interaction. I identified four emergent themes from Green Valley College as (a) convenience for teacher and student, (b) immediate benefit to student learning, (c) interaction between student & content, student & teacher/expert, and between/ among students, and (d) replication of student real-life current/future experience. Finally, confirmation of the teachers as innovators was indicated by journal entries and interview responses. I summarized the themes and their times discussed for Green Valley College in Table 5.

Table 5

Summary of Themes for Green Valley College Data Collection Instruments

Green Valley College Themes	Times Discussed
Challenges to Adoption: Timing Time needed to learn technology Time needed to prepare course/resources Timing of teaching assignment	8
Challenges to Adoption: Communication	n/a
Challenges to Adoption: Social Lack of support from administration for Professional Development (PD) Lack of support for course design or tech assistance Concern about student tech level, impact on success Lack of understanding of online pedagogy	9
Challenges to Adoption: Other (*emergent theme*) Questions of accessibility	4
subtotal for Challenges to Adoption	*21/157 (13.4%)*
Reasons for Adoption: Administrative Support Requirement to use LMS at least for grades w/training Support for in-house PD Faculty compensation new or converted course	3
Reasons for Adoption: PD Adopted after required online teacher training Professional conference experience Local support	7
Reasons for Adoption: Peer Interaction Collegial support – two-way Greater community of practice Informal discussions with local course designer Opportunity to take on student role with peers	9
Reasons for Adoption: Other (*emergent themes*) Convenience for teachers and students (36) Immediate benefit to students (33) Interaction between students & content, students & teachers/experts, and between/among students (37) Replication of student real-life current/future experience (11)	117
subtotal for Reasons for Adoption	*136/157 (86.6%)*
Indications of Teachers as Innovators Time was tight but not prohibitive Technology was new, but easily learned I was motivated because students asked for it	8 (confirmation of participant characteristic as innovator)

Challenges to Adoption. The first three themes occurring in the Green Valley College data referred to challenges to adoption of technology. Two of these were suggested by literature review and conceptual framework and one emerged from the data. There were 21 thematic mentions of challenges to adoption, which is 13.4% of the thematic mentions in the Green Valley College data.

Timing. The first theme in the data is timing. This is identified as a barrier caused by the academic calendar, course schedule, notification of assignment to a class, training or support schedule, or a related item over which the teacher does not have control. Of the eight mentions of timing as a potential challenge to adoption, all eight statements were qualified by the teacher either explaining this was an issue for other teachers and not them, or it was an issue they overcame. For example, P1 said, "Timing is a challenge because it is difficult to test the tool before your students use it live", after attending a summer term professional conference and learning about a new tool for possible use in the fall. However, P1 went on to describe spending time researching and preparing, creating pre-, post- and mid-semester surveys, and committing to watching every video the students made with the new tool to ensure that if anything was not working or needed to be modified in the use of the tool, there would be a quick response time. P1 identified the challenge and a way to eliminate the barrier. P4, in referring to colleagues who have not adopted new technology said, "Many are willing to learn, but lack time." P4 went on to describe the issue of time and its intersection with the next category of challenges, Social considerations, saying,

> I think most instructors are naturally curious and interested in new teaching tools and strategies (online or F2F.) Time is the issue. When I started using LMS tools…I was fortunate enough to be in a position where I could dedicate a fair amount of time to exploring new tools, at my discretion and on my own "dime" so to speak. Many full-time and adjunct faculty do not have the time to explore and learn how to use LMS tools without being compensated.

P4 described the challenge of spending uncompensated time to learn to use new tools as one that is unsurmountable by some faculty. That is the next theme identified as a barrier, social considerations. Note that communication, while it is a theme suggested by the literature and study framework, was not identified as a theme of challenge to adoption by the Green Valley College teachers.

Social Considerations. Social considerations include feelings on the part of teachers that they are not technically competent; that the administration doesn't demonstrate support for the teachers learning to be technically competent through the establishment of professional development programs and compensation for training, availability of course designers and other support positions; the lack of collegial acceptance of technology; and a fear that either their own or their students unpreparedness would lead to a decrease in student success. During the interview, P3 described first learning the basics of using an LMS at a previous school where professional development was not an option, "Oh boy. No. I would say it was mostly lacking." To integrate new tools into the LMS, P3 "... just remembered figuring things out on my own, more or less." Continuing along the lines of the need for professional

development, P4 said, “From my anecdotal experience, some faculty at my college are not well-versed in technology or online pedagogy. Many are willing to learn but lack time. Some are adamantly opposed to online learning seeing it as inferior to face-to-face learning.” In the reflective journal, P4 wrote that “Student learning curve for a new technology can be considerable with a diverse student population.” If teachers do not feel confident in their own technical ability, that fear of not being able to support students will stop them from progressing with technology. And even with new tools, P4 continued, “Again, the tool does not replace the teacher. ‘Cool tools’ do not negate the need for instructor facilitation and presence in the course.” These teachers realize that there is a need for institutional backing for professional development and support for teachers who lack the experience, pedagogical knowledge, or confidence to integrate new tools into their basic LMS.

Accessibility. Accessibility emerged as a challenge mentioned as a reason that other teachers, not involved in this study, had discussed with the study participants for keeping them away from trying new online tools. Accessible resources are created to comply with the Americans with Disabilities Act (ADA) and Section 508 of the Rehabilitation Act of 1973. P1 cited the lack of accessibility and the fear of not enough time to remediate resources as a reason some instructors will not integrate new tools. “I think accessibility is the area that has the most, most growth potential for online teaching and learning. We're already behind when it comes to making sure that everything that we're posting is accessible for students.” P4 wrote that one of the disadvantages of new tools is “Tools may not be accessible (this applies to external LMS tools - LTI apps,

etc.)". P4 explained in the interview that without having the proper training and knowledge, teachers were fearful of not being able to provide access to all students, aware that online students often don't self-identify as needing accommodation. However, Accessibility will also be mentioned later in this section as a reason for adoption of new tools, as some teachers feel the online environment provides more opportunities for individualized accessible learning.

Reasons for Adoption. The next four themes occurring in the Green Valley College data refer to reasons for adoption of technology. Three of these were suggested by literature review and the conceptual framework and four themes emerged from the data. There were 136 thematic mentions of reasons for adoption, divided among seven themes, which is 86.6% of the thematic mentions in the Green Valley College data.

Administrative Support. The first theme was administrative support. While the teachers at Green Valley College cited the lack of administrative support as evidenced by minimal or missing opportunities for sponsored professional development as a challenge to the adoption of new tools, the same teachers praised their current college's robust professional development as an advantage in their adoption of new tools. P4 responded to an interview question about factors that influenced the adoption of new tools saying, "I would say the professional development is probably the number one thing. Having an in-house program is - that's pretty key. Because an in-house person has a really good understanding for the local needs in terms of faculty." Later, P4 added that "faculty are compensated for developing new online courses. And say you have a face to face course, and you'd like to take it online and no one has done that before they will compensate you

for that." P4 sees the opportunities for professional development and faculty compensation as evidence of administrative support. Similarly, when discussing decisions around using new tools in the LMS, P3 said, "At this college, I was pretty quickly involved with distance education. They provided a lot of support and providing that support, that's difference, obviously." P3 explained that it was a requirement to have some professional development training on the LMS before teaching online, and so completed the local online training modules. This opened the door to a relationship with the staff course designer who supported P3 with the integration of new LMS tools.

Professional Development. Each of the four teachers from Green Valley College felt that opportunities for professional development had a positive impact on their decisions to adopt new tools. P1, with support from the college, attended a hands-on new tool training session at an educational conference. The experience of learning to use the tool along with other colleagues was the determining factor in P1's implementation of the tool. P2 praised the LMS team on campus for providing continuous support for basic LMS functionality to research and support with new tools available for integration into the LMS. As mentioned earlier, P3 experienced the requirement to have some professional development training on the LMS before teaching online. The training was offered online by local staff, and it was the training that began a relationship between P3 and the staff who went on to support P3 with the integration of new LMS tools. P4 mentioned that the local staff "provide workshops on a regular basis for our professional development days for the college where they provide the cool tools workshops and that kind of thing."

Peer Interaction. The third a priori theme was peer interaction and included participation with peers in structured experiences such as facilitated workshops as well as informal and reflective conversations. Lack of peer acceptance was also identified in the framework as providing a challenge to some teachers' adoption of new technology. For three of these teachers, positive interactions with their peers was beneficial to their own adoption of new tools. P4 described belonging to a community of practice with his peers and feeling support for integrating new tools. P1's experience at the educational conference was a shared learning experience with teaching peers from other colleges, all of whom were having a collaborative positive experience with a new tool. After the conference was over, P1 was back in the online classroom and was "hoping to record some of those sessions, just so I can share with some of my colleagues how I use it". P3's local online training took place with other teachers as a shared experience with colleagues all preparing to teach online. The relationship with the support team and other local online teachers began with that training.

In addition to the a priori themes, there were four emergent themes that reflected the experiences of the teachers during their implementation of new tools in online classes. These themes are identified as (a) convenience for the teachers and the students, (b) immediate benefit to students, (c) interaction between students & content, students & teachers/experts, and between/among students, and (d) replication of student real-life current/future experience.

Convenience. Convenience emerged as a theme that was a consideration from both the teacher and student point of view. P1 and P3 had previously used the LMS and

the same or similar integrated video tools on the job or at other educational institution, had positive experiences and found it was convenient to integrate the tools into the current LMS and continue with a system that was working. Although P2 had not used the same system at another institution, its ease of use conveniently allowed for not only basic implementation but the use of additional tools to enhance student interaction.

While the basic LMS allowed students to upload multiple types of files, depending on the configurations selected by the teacher, there were options to integrate new tools which allowed additional types of files. For example, by authorizing Google Drive integration at an institutional level, teachers could choose to integrate their individual Google Drive and present students with the same file, which would be accessed and completed by each individual student and uploaded to an assignment seamlessly. All four teachers reported that tool integration was a simple process that supported allowing students to easily complete and submit assignments without needing to purchase additional software or download and/or print the resources. As P3 mentioned, "Not all students have a printer at home." All four teachers mentioned reducing the cost of resources by integrating whatever tools were necessary to support their particular content, and of course, reducing the use of paper and ink. Tool integration also means that students are more likely to stay on the learning path because they are not directed outside of the LMS to access resources, reducing the risk that they may not be back in a timely manner. P4 noted that the course homepage was the perfect place to provide instructions for students on how the course was setup as well as providing other important information, and there was an educational value to integrating resources so the

students remained in the LMS, with the homepage always available. As P2 said, “putting everything together for the class within the LMS, just made sense.” P3 also noted that having students upload all of their assignments within the LMS by integrating any additional tools such as publisher sites and learning platforms, meant that there was a repository of all the student work, over the time of the course, in one place. P3 found that the students appreciated seeing the development of their work as they progressed through the course, which leads into the topic of online grading.

Another benefit of the LMS is the online grading system. Using the LMS to make grading more efficient is appreciated by all of the teachers and they reported that students appreciated having continual access to their grades. However, some external educational tools are configured to have students not only access resources outside of the LMS, but also complete assessment activities on the outside sites where the grades are also recorded. All four teachers expressed their preference for integrating those learning tools directly into the LMS. As P1 said, “By keeping everything within the LMS and integrating as much as possible, you have the advantage of having everything within the LMS during grading and don’t have to toggle back and forth. Students similarly benefit!” P3 also mentioned the convenience of being able to contact students directly during grading with the integrated email system. That is only possible when teachers integrate the new tools directly into the LMS. P3 also mentioned integrating an anti-plagiarism tool directly into the gradebook as a convenience during grading and immediate information for the students in one place. P3 also noted that “this may not be the only course the

students is taking, so it would be nice if they only had one place to go for all of their classes."

Integrated video is an important part of P1's class. Not only does P1 prefer listening to students rather than reading discussions, P1 uses video to connect students to content experts in an interview exercise and to connect individually with students for office hours or appointments. Rather than having students use an outside tool for videoconferences, it is more convenient to find and integrate a tool directly into the class. P1 said,

> For convenience, it is much easier for me to meet with a student via videoconference than it is for them to meet with me in person or over the phone. I can share examples through share screen and even show videos or demonstrate a skill. I can multitask better and cut down on commute time.

While there is a limited media capability within the LMS, these teachers have found their own selection of new media tools in integrated them directly into their classes.

While accessibility was mentioned in the previous sections, as a challenge to adopting new tools, P1 wrote,

> I believe that online education is the ideal vehicle for students who have special needs and but that still have the desire to learn. This student with hearing loss, has been able to do the media assignments and we talked about some strategies and tools that can be implemented if a student is completely Deaf and what that would look like. And [the student and I] we have some interesting solutions to that. I

> plan on going back to the department and to distance-education and sharing what experiences the student had in the class. I've been monitoring his progress and he's been able to do the assignments and it's going really well in my class, so exciting to see a student who has some challenges and who otherwise needed an accommodation in class in a face-to-face class not really needing an additional accommodation online. Kind of cool.

Immediate benefit to students. One of the challenges to adoption that participants felt was a hindrance for colleagues was the concern that the diverse student population may not be sufficiently prepared technologically to succeed in an online learning environment. However, the participants cited the opposite experience. P1 wrote that by incorporating new tools into the LMS like apps that allow media interaction, the platform "mimics other social media platforms students might use in their free time like Snapchat and Instagram. We are adjusting to their learning and communication style." Because the students seemed to be constantly online for other things, P3 came to realize "that students expected 24/7 access to their grades and to be able to raise their scores when they were ready to make revisions or improvements." By integrating tools that allow teachers to use advanced functions like markup on different types of student submissions, P3 was able to return student submissions more quickly and both P3 and students could refer to a history of the work and using integrated tools, had the ability to collaborate both synchronously and asynchronously during the revision process. P4 also mentioned that incorporating a "variety of LMS tools supports inclusivity and accessibility." For example, through the use of an integration with a tool that provides immediate alternative formats, students can

access P4's text-based resources as audio files, an eBraille file, or a tagged PDF. Rather than the technology limiting access for students, the study participants felt that technology broadened the opportunities for students to access materials when and how they wanted, and in the case of students with additional needs, tools made it possible for students to work without needing to wait for help from others. Students felt they had immediate access when they needed and wanted it.

Interaction. All the participants expressed that integrating tools into the LMS provided enhanced interaction between students and learning content, students and their teachers or experts, and between/among students. To enhance interaction between the students and their teacher or experts, P2 mentioned that at first students said they wish they had someone to talk to, forgetting that they only had access to their teacher two or three hours a week. However, P2 said,

> That's where the discussion comes in – you offset missing the in-person interaction by regular communications in the online classroom…[with an integrated tool] I provide module recaps via video-conference, also recorded and closed-captioned, so students have added opportunities to see and connect with me.

P1 also uses an integrated media tool for videoconferencing and wrote,

> It's a great tool for extending your reach as a subject matter expert. I can interview someone in Boston, via videoconference and create an assignment around it where students can even interact with that guest speaker.

While some participants mentioned the need to get used to live or recorded interaction via video tools, they agreed it was a student-friendly way to make connections.

P2 mentioned the importance of trying to develop a sense of community among the students, wanted to do more than use the discussion board and found that adding the videoconference tool was also important for the student to student interaction. As P1 wrote, "Finding tools to get students to interact with each to create a sense of community is critical to the students' success." P1 has integrated a tool to let students create and share their own short videos from their personal devices, share those within the LMS, and still using the tool integrated within the LMS, respond to each other. To ensure that students felt comfortable with a new tool for interacting, P3 incorporated the tool for an early, low-stakes ice-breaker exercise before using it an assignment.

All of the participants noted that students were comfortable getting non-academic information from multiple types of sources based on their individual preferences, so the more types of content presentation the teachers used, the more likely students would find their desired method for access. As P1 said, the idea was to find tools that "fit in to the students' lifestyles and learning styles." P1 also mentioned the importance of integrating tools into the LMS to help students' stay focused and on task so "students can find everything in one place and don't need to leave the LMS to complete the assignment." P1 also picks out certain concepts that have been difficult for students to master, and makes short videos on those points, "so students have another angle to the information in addition to what's in the textbook." P3 uses an integrated flashcard-type tool to help students focus on certain information before, during, and after a reading. P4 also uses

interactive flashcards to appeal to students' kinesthetic nature, "…so they actually have to do something" to reinforce the material.

Replication of student real-life current/future experience. This theme has two components, taking advantage of the technology students already use in their own life and using technology in ways students may encounter as they move on to more education or to a working situation. All of the study participants remarked that they took part in this study completely through technology including emailing their journals, taking part in web-based interviews, and leading a tour of their virtual classrooms. They all remarked that technology is ubiquitous in theirs and their students' lives. Some students may not have web access at home, but they know how to use it and manage to complete their courses online. So, integrating tools that are similar to what students use in their daily lives presents the learning resources in ways that are accessible for students – the technology becomes invisible rather than a barrier. P4 said

> I had a colleague who was concerned that students wouldn't know how to post a video and I said that if they can make a video and post it to YouTube, they can make and post a video to the class.

P4 also remarked that by incorporating tools that approximate what students use outside the classroom, checking in and using the tools seemed to happen at a higher rate and the interaction took on a "social component" without any loss of academic tone. P4 included a discussion of academic tone early on in the classes. Both P4 and P1 encourage students to use their integrated video tool and explore options for presentation and

screen-sharing in preparation for possible use in their careers. P1 tells students “This is becoming the norm in business, what we’re doing right now.”

The data from the Green Valley College teachers reflected five of the six themes generated literature review and conceptual framework themes. Through the use of open coding, I coded five emergent themes from Green Valley data. Finally, confirmation of the teachers as innovators was indicated by journal entries and interview responses.

Within-Case Thematic Analysis for Red Desert College.

I coded the data from the Red Desert College teachers in the same way as the data from the Green Valley College teachers using the six themes provided by the literature review and conceptual framework. I identified coded data were for one of the three themes that referred to challenges to adoption of technology. The themes were (a) timing and (b) communication, neither of which occurred in the Red Desert College data; and (c) social considerations. A discrepant concern was mentioned by a study participant having heard from a colleague of the reluctance to adopt new tools out of fear that they might be discontinued by the vendor. The colleague was concerned about spending time learning how to use a tool and designing assignments, and if the tool was discontinued or no longer supported by the LMS, the time and work would be wasted. Three themes referred to reasons for successful adoption of technology and they were (a) administrative support, (b) professional development, and (c) peer interaction. I identified two emergent themes in Red Desert College data as (a) convenience for teacher and student and (b) interaction between student & content, student & teacher/expert, and between/ among students. Finally, confirmation of the teachers as innovators was indicated by journal

entries and interview responses. I summarized the themes and their times discussed for Red Desert College in Table 6.

Table 6

Summary of Themes for Red Desert College Data Collection Instruments

Red Desert Themes	**Times Discussed**
Challenges to Adoption: Timing	n/a
Challenges to Adoption: Communication	n/a
Challenges to Adoption: Social Lack of support from administration - infrastructure Concern about student tech level, impact on success Concern about teacher tech level	6
Challenges to Adoption: Other (*a discrepant item*) Concern about vendor commitment to tools	1
subtotal for Challenges to Adoption	*7/31 (22.6%)*
Reasons for Adoption: Administrative Support Communication that online supports enrollment Faculty release time for PD Global integration of tools	4
Reasons for Adoption: PD Opportunities for paid vendor training Opportunities for paid external training Local workshop opportunities	5
Reasons for Adoption: Peer Interaction Opportunity to take on student role with peers	2
Reasons for Adoption: Other (*emergent themes*) Convenience for teachers and students (6) Interaction between students & content, students & teachers/experts, and between/among students (7)	13
subtotal for Reasons for Adoption	*24/31 (77.4%)*
Indications of Teachers as Innovators Time was tight but not prohibitive Technology was new, but easily learned I was motivated because of students' response	6 (confirmation of participant characteristic as innovator)

Challenges to Adoption. The first theme occurring in the Red Desert College data refers to challenges to adoption of technology. The three codes in this theme reflect social considerations reported by the participants as concerns of their colleagues, not themselves. The first item was the perceived lack of support by administration based on reported concerns about the stability of the infrastructure that supports the LMS. When the college internet services are not available, neither is access to the LMS. The participants also reported that their colleagues are uncomfortable about their own technology capabilities. When using an additional tool requires an additional action to configure or assess student work, P5 reported that colleagues have been reluctant to "take that little extra step…that little bit more is the longest step." P6 wrote that "developing and teaching online courses in recent years required more in-depth training on LMS use and tools" and colleagues were not ready to make that commitment. P6 expressed a third concern expressed on behalf of colleagues that new tools would, "cause students frustration" and P5 mentioned that colleagues were concerned about students' general lack of technology skills. An additional concern was mentioned by P6 that a colleague reported reluctance to adopt new tools out of fear that they might be discontinued by the vendor. There were six thematic mentions of challenges to adoption and one additional item, which is 22.6% of the thematic mentions in the Red Desert College data.

Reasons for Adoption. The next four themes occurring in the Red Desert College refer to reasons for adoption of technology. Three of these were suggested by literature review and the conceptual framework and three themes emerged from the data. There were 25 thematic mentions of reasons for adoption, which is 81% of the thematic

mentions in the Red Desert College data.

Administrative Support. The first theme was administrative support. While the teachers at Red Desert College spoke on behalf of their colleagues as the unstable infrastructure as evidence of lack of administrative support, they did not mention that as a factor for them. They did mention that the administration's support for online classes as a way to increase enrollment. P6 said the administration's position was that online classes would "help enrollment, we would have training and it would be a win/win for everyone." As a result, P6's teaching load was reduced for one semester to allow time for a college-paid professional development opportunity to receive training to prepare for teaching with the new LMS with the understanding that P6 would prepare a course to be taught online the next semester. P5 explained that after receiving college-paid vendor training for a new tool, the college paid for the tool to be integrated into the LMS making it available within P5's class. Both P5 and P6 also mentioned the increased opportunities for additional paid professional development opportunities made possible through support of the administration for developing online teachers.

Professional Development. It was the professional development opportunities that P5 and P6 both acknowledged have moved them so quickly forward with doing more in the LMS than just using it out-of-the-box. P5's opportunity to take the two-week vendor course included a requirement to build an assignment with the new tool. That assignment became a part of P5's class during the next term. P5 said that using the tool within a workshop environment demonstrated that the activities would be more engaging for the students and the teacher. P6 cited the number of local professional development

offerings on in-service days and throughout the academic year as big reason for using LMS tools. The hands-on opportunities working within the LMS provided the chance to apply new skills and gain confidence to use tools immediately within a class.

Peer Interaction. The third a priori theme was peer interaction, but for both P5 and P6 in separate professional development instances, the valuable interaction took place online and with peers at other institutions while P5 and P6 were in student roles. As P6 said, "the course was actually being taught in the current LMS, which we hadn't transitioned to yet, so I got that view as a student using it and I really loved it." The conversation among peers included discussions on potential barriers they encountered in their learning experiences and allowed them to develop potential ways to overcome those barriers. For example, P6 wrote additional instructions for students for processes that might be confusing. When using a new tool, P5 "made a couple of videos to show them how to set it up and it was, based on the results, very successful."

Convenience. Convenience emerged as a theme that was a consideration from both the teacher and student point of view. For example, P6 noted that when a tool could be integrated directly into the LMS, both the teacher and student could stay within the LMS to work. In addition to convenience, staying with the LMS helps students stay focused on the task at hand. When P6 transitioned to using OER materials (Open Educational Resources), those readings and activities were integrated directly into the LMS. P6 integrated a tool for student feedback directly into the LMS and learned that the students appreciated the organization and consistent structure that integrating all resources and activities within the LMS provided. When P5 started using a media tool, it

was integrated directly into the LMS which allowed students to post responses using their phones' audio and video capability directly into the LMS.

Interaction. Both P6 and P5 expressed that integrating tools into the LMS provided enhanced interaction between students and learning content, students and their teachers, and between/among students. P6 had the opportunity to enroll in an online teaching course as a student and experienced first-hand how the use of tools made the facilitated engagement and encouraged participation. P6 described the course as including "really good models" for using LMS tools and was able to take the practice course assignments and apply them directly in the next terms' class. P5 had a similar experience in the vendor course. After learning about how to use the tool as a student, the vendor course required that P5 create an assignment using the tool. P5 took that and applied immediately with students. P5 said

> The more involved I was engaging students, creating lessons and activities that were engaging with them, with them, and each other with me and each other that it was more gratifying for me, more gratifying for them, mostly from feedback from students and success rates.

P6 also talked about using reviews from colleagues' websites that described how they successfully used tools in their online classes. Those reports encouraged P6 to incorporate new tools in both the online and face-to-face sections of classes, where students in both sections provided positive feedback about appreciating different ways to communicate among each other and with P6.

The data from the Red Desert College teachers reflected four of the six themes generated literature review and conceptual framework themes. Through the use of open coding, I coded two emergent themes and one instance of discrepant data. Finally, confirmation of the teachers as innovators was indicated by journal entries and interview responses.

Cross-Case Thematic Analysis

In this second level of data analysis, I compared the results from the two individual sites to identify themes that were common across both sites and those that were specific to a particular site (Merriam & Tisdell, 2016). Through this comparison, I identified four a priori themes that were common to both sites, one a priori theme appearing only in the Green Valley College data, two common emergent themes, three emergent themes that were specific to only Green Valley College, and one discrepant item. I summarized the thematic comparison between Green Valley College and Red Desert College in Table 7.

Table 7

Themes Comparison Between Green Valley College and Red Desert College

	Green Valley College	**Red Desert College**
Challenges to Adoption: Timing	8/157 (5.1%)	--
Challenges to Adoption: Communication	--	--
Challenges to Adoption: Social	9/157 (5.7%)	6/31 (19.4%)
Challenges to Adoption: Other		
Questions of accessibility (*emergent theme*)	4/157 (2.5%)	--
Concern about vendor commitment to tools (*discrepant item*)		1/31 (3.2%)
Reasons for Adoption: Administrative Support	3/157 (1.9%)	4/31 (12.9%)
Reasons for Adoption: PD	7/157 (4.5%)	5/31 (16.1%)
Reasons for Adoption: Peer Interaction	9/157 (5.7%)	2/31 (6.5%)
Reasons for Adoption: Other (*emergent themes*)		
Convenience for teachers and students	36/157 (22.9%)	6/31 (19.4%)
Immediate benefit to students	33/157 (21%)	--
Interaction between students & content, students & teachers/experts, and between/among students	37/157 (23.6%)	7/31 (22.6%)
Replication of student real-life current/future experience	11/157 (7%)	--

From the literature review and conceptual framework, I developed six a priori themes to use during data analysis. I identified three themes that referred to challenges to adoption of technology as (a) timing, (b) communication, and (c) social considerations. I An identified an emergent theme for challenge to adoption in the Green Valley College data and open coded it as questions of accessibility. I identified three a priori themes that referred to reasons for successful adoption of technology as (a) administrative support, (b) professional development, and (c) peer interaction. I identified four emergent themes in Green Valley College and open coded them as (a) convenience for teacher and student, (b) immediate benefit to student learning, (c) interaction between student & content, student & teacher/expert, and between/ among students, and (d) replication of student

real-life current/future experience. I identified one discrepant item in the Red Desert College data as concern about vendor commitment to tools.

A Priori Common Themes. The first group of a priori themes referred to challenges to adoption of technology (a) timing, (b) communication, and (c) social considerations. Of the three themes, only one was common to both cases, the theme of social considerations. At Green Valley College, the teachers expressed a need for institutional backing for professional development and support for teachers who lack the experience, pedagogical knowledge, or confidence to integrate new tools into their basic LMS. At Red Desert College, the teachers described a similar feeling, though on the part of their colleagues, that a lack of support by administration was demonstrated by the need for support for colleagues who lack the technical and pedagogical training to teach online as well as concerns about the stability of the infrastructure that supports the LMS. Additionally, one of the Red Desert College teachers mentioned that colleagues were concerned about students' general lack of technology skills.

The second group of common a priori themes that referred to reasons for adoption of technology were (a) administrative support, (b) professional development, and (c) peer interaction. in both cases, the teachers mentioned the importance of having Administrative Support for their efforts to learn to use new online technology as evidenced by providing staff/technical support, encouraging professional development, and finding ways to provide teachers compensation for their efforts. At both colleges, teachers benefitted from attending vendor or external professional development courses. Additionally, the teachers mentioned that being able to avail themselves of local

professional development, helped them to be successful in their adoption of new online tools. The final theme, Peer Interaction was mentioned by the teachers for the importance of having peer support while working through challenges and for providing a community from which ideas were generated as challenges arose.

A Priori Case-Specific Themes. An a priori theme that stood out as being a challenge only at Green Valley College was the challenge of timing. As mentioned, this theme is identified as a barrier caused by an item over which the teacher does not have control such as the academic calendar, course schedule, notification of assignment to a class, or the professional development schedule. Because the study participants were selected because they were successfully adopting new tools, their comments were either identified as perceived issues for other teachers or as issues they overcame. For example, P1 wanted to implement a new video tool for students that was introduced at a mid-summer conference. That meant that there was no time to test the tool prior to integration and use for the upcoming semester. But P1 was committed to creating instructions for students, checked in with surveys, and watched every video to be able to respond immediately if a student had an issue. P4 mentioned that not all teachers have the extra time to spend closely managing new technology to be prepared to help students quickly. But P4 wrote "I was fortunate enough to be in a position where I could dedicate a fair amount of time to exploring new tools, at my discretion and on my own "dime" so to speak."

Emergent Common Themes. There were two emergent themes common to both college sites and both themes were reasons for adoption. The first emergent common

theme was the convenience that a new tool provided for both teachers and students. The teachers at Green Valley College appreciated being able to integrate tools including Google Drive, publisher resources and websites, and specific video tools. Tool integration meant that students worked seamlessly within the LMS, without straying off the learning path the teacher had designed, although the students were accessing resources from other sites. At Red Desert College, P6 integrated a tool for student feedback directly into the LMS. As students completed assignments and activities using external tools, they were able to upload them directly into the LMS. Teachers also noted that integrating resources, including content resources meant that neither they nor students were required to print and carry hard copies of material as all web-based resources were available by phone, tablet, or desktop device anywhere the Internet was available.

The second emergent common theme was the tools' capability to facilitate interaction between student & content, student & teacher/expert, and between/ among students. At Red Desert College, P5 integrated a tool that allowed students to post videos, images, and/or text, present them using their voice or text, and comment on their classmates' media posts. The tool included universal design aspects to facilitate accessibility for students using adaptive hardware and/or software. P1, at Green Valley College, noted that integrating tools that "fit in to the students' lifestyles and learning styles", was an effective way to reach students using technology the students were already comfortable with in other aspects of their lives.

Emergent Case-Specific Themes. There were three emergent case-specific

themes at Green Valley College, one as a challenge and two as reasons for adoption. The theme of accessibility emerged as a challenge to adoption at Green Valley College, but also as a perceived benefit. As happened with the a priori theme of timing, the occurrence of this emergent theme as both challenge and benefit or dismissed as a non-factor was an indication of the characteristic of the participant pool being limited to teachers who had successfully adopted new technology in the forms of LMS tools. While the use of the digital environment for learning brings the challenge for ensuring that all aspects of the environment are accessible for all students, it also provides benefits for students to use technology to individually modify the learning environment. As P1 wrote,

> I believe that online education is the ideal vehicle for students who have special needs and but that still have the desire to learn. This student with hearing loss, has been able to do the media assignments and we talked about some strategies and tools that can be implemented if a student is completely Deaf and what that would look like. It's…..so exciting to see a student who has some challenges and who otherwise needed an accommodation in class in a face-to-face class not really needing an additional accommodation online. Kind of cool.

The second emergent case-specific theme was the teachers' recognition that the new tool had an immediate benefit to student learning. P4 noted that through the integration of an external tool, all of the course files were immediately available to students in alternative formats, including audio files, eBraille files, or a tagged PDF. Rather than the technology limiting access for students, P4 expressed that technology broadened the opportunities for students to access materials when and how they wanted,

and in the case of students with additional needs, tools made it possible for students to work without needing to wait for help from others. P3 used an integrated tool to collaborate both synchronously and asynchronously with students during the writing assignment revision process. Using either the basic gradebook or an integrated grade tool, students received immediate feedback on formative assessments that could help focus their efforts to learn new material.

The third emergent case-specific theme was that the use of the tool replicated student real-life current or expected future experience. Like using technology that is similar to what students use in their everyday life, applying technology in an academic environment provided opportunities to practice skills that students will use in career situations, such as using video tools for job interviews or to consult with experts in their field who are not co-located. As P1 explained,

> [The tool] also helps them with communication. I think it is really important for business, specifically, I just had an online interview video interview with an potential student employer. And I think that's becoming more and more common. So, I believe the more comfortable you get in the video format, even though students kind of gripe about it efforts, the more, the better, the better they are prepared for the business world, the future of the business world.

Discrepant Data. When referring to discrepant data, Merriam and Tisdell (2016) explain that analysis of data can take place simultaneously with data collection when a researcher seeks information that varies from what has been previously found. During one of the interviews from Red Desert College, a study participant mentioned having

heard from a colleague of the reluctance to adopt new tools out of fear that they might be discontinued by the vendor. As I followed up in the interview, the participant described that the colleague was concerned about spending time learning how to use a tool and designing assignments, and if the tool was discontinued or no longer supported by the LMS, the time and work would be wasted. This was reported in the third person as a concern from only one colleague and I chose not to include it in data analysis. While this one instance does not impact the theoretical proposition of this study (Yin, 2014), I mentioned it here to provide a complete report of the data and for the benefit of future research.

Research Questions

From the results of the data analysis, I identified a priori and emergent themes. Those themes were applied to answer the three related research questions and two central research questions.

Related Research Question 1. This Related Research Question was, why do teachers initially resist using technology tools designed to engage online learners? The key findings were first that while the study participants described challenges that they either considered themselves or were mentioned by their colleagues, these teachers found ways to overcome barriers of time and social considerations. The most significant challenge that was reported was that of time – time to prepare an online course, time to learn to use the technology, and time to engage with the students. However, the successful teachers realized that to integrate new technology, they might need to spend uncompensated time. At Green Valley College, P4 spoke up for colleagues noting that

some teachers were sometimes just not in the position to do that. This challenge was identified by the framework and in the research. The other key finding was related to the category of social considerations, that teachers felt that they are not technically qualified and did not have the time or means to gain those skills. The teachers in the study, again identified this challenge for their colleagues, mentioning that there is a need for more available professional development and more hands-on support from experts in course design and delivery to back-up the teachers who are the content experts.

Related Research Question 2. This Related Research Question was, what factors contribute to teachers' willingness to adopt technology tools designed to engage online learners? The key finding was that the factors that contribute to teachers' willingness to adopt technology tools included convenience, interactivity, benefit to student learning, and replication of real-life experiences. These themes were described by the teachers, based on their experience, as being positive for the as teachers and as reported by their students. These included two themes that were common to both cases: convenience for teacher and student and interaction between student & content, student & teacher/expert, and between/ among students; and two that were unique to one site: immediate benefit to student learning and replication of student real-life current/future experience. All of these themes were related to the use of integrated tools in an LMS and the positive effect those tools had on the teaching and learning environment.**Related Research Question 3.** This Related Research Question was, what do course object reviews reveal about how teachers are using technology tools for student engagement? The purpose of this question was to provide an opportunity for the researcher to observe the actual online learning

environment to see how the teachers' use of the tools they described in the interviews and journals looked to a student in the online classroom. In all cases, the researcher observations aligned with the teachers' descriptions.

Central Research Question 1. This Central Research Question was, how does teachers' resistance to the use of technology tools in online courses reflect Rogers's (2003) characteristics of innovation? Rogers (2003) described the adoption process as having four main elements, and two of those, the social system, and the time it takes a potential adopter to complete the process, were identified clearly by the study participants as having an effect on their colleagues who were resistant to integrating new tools into their LMS. The key finding though, was that teachers who successfully integrated new tools, clearly demonstrated the characteristics of early adopters as they moved through Rogers's (2003) decision-making process. The teachers each educated themselves on the technology; made their decision to adopt based on information gathered from peers, experts, or students; and implemented thoughtfully based on factors of time. As they moved through potential barriers, they demonstrated characteristics of early adopters.

Central Research Question 2. This Central Research Question asked How does teachers' progressive use of technology tools reflect Kolb's (1984) stages of experiential learning? Kolb's (1984) ELM describes multiple points in the learning experience where a learner could make a decision to adopt a new skill or practice. The key finding here was that the study participants made their adoption decision to implement a new tool into their LMS, the individual implementations took place at specific points in the ELM cycle, as aligned with Kolb's (1984) learner descriptions.

Summary

In Chapter 4 I presented the results of this study, beginning with a description of the setting, demographics, and participant selection process. I discussed the data collection process for each type of instrument. I followed that with a presentation of the data analysis process including a description of the coding process, identification of emergent themes, and consideration of discrepant data. I discussed evidence of trustworthiness and addressed credibility, transferability, dependability, and confirmability consistent with Chapter 3. Finally, I presented a discussion of the results patterns and themes for both the within-case and cross-case analysis, discrepant data, and key findings for the research questions along with relevant direct quotes. From the related research questions, the key findings of this study were that (1) community college teachers who found ways to overcome barriers of time and social considerations to successfully integrate new tools in their online classes, participated in diverse types of professional development and training opportunities, and (2) the emerging factors that contributed to teachers' willingness to adopt specific technology tools were primarily for the benefit of the students including increased interactivity between students and the teacher, students and the content, and among students; and the applicability of the tools to real-life experiences; though one factor, convenience, benefitted both the students and the teacher.

Related to the framework for this study, key findings for the central research questions included (1) teachers who successfully integrated new tools demonstrated the characteristics of innovators or early adopters as they moved through Rogers's (2003)

decision-making process and that (2) teachers made their adoption decision to implement a new tool into their LMS, at multiple specific points in the ELM cycle, as aligned with Kolb's (1984) learner descriptions.

These results provide the basis for a discussion in Chapter 5. I present an interpretation of the findings with consideration for the limitations for the study, along with recommendations for future research. Finally, I present implications for social change including potential immediate applications.

Chapter 5: Discussion, Conclusions, and Recommendations

The purpose of this qualitative case study was to describe how teacher resistance to the use of instructional tools in online courses reflects Rogers's (2003) characteristics of innovation and how their progressive use of instructional tools reflects Kolb's (1984) stages of experiential learning. This study contributes to the body of research in my field in the design of responsive and innovative professional development programs to encourage and support teacher adoption of best practices in online instruction through a better understanding of how some online teachers experience success in overcoming their initial resistance to technology tools to engage students in the online classroom. Using single and cross-case analyses, I identified 10 themes from the data. Of those, two a priori themes and one emergent theme corresponded challenges to adoption of new technology, and one a priori theme and five emergent themes corresponded to teachers' reasons for adoption of new technology.

From the related research questions, the key findings of this study were: (a) teachers who initially resist technology found ways to overcome barriers of time and social considerations to successfully integrate new tools in their online classes participated in diverse types of professional development and training opportunities, (b) the emerging factors that contributed to teachers' willingness to adopt specific technology tools were primarily for the benefit of the students including increased interactivity between students and the teacher, students and the content, and among students; and the applicability of the tools to real-life experiences; though one factor, convenience, benefitted both the students and the teacher. Related to the framework for

this study, key findings for the central research questions included (a) teachers who successfully integrated new tools demonstrated the characteristics of early adopters as they moved through Rogers's (2003) decision-making process and that (b) teachers made their adoption decision to implement a new tool into their LMS at multiple points in the ELM cycle, as aligned with Kolb's (1984) learner descriptions.

In this chapter, I begin with an interpretation of the study findings in relation to the reviewed literature and conceptual framework for the central research questions. I follow with a description of the limitations of the study and recommendations for future research. Finally, I conclude with a discussion of the implications of the study findings and applications for social change.

Interpretation of Findings

The interpretation of findings for this study is based on the literature review and the conceptual framework. The interpretation of findings for the related research questions is presented first and is anchored to the themes for this study. This interpretation is followed by the interpretation of findings for the central research questions, from which the related research questions were derived. The findings for the central research questions are also interpreted in relation to the conceptual framework for this study, which was based on Rogers's (2003) characteristics and Kolb's (1984) stages of experiential learning.

Successful Use of Technology: Thematic Findings

The first related research question was "Why do teachers initially resist using technology tools designed to engage online learners? Previous research indicated that

there are two challenges to technology adoption: timing and social considerations (Esterhuizen, 2015; Fray-Aiken & Campbell-Grizzle, 2016; Sato et al., 2015). This study's results add the challenge of online resource accessibility and universal design for learning. While research aligns with the key finding that time and social considerations are challenges to adoption, it stops short of providing the story of how the teachers moved on from the original resistance to adoption. The findings from the second related research question begin to illuminate those reasons.

The second related research question was, "What factors contribute to teachers' willingness to adopt technology tools designed to engage online learners?" Previous research indicated that three considerations are important to teachers' technology adoption: (a) administrative support, (b) professional development, and (c) peer interaction. Data from my study confirmed that administrative support takes multiple forms including involvement of teachers in early policy development discussions, establishment of professional development programs, and provision of adequate technology infrastructure (Esterhuizen, 2015; Mbatha, 2015; Mitchell et al., 2015). The theme related to the importance of providing professional development for teachers, when they are deciding to adopt new technology confirms that professional development is important (Freeman & Tremblay, 2013; Kidd et al., 2016; Pettersson & Olofsson, 2015) and extends its importance to community college teachers.

The key finding here is the emergence of four additional factors relating to teachers' adoption of new technology: (a) convenience for teacher and student, (b) immediate benefit to student learning, (c) interaction between student and content,

student and teacher/expert, and between/ among students, and (d) replication of student real-life current/future experience. The common thread from these themes is positive impact on the student learning experience, extending previous studies to better understand why teachers are motivated to overcome barriers to adopt technology.

Conceptual Framework: Characteristics of Innovation

The first central research question was, "How does teachers' resistance to the use of technology tools in online courses reflect Rogers's (2003) characteristics of innovation?" With his DoI theory, Rogers identified a timeline for identifying adopter categories and three factors that were reasons for failing to complete adoption in a timely manner. While the data from my study confirmed that both time constraints and social considerations are potential challenges for technology integration (Esterhuizen, 2015; Fray-Aiken & Campbell-Grizzle, 2016; Sato et al., 2015; Xiberta & Boada, 2016), my study extends what is understood: community college teachers described how they overcame the barriers of time and social considerations to adopt new tools as soon as possible for the benefit of their student facilitated by participation in a variety of professional development activities including local online training modules, conference sessions, workshops, college-paid online training, and college-paid vendor training.

Conceptual Framework: Stages of Experiential Learning

The second central research question was, "How does teachers' progressive use of technology tools reflect Kolb's (1984) stages of experiential learning?" Kolb's ELM cycle identifies a learner's needs by where they are in the learning process and provides a framework for categorizing types of experiences that are transformational at each stage in

the cycle. The key finding here was that study participants who were at various points on the ELM cycle in learning about technology tools persisted to find and participate in different types of professional development depending on their needs and what stage their situation placed them in the ELM. The finding supports previous research emphasizing the value that diverse professional development and training opportunities provide to teachers (see Kidd et al., 2016). This study extends what is understood about experiential learning to online teachers who are able to overcome challenges to adopt new technology tools for teaching online.

Limitations of the Study

The limitations to trustworthiness of this study is related to research design. Prior to commencing the study, I identified several potential limitations to the study design and took steps to mitigate those. However, the potential limitation to the transferability of the study findings due to the small number of sites and participants does exist. In this study, I gathered data from two sites with four participants at one and two at another. Merriam and Tisdell (2016) discussed the focused characteristic of qualitative research that looks at a particular population and the challenges of applying the results from a particular group to another population. The design of the study limited the potential participant list to those teachers who met the criteria as identified by their local distance education coordinator. From that list, I obtained volunteers for the study. While this study included participants from two sites, with a greater number of sites, the potential would exist for more volunteer participants which would increase the degree of transferability of the study findings.

Recommendations

Recommendations for further research are based on study results and limitations of the study. The first recommendation is related to the study finding that identified time constraints and perceived lack of administrative support as barriers to the adoption of new technology. Data from this study suggest flexibility in timing and instructional methods of technology and pedagogical instruction would be beneficial. It is recommended a similar study be conducted in other locations with similar and different settings and environments to determine whether this is a common concern.

The second recommendation is related to the study finding that successful participants took advantage of multiple types of professional development while the lack of professional development was a challenge to the technology adoption process for other teachers. In one instance, a participant cited the required technology training that was part of their teacher preparation program. Since technology training is not required in all teacher preparation programs, it would be beneficial to conduct studies examining how technology training occurs in different teaching programs, as well as whether training graduates believe they are prepared to integrate technology into their instruction.

The final recommendation is related to the limitations of this study. This study was completed with six participants: two participants at one site and four at another site. Replicating this small study with a larger number of participants and sites would increase the degree of transferability of the study findings.

Implications

This study contributes to positive social change in several ways. The findings

from this study support the theoretical need for educational institutions to provide support for the positive influence of factors identified by Rogers and recounted in the literature teachers' general adoption of new technology and specific stories of integrating new tools in their online teaching and learning platforms. Policies that support innovative instruction and learning will lead to increased use of technology tools, including existing tools that teachers can use with new strategies, or new tools that they can use to support student engagement in the online classroom.

In addition, in relation to improved professional practice concerning professional development opportunities available for new teachers as well as those transitioning from face-to-face to online teaching environments. For those involved in designing and presenting professional development opportunities, data from this study suggests that flexibility in timing and methods of technology and pedagogical instruction are significant when scheduling training to appeal to teachers' busy schedules. Knowledge from this study of the adoption factors can inform the design of technology training. Information from this study also points to the need for improved design of current and new professional development opportunities for teachers. The information from this study can influence the development of both new teacher training programs and professional development for current teachers leading to more effective online teachers and more engaged and therefore successful students.

The last contribution and implication of this study is that it may provide educational stakeholders with a deeper understanding of how new technology in online education can make learning available to students who not only benefit from the

convenience of flexible scheduling and location for accessing education, but also students who can leverage technology to access information in ways that are not available in a traditional classroom. Blind students can use screen reading software to hear instruction and apply provided eBraille information. Deaf and hard-of–hearing students can access closed-captions on media files. Students with mobility preferences can use hardware and software suitable to their needs. This extension of technology to benefit students with different learning preferences was not identified by Rogers whose theory predated the current state of technology, nor was it evident in the literature, but importantly emerged from the study data.

Conclusion

The key findings for this qualitative case study were (a) community college teachers who found ways to overcome barriers of time and social considerations and successfully integrate new tools in their online classes, participated in diverse types of professional development and training opportunities and (b) factors that contribute to teachers' willingness to adopt specific technology tools include convenience, interactivity, benefit to student learning, and applicability to real-life experiences. Related to the framework for this study, key findings included (a) teachers who successfully integrated new tools demonstrated the characteristics of early adopters as they moved through Rogers's (2003) decision-making process and (b) teachers made their adoption decision to implement a new tool into their LMS at multiple points in the ELM cycle, as aligned with Kolb's (1984) learner descriptions. These findings support the need for institutionally supported, flexible professional development programs for online teachers

who are seeking to improve their teaching and support their students.

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Appendix A: Permission for Use of Material from Everett M. Rogers

SIMON & SCHUSTER

name redacted
Permissions Supervisor
address redacted
email address redacted

VIA EMAIL

January 26, 2017

name redacted
address redacted
email address redacted

Dear *name redacted*:

You have our permission to include Figure 7-3: "Adopter Categorization on the Basis of Innovativeness" from p. 281 of our book, DIFFUSION OF INNOVATIONS, 5E by Everett M. Rogers, in your doctoral dissertation entitled " Success Stories: Community College Teachers Using Technology to Engage Online Students."

The following acknowledgment is to be reprinted in all copies of your dissertation:

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This permission applies to all copies of your dissertation made to meet the degree requirements at Walden University. You must re-apply to this department if you wish to include our material in your dissertation for any other purpose. We may require a permission fee at that time.

Sincerely,

signature redacted
printed name redacted

AGREED TO AND ACCEPTED

signature redacted
printed name redacted

Appendix B: Permission for Use of Material from David A. Kolb

From: *name and email redacted*
Sent: Thursday, March 5, 2015 9:43 AM
To: *name and email redacted*
Subject: permission for using ELT model

Hi *name redacted*, you are welcome to use the modified version of the experiential learning cycle. Please cite the 1984 Experiential Learning book.

Best,

name redacted
President
Experience Based Learning Systems, Inc.
email redacted
phone: *number redacted*

Appendix C: Participant Reflective Journal Questions

Question 1: In relation to your professional colleagues, how would you describe the timing of your decision to use LMS tools and why?

Question 2: In relation to your professional colleagues, after you made the decision to use LMS tools, how would you describe the timing of your implementation of LMS tools in your course? What factors, if any, had an influence on that timing?

Question 3: In your experience, what have you found are the advantages of using LMS tools?

Question 4: In your experience, what have you found are the disadvantages of using LMS tools?

Appendix D: Interview Protocol

These are the five interview questions, followed by examples of additional prompts suggested by the literature review:

- **Guided Interview Question 1**: Following up on the timing of your decision to use LMS tools (*from **Reflective Journal Question 1***), what specific events, if any, influenced the timing of your decision?
    - **Additional Prompts:** For example, what communications from your campus such as emails or newsletters included information about using the LMS? What opportunities for professional development activities on the topic of using the LMS were available? What discussions or activities with your professional peers took place that influenced your decision?
- **Guided Interview Question 2**: Following up on the timing of your implementation of the use LMS of tools (*from **Reflective Journal Question 2***), what specific reasons, if any, influenced the timing of your implementation?
    - **Additional Prompts:** How did the academic calendar affect the timing of your adoption? What opportunities were available such as a leave or sabbatical were available to allow time to prepare your course? What technical assistance was available to assist with the preparation of your course? Did you attend any professional development activities either on-campus or online that helped move you forward?
- **Guided Interview Question 3**: Following up on the advantages and/or disadvantages of using LMS tools (*from **Reflective Journals Questions 3 and 4***), you explained that

a specific tool was particularly appropriate for your students or content. Would you please share more about that?

  - **Additional Prompts:** You wrote that the [wiki page] is particularly helpful for your web-based project; would you explain more about that? You wrote that the [peer review tool] aligns with your module objectives; would you explain that a little more?

- **Guided Interview Question 4**: Following up on the advantages and/or disadvantages of using LMS tools (*from* ***Reflective Journals Questions 3 and 4***), you explained that a specific tool did not work with your teaching style or students or content. Would you please share more about that?

  - **Additional Prompts:** You wrote that the [quiz] tool does not include question types that were applicable to your content; would you explain more about that, for example is the equation editor not robust enough compared to Moodle?

- **Guided Interview Question 5**: Following up on the advantages and/or disadvantages of using LMS tools, you explained that a specific tool did not work with your teaching style or students or content. What other tools have you found and why are they more suitable?

  - **Additional Prompts:** You wrote that the [quiz] tool does not include question types that were applicable to your content, but you still are able to assess your students within the LMS; how did you finally determine to assess your students' mastery?

Appendix E: Course Object Review Data Collection Form

Form with Sample Data

Observation Site_____ Participant_____

Tool	Timing	Frequency	Type of Engagement	Grade	Notes
*S+A VC**	*W*	*10*	*ST, SS, SC*	*NG*	*Weekly Video Conference (recordings available)*
*A AF-T**	*R-Assignments*	*11*	*ST, SC*	*NG*	*Available in SpeedGrader*
*S CH**	*I*	*2 times*	*NA:*	*NG*	*No students participated, and follow-up survey showed students did not want to participate*

*examples of observation data

Keys for categorizing observed course tools. (There can be more than one choice for every object, and this is not an exhaustive list.)

- **Tool**
- OHF or OHO (Office Hour FACE-TO-FACE or ONLINE)
    - S or A (Synchronous or Asynchronous)
- DF (discussion forum)
    - I or G (Individual or Group posts)
- EM (email or Canvas conversation)
- AF-T or A or V (Assignment Feedback (text, audio, video))
- CA-T or A or V (Class Announcement (text, audio, video))
- VC (VC meeting)
    - I or G (Individual or Group)
    - S or A (Synchronous or Asynchronous or both)
- CH (Chat)
- **Timing**
- R or I (Regular pattern or Irregular or both)
    - W, BW, M (Weekly or Bi-Weekly or with Module/Event)
- **Frequency**

- Count number of occurrences per S, Q, 5W, 8W (semester, quarter, 5-week class, 8-week class)
  - **Type of Engagement**
- ST or SS or SC or combination (Student-Teacher, Student-Student, Student-Content)
  - **Graded – Non-Grade – Extra Credit**
    - G/NG/XC

Course Object Review Data Collection Form

Observation Site_____ Participant_____

Tool	Timing	Frequency	Type of Engagement	Grade	Notes

Notes

Appendix F: Alignment of Instruments with Research Questions

Research Questions	Related Research Question 1	Related Research Question 2	Related Research Question 3	Central Research Question 1	Central Research Question 2
Participant Reflective Journal Questions					
1: In relation to your professional colleagues, how would you describe the timing of your decision to use LMS tools and why?				X	
2: In relation to your professional colleagues, after you made the decision to use LMS tools, how would you describe the timing of your implementation of LMS tools in your course? What factors, if any, had an influence on that timing?				X	
3: In your experience, what have you found are the advantages of using LMS tools?					X
4: In your experience, what have you found are the disadvantages of using LMS tools?					X
Guided Interview (GI) Questions					
1: Following up on the timing of your decision to use LMS tools, what specific events, if any, influenced the timing of your decision?	X				
2: Following up on the timing of your implementation of the use LMS of tools, what specific reasons, if any, influenced the timing of your implementation?		X			
3: Following up on the advantages and/or disadvantages of using LMS		X			

tools, you explained that a specific tool was particularly appropriate for your students or content. Will you please share more about that?			
4: Following up on the advantages and/or disadvantages of using LMS tools, you explained that a specific tool did not work with your teaching style or students or content. Will you please share more about that?	X		
5: Following up on the advantages and/or disadvantages of using LMS tools, you explained that a specific tool did not work with your teaching style or students or content. What other tools have you found and why are they more suitable?		X	
Course Object Reviews (CO)			
Verify use of tools, the timing of their use, the frequency of use, and the type of engagement.			X