Barriers to Reducing the Digital-Use Divide as Perceived by Middle School Principals

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Barriers to Reducing the Digital-Use Divide as Perceived by Middle School Principals

A Dissertation by

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Submitted in partial fulfillment of the requirements for the degree of

Doctor of Education in Organizational Leadership

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ABSTRACT

Barriers to Reducing the Digital-Use Divide as Perceived by Middle School Principals
by Bob Presby

Purpose: The purpose of this qualitative phenomenological study was to explore and describe the barriers to the integration of information and communication technology (ICT) to support active learning in the classroom as perceived by middle school site principals.

Methodology: This was a qualitative phenomenological study using data collected from interviews. The participants in this study were 16 middle or intermediate school principals in Southern California. They answered interview questions about barriers to integrating ICT for active learning, strategies to reduce or eliminate the barriers, and how they determined ICT was being used for active learning. The results were analyzed to determine common themes.

Findings: The findings indicated that the first-order barriers of funding to provide access to ICT and limited or ineffective professional development combined with the second-order barriers of teachers’ lack of knowledge of ICT to support active learning activities and teachers’ traditional teaching styles are significant. Principals have found that providing the technology to support ICT, professional development opportunities, and time for teachers to collaborate about the use of ICT for active learning activities are effective strategies for eliminating or reducing barriers to ICT integration.

Conclusions: Principals are able to identify first- and second-order barriers to integrating ICT for active learning. The second-order barriers of teachers’ knowledge and traditional teaching styles are much more difficult to reduce and require divergent approaches when
compared to first-order barriers of funding for technology tools and professional development. The school site principal is in a unique position to identify and reduce these barriers

**Recommendations:** The researcher recommends that principals receive training in research-based ICT and active learning evaluative models and develop skills in creating school technology plans. Additionally, principals should work with their administrative teams to regularly observe classrooms to determine the frequency and effectiveness of active learning activities supported by ICT.
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CHAPTER I: INTRODUCTION

Since computers entered classrooms in the late 1980s, teachers and students have gained access to new instructional tools. The U.S. Department of Education (DOE) reported in 1996 that only 4% of schools had a computer for every five students and that only 9% of public school classrooms had Internet access. By 2008, it was estimated that 97% of U.S. public school classrooms had Internet access, and the ratio of computers to students was below 3:1 across the country, with many schools approaching a 1:1 ratio (Gray, Thomas, & Lewis, 2010). Advances in computers and computer-based communication combined with low-cost Internet, low-cost devices, and increased funding at the federal, state, and local levels had increased access to effective technology for many students (U.S. Department of Education, Office of Educational Technology [DOE OET], 2010). Now, the question is no longer if technology supports learning; it is how can technology increase active learning in public school classrooms (U.S. DOE OET, 2016)?

Limited access to computers was a major external barrier to the integration of technology into public school classrooms and a focus of researchers during the 1980s and 1990s. Ertmer (1999) described external barriers such as funding and technology support as first-order barriers and stated that their presence leads to frustration and reluctance from teachers to use technology in the classroom. Additional first-order barriers include a lack of time, a lack of training, and a lack of on-site support (U.S. Congress, Office of Technology Assessment [OTA], 1995). While the original first-order barrier of access to technology has been almost eliminated, the remaining first-order barriers are still being identified and researched.
In addition to the first-order barriers, researchers have identified second-order barriers, or intrinsic barriers, to technology integration. Second-order barriers include a lack of experience, a lack of confidence, teaching beliefs, and school site leadership (Ertmer, Ottenbreit-Leftwich, & York, 2007; Groff & Mouza, 2008; Russell, O’Dwyer, Bebell, & Tao, 2007; Yong Zhao & Frank, 2003). Researchers have found that most teachers regularly use computers in their personal and professional lives regardless of age, gender, or years of teaching experience (Bebell, Russell, & O’Dwyer, 2004; Russell et al., 2007). It is this gap between personal use and use in the classroom that supports the concept that second-order barriers, especially a lack of confidence and teaching beliefs, prevent teachers from regularly using technology in their instruction (Hannafin, 2008; Vanderlinde & van Braak, 2011).

To address all of the first- and second-order barriers, researchers have recommended restructuring preservice credentialing programs, conducting an analysis of existing school and district technology plans, providing targeted professional development for administrators and teachers, and allowing teachers time to practice effective ways to use technology (Ertmer & Ottenbreit-Leftwich, 2010; Somekh, 2008; U.S. DOE OET, 2016; Yong Zhao & Cziko, 2001). The individual who most influences the schoolwide use of technology is the school principal. The school site principal may lead changes in many policies and procedures that would reduce several first- and second-order barriers (Bektas, 2014; Chang, 2012; U.S. DOE OET, 2016; Waxman, Boriack, Lee, & MacNeil, 2013).

However, researchers have discovered that there are multiple definitions for technology use in education (Bebell et al., 2004). Most teachers use technology for
preparation, communication, and delivery of instruction far more often than providing activities for students to actively engage in learning with technology (Bebell et al., 2004; Ertmer, Ottenbreit-Leftwich, Sadik, Sendurur, & Sendurur, 2012; Russell et al., 2007).

However, the billions of dollars spent on technology are intended to improve student learning (Cuban, 2001; Hannafin, 2008). The school principal is the change agent who can set the vision to close this digital-use divide to increase student achievement (Cuban, 2001; Hannafin, 2008; Hayashi & Fisher-Adams, 2015; U.S. DOE OET, 2016; Waxman et al., 2013).

**Background**

This background section introduces the concept of educational technology in middle schools with a focus on active-use technology to enhance student learning. Understanding the barriers to the integration of information and communication technology (ICT) in public middle school classrooms is a starting point for reducing these barriers. Cennamo, Ross, and Ertmer (2014) defined ICT as “an umbrella term that refers to all technology that supports the manipulation and communication of information” (p. 3). Integrating ICT at the middle school level requires an analysis of the leadership capacity of the site principal. Researchers agree that the site principal is integral and one of the most important factors in the level of ICT integration for active learning (Chang, 2012; Hayashi & Fisher-Adams, 2015, Machado & Chung, 2015; Waxman et al., 2013).

**Middle Schools**

The concept of a separate school for students in sixth to eighth grades, generally known as a *middle school*, began 40 years ago (Rockoff & Lockwood, 2010). Approximately 90% of the schools in California designed specifically for this age group
are sixth- to eighth-grade middle schools or seventh- and eighth-grade intermediate schools. In middle schools, educators focus on a specific age group and generally employ teachers who have a background in teaching a specific subject or content area (Allison & Rehm, 2007). In many situations, this is the first time students experience multiple teachers, content-specific instruction, and courses designed to assist in the matriculation to high school (Rockoff & Lockwood, 2010).

Furthermore, students enter middle school at a time in human development known as adolescence. *Merriam-Webster’s Online Dictionary* simply defined adolescence as “the period of life when a child develops into an adult” (“Adolescence,” n.d., para. 1). Allison and Rehm (2007) found that cooperative learning, peer tutoring, visual, and alternative forms of assessments like computer-assisted presentations or project-based learning (PjBL) activities increased the learning and engagement for middle school students. More recently, Edwards (2015) analyzed the use of technology to support active learning in four highly effective middle school classrooms and found that teaching with technology was beneficial for young adolescents, as they are curious about themselves and the world around them. Looking at the history of technology in schools helps to develop an understanding of ICT in the classroom.

**History of Technology in Education**

Hap Aziz (2010) explained, “Educational technology is the considered implementation of appropriate tools, techniques, or processes that facilitate the application of senses, memory, and cognition to enhance teaching practices and improve learning outcomes” (para. 1). This broad definition includes the introduction of paper to the classroom in the early 1800s, the ballpoint pen of the 1950s, and the personal
computers of the 1980s (Collins & Halverson, 2009). While the early attempts at integration of computers in classrooms began in the 1960s and 1970s, the first regular use of computers started in the mid-1980s (Collins, 1996).

Between 1982 and 1984, computers started to appear in classrooms and in early computer labs in public schools (Cennamo et al., 2014). The primary use of computers at that time was drill-and-practice type software and basic computer programming. However, early research showed mixed results on the effectiveness of this new technology and questioned the benefit given the cost of computers compared to their effect on student learning (Roblyer, 1985). With the creation of the World Wide Web in 1991, reduced costs of hardware, and the increase of web-based educational content, research shifted from asking if computers are effective for student learning to asking how ICT can increase student learning, engagement, and achievement (Cennamo et al., 2014; U.S. DOE OET, 2016).

During the 1990s, billions of dollars were spent by federal, state, and local governments to integrate ICT into public school classrooms (Coley, Cradler, & Engel, 1997; U.S. DOE, 1996). Reports from the U. S. Congress, Office of Technology Assessment (OTA, 1995), the U.S. Department of Education, Office of Educational Technology (U.S. DOE OET, 2010), and the National Center for Education Statistics (Gray et al., 2010a) showed that from the early 1990s to the late 2000s, the percentage of classrooms with computers grew from 4% to nearly 100%. This research also showed that during this time, teachers began using computers on a daily basis for communication and preparation for classes and that nearly 100% of students reported using computers during their K-12 experience (Coley et al., 1997).
With the access to basic computers almost completely achieved, educators turned their focus to increasing the capacity of ICT and continuing to lower the ratio of students to computers (Bebell & O’Dwyer, 2010; U.S. DOE OET, 2016). This includes increasing the megabit speed of the Internet access at schools and additional 1:1 computer-to-student settings across the country, which is supported by the federal government’s E-rate program that provided billions of dollars for these goals (U.S. DOE OET, 2016). However, not all researchers agree that this additional push for more technology is the most effective use of money (Cuban, Kirkpatrick, & Peck, 2001; Ertmer & Ottenbreit-Leftwich, 2010; Groff & Mouza, 2008; Watson, 2005). Funding for professional development for effective use of technology and research to determine the overall benefits of ICT in the classroom is lacking (Cuban & Jandric, 2015; Ertmer & Ottenbreit-Leftwich, 2013).

**Barriers to Technology Integration**

The integration of any innovation into a society or a social system is a complex process with opportunities for barriers to prevent the lasting success or stability of the innovation (Frank, Zhao, & Borman, 2004; Rogers, 2003). Rogers (2003) described that the diffusion of innovation is an interrelated process, with the rate of adoption being affected by several perceived attributes. Rogers’s concept of diffusing innovations into a system is supported by researchers as they work to identify the barriers to the integration of computers and ICT into public school classrooms. Successful integration of computers and ICT in public school classrooms requires an analysis of barriers, the social systems of schools, and the agents responsible for technology and instruction.
Types of barriers. The barriers to the integration of ICT into public school classrooms include first-order (external) barriers and second-order (internal) barriers (Ertmer, 1999). During the early stages of computer and ICT integration into schools, students, teachers, and administrators contended with first-order and second-order barriers simultaneously (Cuban et al., 2001; Ertmer, 1999; Yong Zhao & Cziko, 2001). Several researchers discovered that the difficulty of addressing both first- and second-order barriers was a main cause of the slow diffusion rate of ICT during the early stages of integration in the late 1980s and early 1990s (Cuban, 2001; Schlechty, 2001; U.S. DOE, 1996).

First-order barriers. Researchers have shown that the original first-order barrier of access to technology, or having computers and the Internet, has been eliminated in almost every public school classroom (Gray et al., 2010a). The student-to-computer ratio is a remaining aspect of the original first-order barrier of access to technology and has been reduced from near 24:1 in the 1990s to below 3:1 in most schools (Gray et al., 2010a). However, even with this increase in access to technology over the past 2 decades, some teachers still report that limited access to computers is a barrier to full ICT integration (Cuban & Jandric, 2015; Schoepp, 2004).

Other first-order barriers include inferior hardware or software; limited administrative, peer, and technical support; a lack of training; and a lack of time to develop skills in using computers in the classroom (Ertmer et al., 2007; Groff & Mouza, 2008). Researchers have found that these barriers may always exist with the ever-
changing nature of technology and current design of the public school system (Hermans, Tondeur, van Braak, & Valcke, 2008; P.-S. Hsu & Sharma, 2008). Reducing first-order barriers requires increased funding, changing the preservice models at the university level, and restructuring the support systems at the district and school levels (Ertmer et al., 2012; Lim et al., 2013; Machado & Chung, 2015).

Second-order barriers. Research on ICT in the classroom has found that just providing access to computers will not ensure use by teachers and students (Collins & Halverson, 2009; Frank et al., 2004; Hannafin & Foshay, 2008; Keengwe, Onchwari, & Wachira, 2008; Rogers, 2003; Yong Zhao & Frank, 2003). Researchers have found that second-order barriers are more difficult to overcome than first-order barriers (Ertmer et al., 2012). The most common second-order barriers include pedagogical beliefs, motivation, established practices and cultures, and personal beliefs about computers (Ertmer et al., 2012; Groff & Mouza, 2008; Mueller et al., 2008).

Technology in the Classroom

While the first- and second-order barriers may slow the integration process, computers are being used in public school classrooms and have been for 4 decades. Research on technology in the classroom can go in various directions, including the teachers’ use of technology, the students’ use of technology, or the type of technology available (Layng & Twyman, 2014; Wegerif, 2015). Although the site principal influences the reduction of barriers for ICT integration, the classroom teachers’ skills and beliefs about ICT use will have a greater effect on the way students use ICT in the classroom (Wegerif, 2015).
**Teachers using ICT.** Teachers are faced with countless ways to integrate ICT into their classrooms (Keengwe et al., 2008; U.S. DOE OET, 2016). Primarily, teachers use ICT in the classroom to present material, provide practice opportunities for students, and support students’ inquiry and learning through presentation and active-use technology (U.S. DOE OET, 2016). Researchers have shown that regular use of ICT has greatly increased over the past decade and that teachers are providing access to ICT on a regular basis (Ertmer & Ottenbreit-Leftwich, 2013; L. F. Johnson, Levine, Smith, & Haywood, 2010; U.S. DOE OET, 2016). In addition, experts have found that the majority of ICT is used at a lower level and has mainly replaced older technology, such as LCD projectors instead of overhead projectors, or new computer-based worksheets (Russell et al., 2007; Weston & Bain, 2010).

Studies have found contradictory information in relation to factors such as age, gender, years of teaching experience, and type of preservice education and the use of ICT in the classroom by teachers (Celik & Yesilyurt, 2013; Russell et al., 2007; Vanderlinde & van Braak, 2011; Yong Zhao & Cziko, 2001). However, researchers have found that teachers’ beliefs about student learning and willingness to collaborate with other educators are significant factors affecting the use of ICT in the classroom (Groff & Mouza, 2008; Inan & Lowther, 2010; Mueller et al., 2008; Whitaker, Casas, & Zoul, 2015). Furthermore, teachers with a constructivist approach toward teaching and learning use ICT for active learning activities more than teachers with more traditional teaching beliefs (Mueller et al., 2008; Whitaker et al., 2015).

**Student learning and ICT.** Student learning is a complex process that involves countless factors that can be measured in many different ways
Cocking, 2000; Smith, Dockrell, & Tomlinson, 1997). However, activities and lessons that are student centered, hands-on, and engaging, referred to as active learning, tend to produce better learning outcomes than teacher-centered, or passive, learning (Bransford et al., 2000). ICT integration can be used for active and passive learning, and it is up to the teacher to determine which approach will be taken (Groff & Mouza, 2008; Yong Zhao & Frank, 2003). Active learning occurs when students are not overly reliant on the teacher and work in the intellectual, physical, and social domains, while passive learning is teacher driven, and students work in only one of the domains (Bransford et al., 2000; Edwards, 2015).

This gap between active learning technology and passive learning technology is called the digital-use divide (U.S. DOE OET, 2016). While it is more common for students to use technology in passive learning, students who use technology for PjBL, collaboration, and creativity demonstrate higher achievement and higher levels of engagement (Aslan & Reigeluth, 2013; Becker, 1994). Researchers agree that ICT is more effective for student learning when the activities are meaningful, engaging, and authentic (Aslan & Reigeluth, 2013; Becker, 1994; Hermans et al., 2008).

** Principals and Leadership **

Leadership expectations for middle school principals have changed from being the building and budget manager of the 1970s, to the curriculum-minded, top-down manager of the 1980s, to the visionary leader who, through consensus, will lead the entire learning community toward student achievement (Lashway, 2002). Now, 21st-century principals will need to accomplish these tasks and support educational technology for their teachers and students to ensure optimal learning environments (Hayashi & Fisher-
Adams, 2015; Sincar, 2013; Waxman et al., 2013). To accomplish these tasks, principals need the capacity to lead change by developing a clear, shared vision and demonstrating a belief in this vision (Schlechty, 2001). Researchers have identified that visionary leadership is the most important attribute for principals to promote ICT and reduce both first-order and second-order barriers to ICT integration in the classroom (K. M. Brown & Anfara, 2003; Hannafin, 2008; P.-S. Hsu & Sharma, 2008; U.S. DOE OET, 2016; Vanderlinde & van Braak, 2011).

In addition to being visionary leaders, researchers found that several other attributes and skills will help principals increase ICT in the classroom and help to close the digital-use divide (Kurland, Peretz, & Hertz-Lazarowitz, 2010; Waxman et al., 2013). One factor that increases ICT use in the classroom is the principals’ ability to encourage teachers and support teachers through the change and integration process (Kurland et al., 2010). Furthermore, the ability to secure resources that will increase the capacity of technology access and provide the necessary support staff is essential for successful technology integration (Hayashi & Fisher-Adams, 2015; Kurland et al., 2010; U.S. DOE OET, 2016). Providing highly effective professional development focused on the use of technology and active learning was identified as a valuable factor in reducing both first- and second-order barriers to technology integration (Ertmer & Ottenbreit-Leftwich, 2010; Groff & Mouza, 2008; Watson, 2005). Lastly, principals’ perceptions toward technology and their own skill in the use of effective and active instructional technologies have strong effects on the level of technology integration and use in the classroom (Chang, 2012; Waxman et al., 2013).
Summary

Barriers to the integration of any innovation into public school classrooms need to be reduced or eliminated if the innovation is to last and be effective (Ertmer & Ottenbreit-Leftwich, 2013; Rogers, 2003; Schoepp, 2004; Somekh, 2008). ICT and active learning activities can be used in all grade levels, but they are additionally beneficial during the middle school years when curiosity and connections are important (Edwards, 2015). There are several stakeholders involved in ICT integration, including teachers, students, parents, community members, and district/school support staff; however, the principal is crucial in reducing or eliminating the barriers toward ICT integration and leading the change process to use ICT for active learning (Chang, 2012; Kurland et al., 2010; U.S. DOE OET, 2016).

Researchers have linked principals’ perceptions toward technology and visionary leadership skills to the rate at which ICT is successfully integrated into the classroom (K. M. Brown & Anfara, 2003; Chang, 2012; Ertmer & Ottenbreit-Leftwich, 2010; Kurland et al., 2010). With the digital divide being dramatically reduced over the past 4 decades, reducing the newly identified digital-use divide may result in new barriers or addressing the current barriers with new strategies (U.S. DOE OET, 2016). The principal is the sole individual at the school site who has the authority and potential to link all stakeholders to a shared vision to increase the use of active learning technology and reduce barriers to the integration of current and future ICT practices (Bektas, 2014; Waxman et al., 2013). Therefore, analyzing and understanding the perceptions and leadership skills of middle school principals will provide valuable information in
predicting the success of integrating ICT for active learning in public middle school classrooms.

**Statement of the Research Problem**

Most studies have found that when used appropriately, ICT will improve students’ engagement and achievement. While the constraints of first-order barriers have been identified and, in many cases, eliminated or considerably reduced, there will always be first-order barriers to address as technology changes and evolves (U.S. DOE OET, 2010). In addition, second-order barriers have been identified, and several research-based recommendations have been presented to assist in reducing these barriers (Daniels, Jacobsen, Varnhagen, & Friesen, 2013; Ertmer et al., 2012; Lim et al., 2013). However, effective technology plans to strategically reduce or eliminate barriers to technology integration in public school classrooms are still not being developed or executed (U.S. DOE OET, 2016).

The literature supports that the classroom teacher is a powerful component in the teaching process (Groff & Mouza, 2008; Inan & Lowther, 2010; Keengwe et al., 2008; Whitaker et al., 2015). In looking at ICT, the teacher determines when, how long, and how ICT will be used on a daily basis (Ertmer & Ottenbreit-Leftwich, 2010). While there are several factors that determine the amount of ICT use, the teacher’s beliefs about using and the effectiveness of ICT are often the most influential factor in effective ICT use in the classroom (Cennamo et al., 2014; Hermans et al., 2008; Inan & Lowther, 2010). Yet, when ICT is used, it is more commonly used in passive learning focused more on information collection or digital worksheets instead of active learning utilizing creativity, collaboration, and critical thinking (U.S. DOE OET, 2016).
Changing one’s beliefs can prove to be an extremely difficult task (Rogers, 2003). However, proven and theoretical models about ICT integration show how to start this change process to increase the use of ICT for active learning and close the digital-use divide. These models include improved preservice teacher programs, effective professional development designed around ICT use, and ample time to learn and practice using ICT to support active learning (Daniels et al., 2013; Ertmer et al., 2012; Lim et al., 2013; U.S. DOE OET, 2016). Each of these models confirms researchers’ assertions that the site principal is the crucial element in the successful implementation of ICT in the classroom to support active learning (Hadjithoma-Garstka, 2011; Layng & Twyman, 2014; Machado & Chung, 2015; Waxman et al., 2013).

Similar to teachers’ impact on ICT integration, principals’ beliefs and perceptions about ICT are fundamental to how ICT is used in classrooms and throughout schools (R. Brown, 2011; Chang, 2012; Creighton, 2003; Machado & Chung, 2015). Furthermore, it is crucial to have this understanding at the middle school level. It is during this time that students begin to develop skills and understandings that will shape their education (Edwards, 2015). Without a clear understanding of principals’ beliefs and perceptions toward ICT and barriers to active use of technology, change models and technology plans will not be effective (Vanderlinde, van Braak, & Dexter, 2012).

**Purpose Statement**

The purpose of this qualitative phenomenological study was to explore and describe the barriers to the integration of information and communication technology (ICT) to support active learning in the classroom as perceived by middle school site principals.
Research Questions

The central research question was, What are the barriers that middle school principals perceive affect the integration of the active use of technology for student learning? In addition, the following subquestions guided the research:

1. How do middle school site principals reduce or eliminate barriers to effectively integrate the active use of technology in the classroom for student learning?
2. How do middle school site principals determine if the active use of technology is effectively integrated in the classroom to increase student learning?

Significance of the Problem

The approach of just adding technology in the form of hardware and software to the classroom to create active learning environments has not worked (Cuban, 2001; Hannafin, 2008; Sincar, 2013). Research conducted on educational settings with extensive technology equipment has constantly found that the use of technology in the classroom is inconsistent and often limited to passive learning activities instead of highly engaging, active learning activities that support 21st-century learning (Bebell & O’Dwyer, 2010; Tondeur, van Braak, & Valcke, 2007; U.S. DOE OET, 2016). Furthermore, these findings often identify the same first- and second-order barriers as they relate to teachers and students.

The site principal has direct and indirect influence on actions that will reduce barriers to successful ICT integration into the classroom for active learning (Chang, 2012; U.S. DOE OET, 2016; Waxman et al., 2013). Reducing these barriers may prove to be an arduous task considering the limited amount of technology training available in most administration preparation programs and ongoing professional development
opportunities (Hadjithoma-Garstka, 2011; U.S. DOE OET, 2016). Understanding the role of the site principal in technology integration is important in developing a complete understanding of ICT in the classroom (Alghamdi & Prestridge, 2015).

Even after technology has been successfully integrated into the classroom and ICT use is regular and ongoing, how ICT is used remains a question (U.S. DOE OET, 2016). The digital-use divide has been identified as a concern, and researchers have suggested that active learning through active-use technology will reduce this divide (Edwards, 2015; U.S. DOE OET, 2016). Principals can support teachers and students in using ICT for active learning in many ways, but this appears to be inconsistent from school to school (Banoglu, 2011; Machado & Chung, 2015; Waxman et al., 2013).

There have been significantly more studies conducted in the area of barriers to technology integration in the classroom with a focus on students and/or teachers when compared to studies conducted with principals as the focus (Machado & Chung, 2015; Preston, Moffatt, et al., 2015; Preston, Wiebe, et al., 2015). While these studies presented findings and recommendations to reduce these barriers, they often referred to district or school site leadership. Understanding middle school principals’ perceptions of barriers to integration of ICT in the classroom is an important step to reduce first- and second-order barriers and increase student use of ICT for active learning (Machado & Chung, 2015; Waxman et al., 2013).

**Definitions**

**Active learning.** Active learning is a learner-centered approach strongly associated with the constructivist philosophy of education (Wurst, Smarkola, & Gaffney, 2008). Student-centered learning, inquiry-based learning, learning by doing, and
problem-based learning (PBL) and PjBL are all examples of active learning (Schrum & Levin, 2012).

**Active-use technology.** Active-use technology refers to ICT used to support students’ collaboration, creativity, critical thinking, and communication or other activities that support active learning.

**AVID strategies.** Advancement Via Individual Determination (AVID) strategies primarily utilize active learning activities including writing, inquiry, collaboration, and reading to improve student engagement and understanding of the content material.

**Barriers to ICT integration.** Barriers to ICT integration include any factor that may lead to the reduction of ICT used in the classroom for instructional, communication, or administrative tasks carried out by teachers or students.

**Constructivism.** Constructivism is an educational philosophy that is grounded in the belief that learning takes place with hands-on, experimental activities. Examples of constructivist activities include problem solving, student-directed goals, primary source data, and authentic assessments (E. Murphy, 1997).

**Digital-use divide.** According to the U.S. DOE OET (2016),

A digital-use divide separates many students who use technology in ways that transform their learning from those who use the tools to complete the same activities but now with an electronic device (e.g., digital worksheets, online multiple-choice tests). The digital use divide is present in both formal and informal learning settings and across high- and low-poverty schools and communities. (p. 5)
**Education technology.** Education technology includes the hardware, software, and applications used to support learning in the classroom, in lesson preparation, and for assessments.

**Information and communication technology (ICT).** ICT is a general term that refers to all technology that supports the manipulation and communication of information (Cennamo et al., 2014). For the purpose of this study, ICT refers to the electronic devices and infrastructure used by teachers and students to communicate and convey information.

**Middle schools.** Middle schools are designed to be a bridge between elementary and high school. Generally, a middle school includes Grades 6, 7, and 8, and an intermediate school includes seventh and eighth grades. This study looked at seventh- and eighth-grade classes regardless of the school’s overall grade makeup.

**School culture.** According to Peterson and Deal (1998), Culture is the underground stream of norms, values, beliefs, traditions, and rituals that has built up over time as people work together, solve problems, and confront challenges. This set of informal expectations and values shapes how people think, feel, and act in schools. (p. 28)

**Technology leadership.** Technology leadership is the ability of an individual to manage and lead in all areas of technology including organizing, planning, and implementing technology at a school (Chang, 2012; McLeod, Bathon, & Richardson, 2011; Sincar, 2013).

**Traditional teaching beliefs.** Traditional teaching beliefs encompass the pedagogical belief that the teacher is responsible for delivering all information and new
learning through lecture or assigned readings (Alkhawaldeh & Menchaca, 2014; Daniels et al., 2013; Levin & Wadmany, 2005).

**Visionary leadership.** Visionary leadership is leadership that is innovative, inspirational, and based on teamwork that leads an organization toward a future that is definable and based on clear goals (Avolio, 1999; Bass, 1985; Bennis, 1997; Yordsala, Tesaputa, & Sri-Ampai, 2014).

**Delimitations**

1. This study was delimited to principals of intermediate schools and middle schools.

2. This study was delimited to the seventh- and eighth-grade academic classes of English, mathematics, social studies, and science.

3. This study was delimited to 16 principals from four counties in Southern California.

**Organization of the Study**

Chapter II of this study is a review of the literature pertaining to integrating ICT into the classroom for active learning. Chapter III reviews the methodology and procedures deemed to be appropriate for answering the research questions. Chapter IV presents the results of the study and themes discovered from the interviews with the participating principals. Chapter V contains an analysis of the data, answers to the research questions, and recommendations for future studies.
CHAPTER II: REVIEW OF THE LITERATURE

Middle schools are a unique setting for students matriculating through the U.S. education system. These students are in the process of puberty, attending multiple classes for the first time, and starting to explore the world around them (Edwards, 2015; Hansen, 2014). Teachers and administrators in these settings are also faced with challenges including delivering instruction to young adolescents and introducing a multiteacher, multiclass concept to students through a separated multiple-subject-matter approach (Edwards, 2015; Hoy & Sabo, 1997; C. C. Johnson, 2005).

Information and communication technology (ICT) can greatly support the efforts of active learning instruction. Since the introduction of the microcomputers in the late 1970s, teachers and administrators have labored over plans and systems to effectively use ICT to support teachers and students (Hew & Brush, 2007). However, despite the billions of dollars spent on integrating ICT into classrooms to support student learning, educators have encountered several barriers, leading some teachers, administrators, and researchers to question ICT’s effectiveness for student learning (Cuban, 2001).

Fortunately, actions and processes to reduce barriers to ICT integration have been identified. Potential strategies for minimizing barriers include purchasing additional equipment and providing professional development for teachers and administrators (Ertmer, 1999). While these barrier reductions are essential for successful ICT integration, the site principal is the single most influential barrier reducer (Bektas, 2014). The site principal’s ability to set the vision for the school and support ICT for active learning activities will greatly reduce the digital-use divide and ensure that students
develop the necessary 21st-century learning skills to be successful in high school and beyond (Daniels et al., 2013; U.S. DOE OET, 2016).

This study includes a synthesis matrix of pertinent research (see Appendix A), and a review of literature was completed to provide a framework of ICT integration into middle schools to support active learning and close the digital-use divide. First, an overview of middle schools and active learning provides the setting and activities for the study. Next, the history of ICT in schools, barriers associated with ICT integration, and research supporting reductions to these barriers are presented. The last section looks at the role of the site principal and how this position directly affects the successful integration of ICT into the classroom.

**Middle Schools**

The concept of a separate school to address the needs of young adolescents rather than continuing with the kindergarten through Grade 8 model was added to the U.S. education system over 50 years ago (Friend & Degen, 2007; Rockoff & Lockwood, 2010). Middle school-age students undergo several physical and emotional changes with the onset of puberty, and this may be compounded with the stress of outside influences in their community and family as well as transitioning to a new school (Friend & Degen, 2007; Hansen, 2014).

**Evaluating Middle Schools**

Hoy and Sabo (1997) identified successful middle schools as having (a) institutional integrity, (b) collegial leadership, (c) resource support, (d) teacher affiliation, (e) academic emphasis, and (f) principal influence. Additionally, successful middle schools are learning organizations in which members use data to make informed
decisions that best serve their unique student population (Allison & Rehm, 2007; Friend & Degen, 2007). In contrast, less effective middle schools utilize whole-school programs that lack the attention and focus on targeted students and fail to create a learning environment centered on shared leadership and student success (Allison & Rehm, 2007; Hansen, 2014; Hoy & Sabo, 1997).

Schools that are rigid and focused on narrow curriculums may miss making vital connections with adolescent students (Allison & Rehm, 2007; Hansen, 2014; Wu, Hsu, & Hwang, 2008). Building this connection with students and making positive bonds between the school and the students are crucial elements for later success in high school and beyond (Allison & Rehm, 2007; Hansen, 2014). Effectively using technology and providing active learning activities are two interrelated strategies that can improve learning and increase student engagement (Allison & Rehm, 2007; Downes & Bishop, 2012; Hansen, 2014; Hoy & Sabo, 1997; Wu et al., 2008).

**Technology in Middle Schools**

Middle grade students are pulled toward technology both in and out of school (Downes & Bishop, 2012). In a 6-year study of technology use at middle schools in the United States, Downes and Bishop (2012) found that students in technology-rich settings were more connected to school and in the learning process. The researchers attributed this to the fact that middle grade students spend over 230% more time on nonschool computer use than upper elementary grade students and that technology provides students with easier access to information than traditional forms of teaching (Downes & Bishop, 2012).
Teachers in technology-rich middle schools also understand the value of technology-assisted education for increased collaboration, engagement, and improved organization of the learning process (Downes & Bishop, 2012; Hoy & Sabo, 1997). Common traits at schools with advanced ICT use to support active learning include teachers bringing in new ideas for educational technologies, openness to allowing students to explore new technology for academic use, and school site leadership that promotes and supports the use of technology in the classroom (Allison & Rehm, 2007; Downes & Bishop, 2012; Hoy & Sabo, 1997; Wu et al., 2008). Middle schools with regular technology use in the classroom often have strong site-based leadership from the principal who is supportive of technology use and committed to high standards for teachers (Downes & Bishop, 2012; Hoy & Sabo, 1997). Teachers who regularly use ICT for active learning may have developed this approach from their time as students, through the preservice credentialing process, or from the school/district culture (Almekhlafi & Almeqdadi, 2010; Funkhouser & Mouza, 2013; Ottenbreit-Leftwich et al., 2012).

Active Learning

Prince (2004) defined active learning as “any instructional method that engages students in the learning process. In short, active learning requires students to do meaningful learning activities and think about what they are doing” (p. 223). Examples of active learning include collaborative learning, cooperative learning, and problem-based learning (Prince, 2004). In ancient times, lecturing was the primary method for delivering instruction for formal education, and active learning was used for vocational teaching (Corrigan, 2013; Prince, 2004). Even up until recent times, including the present, lecture has still been the primary method for delivering instruction preferred by
some academic teachers (Messier, 2005; Odom & Bell, 2015). However, active learning is not new to formal education and has slowly been developed over the past 500 years (Schrum & Levin, 2012).

**History of Active Learning**

John Locke in the 1600s and later John Stuart Mill began to identify purpose, interest, and activity as requirements for learning (Dewey, 1915). During the early 1800s, Johann Heinrich Pestalozzi and Friedrich Froebel believed that teaching children required real-life activities and utilized hands-on learning (Kelley, 2012). These beliefs led to the modern kindergarten concept and early learning manipulatives for upper grade students to learn mathematical concepts (Kelley, 2012). This concept of constructing learning was later supported by the psychologists Jean Piaget and Lev Vygotsky in that teachers should provide specially designed activities where knowledge is developed through active discovery (Bransford et al., 2000).

John Dewey (1915) based his educational reforms on the concept of active learning. He stated that using teachers or books to cram students with facts is a violation of the students’ intellectual integrity (Dewey, 1915). Dewey argued that explorations and hands-on learning need to be connected to the problem and that learning happens by trying to solve the problem and not completing a list of isolated activities without any connection to the real world. Active learning is the process of observation and activity that may lead to success or failure but will undoubtedly lead toward learning (Dewey, 1915).
Constructivist Philosophy of Education

The work of Piaget, Vygotsky, and Dewey led to the rise of the constructivist philosophy of education and the origin of modern active learning in schools (Kelley, 2012). Constructivism is an approach to learning where students construct their own learning through multiple, open-ended activities (Creighton, 2003; Levin & Wadmany, 2008; Wurst et al., 2008). In the constructivist setting, students are active participants in learning and teachers serve as agents of the curriculum, designing activities that allow students to build their learning (Paris & Combs, 2006).

Early researchers in constructivist education Barrows and Tamblyn (1977) conducted research with medical students using simulations that provided cause-and-effect data after each decision was made. Students could see the effect of their choices and began to internalize the learning as they began to see patterns in their decision making (Barrows & Tamblyn, 1977). This concept of internalizing learning was also supported in research conducted with college students who utilized both lecture and active learning versus students who only participated in lecture-style learning (Biggs, 1978).

In a review of over 6,000 empirical studies on student performance in constructivist classrooms, Schmid et al. (2009) found that students in constructivist classrooms consistently outperformed their traditionally taught peers. The performance gap was even higher for students in classrooms that used clearly defined constructivist activities such as cooperative learning, problem-based learning (PBL), and inquiry-based instruction (Schmid et al., 2009). Powerful learning environments, based on constructivist activities, allow students to take control of their learning and therefore
learn the material at a deeper level (Dochy, Segers, Van Den Bossche, & Struyven, 2005).

**Examples of Active Learning**

An and Reigeluth (2012) described a learner-centered, active learning environment as “focused on developing real-life skills, such as collaboration, higher-order thinking, and problem solving skills, and meets the complex needs of the information age” (p. 54). This learning environment can be created by establishing inquiry-based activities that utilize a student-centered approach where students describe what they learned, how they learned, and why they learned (Cennamo et al., 2014; Juneau, 2013; Tyminski, Haltiwanger, Zambak, Horton, & Hedetniemi, 2013). In addition, middle school students learn significantly more when engaged in active learning activities compared to students in traditional teaching environments (Schmid et al., 2009).

Cooperative learning is an example of an active learning process in which students work together to construct meaningful answers to solve problems with an emphasis on positive social interaction (Azmin, 2016; Bilen & Tavil, 2015; Dean, Hubbell, Pitler, & Stone, 2012). In this setting, teachers design lessons that require positive interdependency, and during the class they teach social skills rather than the content material (Bilen & Tavil, 2015; Bransford et al., 2000; Dean et al., 2012). Furthermore, the conclusions drawn from these activities are authentic and may vary from group to group and class to class (Azmin, 2016; Tyminski et al., 2013).

Another active learning activity is PBL. PBL activities are designed to expose students to a problem and create an environment where students generate a possible solution through exploration and discourse (Distlehorst & Barrows, 1982; Dochy et al.,
2005; Januszewski & Pearson, 1999; C. C. Johnson, 2005). These lessons vary from a short 5-minute activity to a multiweek, research-based PBL (Dochy et al., 2005; Ertmer et al., 2009). In more advanced settings, students may partner with the teacher in identifying the problem they would like to research and attempt to solve (Prensky, 2012).

Inquiry-based instruction allows for students to direct their learning into areas of interest (Tyminski et al., 2013). During inquiry-based instruction, students explore ideas and think critically about the content material before developing their own opinion or understanding of the topic (Keys & Bryan, 2001; Tosa, 2011; Tyminski et al., 2013). The use of inquiry-based instruction allows for collaboration, critical thinking, and creativity as students analyze, synthesize, and evaluate their learning and the content (Dochy et al., 2005; Edwards, 2015; Januszewski & Pearson, 1999).

**Active-Use Technology**

The 21st-century learning skills of collaboration, communication, critical thinking, and creativity combined with ICT are essential to active-use technology (Shapley, Sheehan, Maloney, & Caranikas-Walker, 2010a). In other words, active-use technology is the technology used to support active learning activities (Ge, Yang, Liao, & Wolfe, 2013; Gebra, Saroyan, & Aulls, 2015). In this modern world, active learning activities require that both teachers and students have access to technology and ICT (Becker, 2000; Porath & Jordan, 2004). Becker (2000) found that for active learning, students need access to computers for word-processing activities and regular use of the Internet and other applications to promote inquiry and exploratory educational opportunities. Just using technology in the classroom does not make an active learning environment. Technology- and ICT-engaged teachers use technology to create
opportunities for students to explore real-world problems, provide meaningful instruction, and assist students as they develop inquiry skills to be successful in school and career settings (Becker, 2000; Bransford et al., 2000).

Early use of active learning and technology involved students and teachers working together to learn how to best incorporate technology (Bransford et al., 2000; S. V. Turner & Dipinto, 1992). Constructivist teachers allowed students to explore this new environment of technology and learning while providing assistance to fellow teachers in the process of using ICT (S. V. Turner & Dipinto, 1992). These efforts led to the development of both PBL and project-based learning (PjBL) activities that utilized ICT for research, collaboration, and presentation of critical thinking skills (Aslan & Reigeluth, 2013; Cennamo et al., 2014; Chen & Chou, 2015).

Researchers and practitioners in education agree that PBL and PjBL have more similarities than differences, and no universal definition has been established to distinguish these two teaching styles (Stefanou, Stolk, Prince, Chen, & Lord, 2013). In general, PBL is viewed as a scaffold to PjBL where knowledge is acquired by having students work on authentic, simulated problems both collaboratively and with support from the teacher (Loyens, Magda, & Rikers, 2008; Prince & Fleder, 2006; Stefanou et al., 2013). PjBL then requires students to apply this knowledge to answer an essential question by producing various products leading to a final presentation of product that addresses the essential question (Barron et al., 1998; Blumenfeld et al., 1991; Stefanou et al., 2013).

PBL and PjBL activities allow for real-world applications and use of ICT for students and teachers (Bransford et al., 2000; Chen & Chou, 2015; Collins & Halverson,
With ICT, students are able to quickly research facts and relevant information; communicate with students, teachers, and experts in the field across the world; and creatively solve real-world problems or create projects that demonstrate critical thinking and learning (Chen & Chou, 2015; Cuban, 2001; U.S. DOE OET, 2016). Additionally, PBL activities expose students to more rigorous academic language, allow for more student-led learning, and provide experiences in working on real-world problems (Aslan & Reigeluth, 2013; Lowther, Inan, Strahl, & Ross, 2008; Suhr, Hernandez, Grimes, & Warschauer, 2010; Summak, Samancioğlu, & Bağlibel, 2010). Yet, despite the research supporting PBL activities, they appear to be rarely used even by teachers with constructivist and student-centered approaches (Palak & Walls, 2009; U.S. DOE OET, 2016).

Keeping this open approach to using and exploring technology in the classroom is crucial, especially with the growing rate of educational applications in technology and ICT (Bransford et al., 2000; Dean et al., 2012; Edwards, 2015; S. V. Turner & Dipinto, 1992). Now with new educational technology tools, software and applications combined with Web 2.0 resources provide countless ways this new technology can enter the active learning process as teacher generated, but in many cases it is brought to classrooms by the students (Dean et al., 2012; Kuhn, 2008; Prensky, 2012).

**History of ICT in Education**

Coley et al. (1997) referred to educational technology as the most advanced technologies available for teachers and students. Hew and Brush (2007) further supported this claim by stating, “From the birth of the motion picture in 1922, to the advent of the computer in the mid-1970’s, educators have been intrigued with the
potential of technology to help transform education and improve student learning” (p. 224). Currently, most modern definitions of educational technology almost exclusively refer to digital tools and digital media or use the blanket term ICT (Wegerif, 2015).

Computers, or microcomputers, began to appear in schools beginning with the Apple II in 1977 and IBM PC in 1981 (Cennamo et al., 2014). To support these new machines in the classroom, by 1982 drill-and-practice software was beginning to be developed, and in 1983 computer programming for students was introduced (Cennamo et al., 2014). By 1984 and the arrival of the Macintosh computer, personal computers were emerging as a less expensive and more accessible alternative to larger mainframes for creating learning environments (Kowch, 2013).

Early research into computers in the classroom discovered that students appeared more engaged and enjoyed using computers, even if the computers acted as a delivery system for electronic flashcards (Bransford et al., 2000; Roblyer, 1985). In addition, advocates believed this immediate, individualized instruction and practice would increase learning and motivation (Hannafin & Foshay, 2008). While computer use in the classroom grew in the early 1980s, not all researchers believed in the effectiveness of computers as learning tools. Roblyer (1985) claimed there was substantial evidence to dispel the belief that computer-based instruction is equally effective for all grade levels and subject areas. He further supported this statement in saying, “Computers are comparatively expensive non-traditional medium of instruction and that other non-traditional approaches seem to yield equal or higher effects” (Roblyer, 1985, p. 28).
Early computers also lacked the efficiency of today’s ICT. Early computer-using teachers would need to organize and utilize several floppy disks for one program, would need to maintain back disks for student information, and were provided with limited support from staff and software developers (Becker, 2000). Most educational computer use during this time was focused on word processing, and use in other subjects like math and science was limited (Coley et al., 1997). However, some early researchers acknowledged the potential positive educational impact that personal computers would have and saw that these devices would become much more inexpensive and small enough to fit into students’ pockets (Papert, 1980).

By 1987, multimedia software was introduced into the classroom, and the World Wide Web followed in 1991 (Cennamo et al., 2014). These two innovations, combined with the decreasing cost of computers, led to a dramatic increase in computers being used by teachers and students in the early 1990s (Cennamo et al., 2014; Coley et al., 1997). Early studies conducted by the U.S. Department of Education (U.S. DOE, 1996) indicated that in 1996, while computers were becoming more common in the classroom, only 4% of the nation’s schools had one computer for every five students, and only 9% of the classrooms were connected to the Internet.

During the 1990s and 2000s, the United States and many other countries invested heavily in educational technology at all levels (Halverson & Smith, 2010; Lei, Zhou, & Wang, 2009; O’Dwyer, Russell, & Bebell, 2005; Russell, Bebell, O’Dwyer, & O’Connor, 2003; Rutkowski, Rutkowski, & Sparks, 2011; Watson, 2001). In 2000, 98% of U.S. schools owned computers, 63% of the classrooms were connected to the Internet, and the student-to-computer ratio was 10:1 (Coley et al., 1997; U.S. DOE OET, 2000). With
close to 100% of schools owning computers, other infrastructure concerns needed to be addressed (U.S. DOE OET, 2000). By 2003, less than 5% of schools in the United States were still using dial-up Internet access, and two thirds of schools had wireless connections to the Internet (Russell et al., 2007). This rapid growth in funding and use of ICT in classrooms demonstrated a strong belief by educators and policymakers that having knowledge of ICT is essential to success in the modern world (Levin & Wadmany, 2005; Watson, 2001).

This push for universal access to technology in the classroom led to public research projects centered on computers, ICT, and student learning (Halverson & Smith, 2010; Rutkowski et al., 2011). This increased contact with computers and ICT did not necessarily lead to increased student achievement, so in countries like the United States, technology-based learning plans were developed to address this gap (Alamin, Shaoqing, & Le, 2015; Rutkowski et al., 2011). Early researchers began to identify effective strategies for using ICT in the classroom and indicated that unless teachers received appropriate training, the full potential of the investment in ICT would not be realized (Halverson & Smith, 2010; Russell et al., 2003).

By the mid-2000s, children between the ages of 9 and 17 were using computers more than any other subgroup in America (Russell et al., 2003). To establish policies and practices for using ICT with students, the U.S. National Academy of Engineering (NAE) and the National Research Council (NRC) created a committee to establish a common understanding for technology literacy (Daugherty, Lybrook, Mentzer, & Little-Wiles, 2013). Following the work of the NAE and NRC, the National Council for Accreditation of Teacher Education and the International Society for Technology in Education (ISTE)
added standards and policies for both teachers and students (Palak, Walls, & Wells, 2006).

In 2010, 100% of American schools had one or more computers and Internet connection for instructional purposes, the student-to-computer ratio was at a 3:1 average, and over 50% of schools had laptops or laptop carts available for student use (U.S. DOE OET, 2010). The teachers and students were now able to utilize Web 2.0 technologies including wikis, blogs, and social network sites, which required schools to have adequate technology and teachers skilled in utilizing these resources (Sadaf, Newby, & Ertmer, 2013). Continuing the support from the early 1990s, the U.S. federal government has set a goal for 99% of students to have access to the Internet at a minimum speed of 100 megabits per second and a target of one gigabit of speed by 2018 (U.S. DOE OET, 2016). This goal is being supported by billions of additional dollars through the E-rate program, which will continue through the decade (U.S. DOE OET, 2016).

E-rate is a federal program that subsidizes the rates for telecommunication services for schools and libraries, thus making ICT and the use of the Internet more affordable (Carvin, 2000). Policymakers for the E-rate program have continually made adjustments to remain current with ICT needs, including the addition of wireless connections (Dickard, 2002). ICT progress made in U.S. schools would not have been possible without the financial support of the E-rate program, and this continued support is required to reduce infrastructure barriers to ICT integration (Federal Communications Commission [FCC], 2010; U.S. DOE OET, 2016). In 2014, the E-rate program was modernized to provide billions of additional dollars to support Internet connectivity (U.S. DOE OET, 2016).
Integration

ICT has become a daily part of modern life and is essential for education and most careers (H. Kim, Choi, Han, & So, 2012; Lim et al., 2013; Tondeur et al., 2007). The process of integrating ICT into classrooms is directly affected by several factors including school culture and the leadership at the school and district levels (Machado & Chung, 2015; Rogers, 2003; Tondeur, Kershaw, Vanderlinde, & van Braak, 2013; Yali Zhao & Bryant, 2006). Rogers (2003) identified five characteristics that significantly affect the rate at which an innovation is adopted—(a) relative advantage, (b) compatibility, (c) complexity, (d) trialability, and (e) observability—and stated that individuals in an organization fall into five categories: 2.5% are innovators, 13.5% are early adopters, 34% are in the early majority, 34% make up the later majority, and 16% are laggards. Interestingly, Dwyer, Ringstaff, and Sandholtz (1990) presented that teachers move through the same stages identified by Rogers for each new aspect of technology, implying that all teachers start as laggards and eventually become innovators when integrating new technology. Yong Zhao and Frank (2003) presented the concept that innovations, like adding ICT to the school setting, are similar to an invasive species, and when the conditions are supportive, the innovation will thrive and diffuse throughout the organization.

Developed by Yong Zhao and Cziko (2001), the perceptual control theory perspective states that three conditions are required for teachers to use technology: (a) The teacher must believe that using the technology is more effective than the previous method, (b) the teacher must believe that the new technology will not hinder progress toward other educational goals, and (c) the teacher must believe that he or she possesses
sufficient ability and resources to use the technology. A final concept of successfully integrating technology into schools is a five-phase approach developed by M. Murphy, Redding, and Twyman (2014) that states the technology must improve student learning, the technology must allow for teacher choice in applications, teachers must ensure the technology is implemented with fidelity to its essential elements, the technology must be applicable in multiple classrooms, and there must be a system for monitoring and allowing for changes.

Through these various theories of integrating innovations, researchers have identified components that directly apply to integrating ICT in schools. Successful ICT integration requires a plan that identifies a vision that meets the needs of the organization, clear goals, and how resources will be obtained (Borokhovski et al., 2011; Chapman, 2013; Richardson, Bathon, Flora, & Lewis, 2013). Using a gradual approach that includes pilot testing and allowing enough time for new aspects of ICT to become part of the regular instruction day may help in the integration of ICT (Creighton, 2003; P.-S. Hsu & Sharma, 2006; Wang & Reeves, 2004; Watson, 2005). At the initial phase of integration, teachers and administrators should be required to use ICT in simple ways that do not cause major disturbances to their current practices (Hartsell & Wang, 2013; Yong Zhao & Cziko, 2001).

**ICT Integration and Teachers**

Researchers agree that integrating ICT into the school setting is a complex task that will constantly require teachers to adapt and change their teaching styles (Holden & Rada, 2011; Lim et al., 2013; Somekh, 2008; Yong Zhao & Cziko, 2001). One difficult aspect of analyzing ICT integration and teachers’ use of ICT is determining what ICT is
and how it will be measured (Aziz, 2010; Bebell et al., 2004; Ertmer & Ottenbreit-Leftwich, 2013; O’Dwyer et al., 2005). Generally, ICT use by teachers falls into the four categories of administrative uses, preparing instruction, delivering instruction, or use as a tool for student learning (Inan & Lowther, 2010). Researchers have found that the most frequent use of ICT by teachers is for administrative purposes including e-mail communication with parents, recording and posting grades, and recording attendance (Gray, Thomas, & Lewis, 2010b; Ottenbreit-Leftwich et al., 2012; Palak & Walls, 2009; Shapley et al., 2010a; Yong Zhao & Frank, 2003). The second most common use of ICT by teachers is in lesson development (Bebell et al., 2004; Ottenbreit-Leftwich, Glazewski, Newby, & Ertmer, 2010; Palak et al., 2006; Peeraer & Van Petegem, 2012). This includes using word processors for worksheets and graphic organizers, developing presentations, or preparing various texts for students (Palak & Walls, 2009; Weston & Bain, 2010). The categories of using ICT for the delivery of instruction and as a learning tool are the least common among teachers (Bebell et al., 2004; Gorder, 2008; Gray et al., 2010b; Ottenbreit-Leftwich et al., 2012; Peeraer & Van Petegem, 2012). This is mainly because teachers often teach how they were taught, preservice programs primarily focus on ICT for preparation activities, and the majority of professional development opportunities available to teachers are focused on the development of lessons (Fredriksson, Gajek, & Jedeskog, 2009; Funkhouser & Mouza, 2013; Ottenbreit-Leftwich & Cullen, 2006).

**ICT Integration in the Classroom**

Using ICT to support teachers’ administrative and preparation needs is often viewed as creating minimal disruption to the status quo, while using ICT in the classroom
for delivery of instruction and as a learning tool may cause major disruptions to the current teaching practices (Goodison, 2003; Rutkowski et al., 2011; Vanderlinde, van Braak, & Hermans, 2009). The level of disruption may be related to the teacher’s philosophy of education, with traditional teachers experiencing greater disruptions in integrating ICT than teachers with constructivist views (Belland, 2009; Groff & Mouza, 2008; Lowther, Inan, Ross, & Strahl, 2012). Teachers who view themselves as the providers of knowledge (i.e., traditional teaching beliefs) often find that ICT replaces their importance in the classroom (Groff & Mouza, 2008). In contrast, teachers who view themselves as facilitators (i.e., constructivist approach) welcome ICT to provide support to their lessons (Groff & Mouza, 2008; Lowther et al., 2012). Developing lessons that use digital tools and ICT will provide students with limitless possibilities in the area of research, presentation options, and collaborative activities, thus expanding the understanding of pedagogy for most teachers (Eteokleous, 2008; Hermans et al., 2008; Wegerif, 2015).

This disruption is not limited to the teachers, as many students who have grown up with digital tools lack the understanding of how to effectively use these tools in the classroom (Ertmer & Ottenbreit-Leftwich, 2010). Developing learning systems that utilize students’ knowledge about ICT and constantly use technology in the learning process will greatly improve the learning process for students (Albion, 2001; An & Reigeluth, 2012; Cennamo et al., 2014; Hartsell & Wang, 2013). In addition, 21st-century learning skills are greatly enhanced with the integration of ICT into the classroom (Cennamo et al., 2014; Creighton, 2003). Regardless of the lesson design, having access to ICT that puts learning in the hands of the students requires schools and
districts to develop various infrastructures for providing ICT access (Drayton, Falk, Stroud, Hobbs, & Hammerman, 2010; Halverson & Smith, 2010; L. F. Johnson et al., 2010).

**The Internet.** As society moves away from print to screen, being able to navigate the Internet has become an essential skill (Dean et al., 2012; Kist, 2012). Using the Internet, students are able to access texts, watch video instructions, and practice with skill-development applications to support their learning (Downes & Bishop, 2012; Ertmer, 2005; Ramirez, 2012). Furthermore, students are able to communicate and work collaboratively through social media networks on a global level and within their own classes in closed-loop groups (Cennamo et al., 2014; Downes & Bishop, 2012; Ramirez, 2012). However, just providing access to the Internet will not necessarily ensure that learning is taking place (Banyard, Underwood, & Twiner, 2006). Teachers, administrators, and technology support staff are essential in developing lessons and providing guidance in using the Internet to support student learning (Banyard et al., 2006).

**Laptop computers.** When students have access to Internet-connected laptop computers, they are able to access new information, produce their own products, and actively communicate to support their learning at any time (Aslan & Reigeluth, 2013; Manochehri & Sharif, 2010; Marchionini, 1988; Shapley et al., 2010a). Providing laptop computers to students also allows for a more involved learning experience and helps students from lower socioeconomic backgrounds gain access to information about their interests and career options (Aslan & Reigeluth, 2013; Shapley et al., 2010b). Ensuring students have access to laptop computers, either through a 1:1 program or class sets,
requires school leaders to develop support systems for students, teachers, and parents to maximize learning opportunities (Bebell & O’Dwyer, 2010; Drayton et al., 2010; Shapley et al., 2010b).

Russell, Bebell, and Higgins (2004) conducted a mixed-methods study comparing elementary classrooms with a 1:1 configuration of laptop computers and classrooms using shared laptop computers and found that the classrooms with a 1:1 design had greater student engagement. In addition, students in the 1:1 classrooms displayed greater skills in writing, peer conferencing, presenting, and overall academic improvement (Russell et al., 2004). In contrast, Shapley et al. (2010b), in a study of the Technology Immersion Pilot in Texas schools, a 1:1 program, found limited and inconsistent improvement in student academic success. These inconsistencies were attributed to weak or unprepared teachers and a lack of targeted support and professional development (Shapley et al., 2010a). However, their research did find that the students’ level of use of laptops outside of school for homework and learning activities was a strong indication of student academic success (Shapley et al., 2010b). In another mixed-methods study, Lowther et al. (2012) found mixed results when they analyzed student achievement of the Freedom to Learn program, which provided 20,000 laptops and comprehensive teacher professional development in Michigan schools. Student achievement did not significantly increase, but it should be noted that student achievement at that time was measured on standardized tests not aligned with technology or 21st-century learning skills (Lowther et al., 2012). Nevertheless, the research did reveal that students showed improvements in 21st-century learning skills and that teachers used more student-centered strategies and more active learning lessons (Lowther et al., 2012). The Freedom
to Learn program also provided intensive professional development opportunities for teachers both before and during implementation (Lowther et al., 2012).

Researchers agree that 1:1 laptop computer programs will increase student engagement, develop 21st-century learning skills, and increase opportunities for active learning activities (Aslan & Reigeluth, 2013; Bebell & O’Dwyer, 2010; Drayton et al., 2010; Lee & Tsai, 2010; Lei & Zhao, 2007). However, there are concerns with 1:1 programs reducing face-to-face student collaboration and ineffective teaching strategies within the 1:1 setting (Drayton et al., 2010). These findings support the need for highly targeted professional development in using 1:1 laptop computers in the classroom and designing lessons that are student centered (Drayton et al., 2010; Lowther et al., 2012; Shapley et al., 2010).

**Mobile devices.** Beginning in the mid-2000s, mobile devices began to be part of everyday society (Kukulska-Hulme, 2009). Mobile devices are affordable, accessible, and allow for learning to take place both in and out of the classroom (Kee & Samsudin, 2014). Researchers have found that adolescents have positive attitudes toward using mobile devices for learning (Kee & Samsudin, 2014; Walker, 2013). However, just giving students mobile devices or allowing students to use their own smartphones without learning tasks and goals identified and supported by an instructor does not ensure that learning will take place (Cumaoglu, 2015; Hannafin, 2008; T.-C. Liu, Lin, & Paas, 2013).

Teachers planning to use mobile devices will need to devote time to learn how the devices work, design the learning activities, research appropriate applications and websites, and create the success criteria for students (Imazeki, 2014; M. Liu, Navarrete, & Wivagg, 2014). Additionally, schools providing mobile devices need to develop
systems for maintaining these devices, including maintaining accurate inventories and establishing theft-prevention measures (Imazeki, 2014; Sung, Chang, & Liu, 2016). Schools using a “bring your own device” (BYOD) model will need to establish procedures for ensuring equal access for all students and appropriate uses of the mobile devices (Campbell et al., 2013; Imazeki, 2014; M. Liu et al., 2014). Despite these requirements for ensuring successful learning using mobile devices, research has indicated that mobile devices are effective in supporting active learning (M. Liu et al., 2014; Sung et al., 2016).

Possible reasons for the effectiveness of mobile devices in learning are their ability to support diverse learning styles, the creation of different learning scenarios, and expanding the learning environment outside of the classroom (Imazeki, 2014; Kee & Samsudin, 2014; Sung et al., 2016). Sung et al. (2016), in their meta-analysis of 110 experimental and quasi-experimental journal articles, found that using mobile devices for learning is significantly more effective than traditional methods including desktop and laptop computer learning. Furthermore, mobile devices allow for additional student-to-student and student-to-teacher communication in both synchronous and asynchronous learning (Borokhovski et al., 2011; Imazeki, 2014; Sung et al., 2016).

**Barriers to ICT Integration**

Barriers to the integration of technology into educational settings have been studied for the past several decades. Researchers have concluded that there are multiple barriers that are often interrelated (Cuban, 2001; Cuban & Jandric, 2015; Ertmer, 1999; Ertmer et al., 2012; Parker, Bianchi, & Cheah, 2008; Russell et al., 2003; Tearle, 2003; Watson, 2005). One approach to understanding and ultimately reducing these barriers is
to group the barriers into first-order and second-order barriers (Bai & Ertmer, 2008; Ertmer, 1999; Park & Ertmer, 2008b).

First-order barriers. Ertmer (1999) first expanded the concepts of barriers to successful technology integration in the classroom by identifying first-order barriers as external or institutional barriers. First-order barriers are further broken down into three main categories including time, resources, and facilities (Angrist & Lavy, 2002; Ertmer, 1999; Russell et al., 2003; U.S. Congress OTA, 1995). While these barriers can be interrelated, analyzing each is required to develop strategies to reduce their negative impact (Park & Ertmer, 2008a).

Time is required for any integration to occur (Rogers, 2003). In the 1995 U.S. Congress, Office of Technology Assessment (OTA) report, teachers indicated that a lack of time was the most problematic barrier to increasing technology in the classroom. Teachers must first take time to learn the new technology, explore the websites, understand the applications, and develop lesson plans that allow the technology to support instruction (Angrist & Lavy, 2002; Cuban, 2001; M. Liu et al., 2014). Cuban et al. (2001) interviewed and observed 21 teachers and discovered that the teachers did not have enough time to incorporate computers into their daily teaching. This research identified barriers such as time required to preview websites, time needed to find appropriate multimedia material and scan it into the computer, and time required to teach students to use these new skills, which may take up to a full year of instruction (Angrist & Lavy, 2002; Cuban et al., 2001). The barrier of time still persists in today’s classrooms, as teachers now need to research the use of handheld devices, find and
understand appropriate applications, and develop management strategies for 1:1 environments (M. Liu et al., 2014).

Competition for economic resources occurs in most educational institutions (Angrist & Lavy, 2002; Groff & Mouza, 2008; U.S. Congress OTA, 1995). Successfully integrating ICT into the educational environment requires hardware and software expenses, maintenance, support staff, infrastructure upgrades, and training costs (Angrist & Lavy, 2002; Eteokleous, 2008; Fredriksson et al., 2009; Groff & Mouza, 2008). Since most public schools in the United States do not have limitless budgets, a lack of resources will be a continual first-order barrier for any district, school, and classroom (Groff & Mouza, 2008).

A final category of first-order barriers is the facilities and logistics of a school site (Becker, 2000; Ertmer, 1999; Russell et al., 2004; Tearle, 2004). Early ICT integration models utilized computer labs, media or laptop carts, or a limited number of classroom computers (Becker, 2000; Russell et al., 2004; U.S. Congress OTA, 1995). Even during the early 2000s as the student-to-computer ratio was reduced, the model of isolated areas with technology reduced the effectiveness of ICT integration (Becker, 2000). Russell et al. (2004) conducted a study of fourth- and fifth-grade classes that utilized a 1:1 laptop model and concluded that this is the most effective way to eliminate the barrier of ICT logistical integration. More recent studies have shown that increasing schools’ wireless capacities and allowing more handheld devices reduced some first-order barriers, but logistical barriers to successful ICT integration still remain (Imazeki, 2014; Jones, Chin, & Aiken, 2014; U.S. DOE OET, 2016). In many school settings, the traditional classroom design is not conducive to supporting 1:1 devices or the teacher’s use of ICT.
to promote active learning (Tondeur, De Bruyne, Van Den Driessche, McKenney, & Zandvliet, 2015).

**Second-order barriers.** While first-order barriers are often removed with additional resources, second-order barriers require a more divergent approach (Bai & Ertmer, 2008; Ertmer, 1999; Russell et al., 2007). Ertmer (1999) defined second-order barriers as barriers “that relate to teachers’ beliefs about teacher-student roles as well as their traditional classroom practices including teaching methods, organizational and management styles, and assessment procedures” (p. 52). Second-order barriers may be deeply rooted in the fundamental makeup of a teacher’s beliefs and are more difficult to remove or reduce than first-order barriers (Bai & Ertmer, 2008; C. Kim, Kim, Lee, Spector, & DeMeester, 2013).

**Barriers and teachers.** Researchers have revealed various findings on the causes of barriers, especially second-order barriers, to ICT integration into classrooms (Cuban & Jandric, 2015; Ertmer et al., 2012; Park & Ertmer, 2008a; Russell et al., 2003; Tondeur, Hermans, van Braak, & Valcke, 2008; Yong Zhao & Cziko, 2001; Yong Zhao & Frank, 2003). Early researchers on barriers to ICT integration in the classroom discovered that first-order barriers were the most common concern for teachers (Becker, 1994, 2000; Collins, 1996; Doornekamp & Carleer, 1993; Ertmer, 1999; Ertmer, Addison, Lane, Ross, & Woods, 1999). Doornekamp and Carleer (1993) and Ertmer (1999) found that when teachers encountered many first-order barriers, they began to develop personal, second-order barriers toward ICT integration in the classroom. Even teachers who approached ICT with positive attitudes often became negative toward ICT integration due to the first-order barriers they encountered (Cuban, 2001; Cuban et al., 2001;
Doornekamp & Carleer, 1993; Ertmer et al., 1999). In general, the barriers related to successful ICT integration into the classroom are demographic data, time and experience, skills and confidence, and personal and professional beliefs about education (Cuban et al., 2001; Ertmer et al., 2012; Hew & Brush, 2007; Machado & Chung, 2015; Russell et al., 2007; Tondeur et al., 2015). All barriers, whether first order or second order, are influenced by the overall school culture and may in turn enhance or reduce other barriers to successful ICT integration (Ertmer & Ottenbreit-Leftwich, 2010; C. Kim et al., 2013; Somekh, 2008; Yong Zhao & Cziko, 2001).

**Demographic data.** Researchers have disagreed on the level of impact that age and gender have as barriers to successful ICT integration (Cuban, 2001; Cuban et al., 2001; Hermans et al., 2008; Tondeur, Valcke, & van Braak, 2008). While some research has found that male teachers may use ICT more frequently than female teachers, further research has supported the idea that other factors produce greater barriers to ICT integration (Cuban et al., 2001; Hermans et al., 2008). However, a teacher’s age and years of experience seem to be related to the level of success with ICT integration into the classroom (Groff & Mouza, 2008; Hermans et al., 2008; Russell et al., 2007).

**Time and experience.** The years of teaching experience and time spent using computers appear to have some impact on the level of ICT integration into the classroom. In a 2003 study of Massachusetts teachers, Russell et al. (2003) found that teachers with less than 5 years of experience were more confident in using computers in the classroom than teachers with 6 to 10 years of experience, and teachers with over 15 years of experience were even less confident that those in the 6-to-10-year range. This analysis was later supported in a 2007 quantitative study of 2,864 teachers in the United States,
which stated that teachers with over 15 years of experience reported using computers less frequently for administrative and preparation work than teachers with less than 15 years of teaching experience (Russell et al., 2007).

In contrast, other researchers found that there was no significant correlation between a teacher’s years of experience and the use of computers in the classroom (Cuban et al., 2001; P.-S. Hsu & Sharma, 2008; Mueller et al., 2008). This research supported the concept that the activities during the years of teaching and the experiences during the university-level preservice time have a greater impact on a teacher’s use of ICT in the classroom (Belland, 2009; Funkhouser & Mouza, 2013; Park & Ertmer, 2008b; Russell et al., 2007). Furthermore, teachers who are new to a school may change their use of ICT in the classroom to match the school culture regardless of their previous level of ICT use with students (Russell et al., 2007).

**Skills and confidence.** The level of confidence in using ICT with students and computer skills a teacher possesses appear to have a greater influence on the level of ICT use than the amount of time spent teaching (Alkhawaldeh & Menchaca, 2014; Ball & Levy, 2008; Cui & Vowell, 2013; Ertmer et al., 2007; Eteokleous, 2008; Groff & Mouza, 2008). Teachers with less confidence in using ICT and those concerned about appearing incompetent in front of their students use computers less than teachers with confidence in using computers (Cui & Vowell, 2013; O’Dwyer et al., 2005). Researchers have agreed that as technology changes, teachers may regularly find themselves as continuous beginners, which is a significant barrier to successful ICT integration into the classroom (Ertmer et al., 2007; Eteokleous, 2008; Inan & Lowther, 2010; Mueller et al., 2008; Watson, 2005).
Additionally, adding ICT to the classroom environment will create disruptions that teachers are not prepared to address (Yong Zhao & Cziko, 2001). Teachers without ICT skills struggle to successfully address these disruptions and are less likely to use ICT in the classroom (Groff & Mouza, 2008; Yong Zhao & Cziko, 2001). While the barrier of skills and confidence often correlates with the age of the teacher, there is a much stronger association with a teacher’s beliefs and philosophy toward education (Alkhawaldeh & Menchaca, 2014).

**Lack of professional development.** An interrelated barrier to time, experience, and skills is professional development for teachers and staff on effective uses of ICT in the classroom (Hutchison & Reinking, 2011). Researchers have concluded that the lack of professional development for classroom ICT use is related to the lack of time available to teachers and/or lack of funding allocated for training (An & Reigeluth, 2012; Brown-Joseph, 2010; Fredriksson et al., 2009; Lu & Overbaugh, 2009; Shapley et al., 2010a). Causing the lack of professional development is inadequate funding allocation and limited time; in turn, a lack of professional development also causes or enhances the barrier of teachers’ skills and professional beliefs related to ICT integration into the classroom (An & Reigeluth, 2012; Brown-Joseph, 2010; Hutchison & Reinking, 2011). A lack of professional development appears to be a significant barrier as it relates to other barriers, and professional development will always be required as new educational technology is developed (Fredriksson et al., 2009; Hutchison & Reinking, 2011; Rutkowski et al., 2011; U.S. DOE OET, 2016).

**Personal and professional beliefs.** Most researchers agree that teachers’ personal and professional beliefs about ICT being used in the classroom can be a major barrier to
successful ICT integration (Cuban & Jandric, 2015; Ertmer, 2005; Hutchison & Reinking, 2011; Watson, 2001). Beliefs and teaching traits that have a strong correlation with increasing ICT integration in the classroom include a constructivist teaching belief, innovativeness, and student-centered approaches (Daniels et al., 2013; Tondeur, Hermans, et al., 2008; Wu et al., 2008). In contrast, teachers with traditional teaching beliefs and skepticism toward ICT resist and limit the use of ICT in the classroom (Almekhlafi & Almeqdadi, 2010; Daniels et al., 2013; Y.-S. Hsu, Wu, & Hwang, 2007; Levin & Wadmany, 2008; Tondeur, Hermans, et al., 2008).

Y.-S. Hsu et al. (2007) conducted a 5-year case study at the university level and discovered that teachers’ beliefs and school resources were the factors that most affected the use of computers in the classroom. Tondeur, Valcke, and van Braak (2008) further supported this claim in their quantitative study of over 500 elementary teachers. They concluded that teachers with strong constructivist teaching beliefs also had increased amounts of ICT integrated into the classroom (Tondeur, Valcke, & van Braak, 2008). Furthermore, C. Kim et al. (2013), during a 4-year study of 22 teachers who participated in extensive professional development related to ICT, found that the teachers’ beliefs about knowledge, learning, and teaching were directly related to their ICT use in the classroom.

The barrier of teachers’ beliefs about education and the use of technology may also influence other stakeholders in the school or the school district (Ertmer & Ottenbreit-Leftwich, 2010). While teachers develop their beliefs about education and the integration of ICT over many years, the collective school culture may also play a role in the development of these beliefs (Collins & Halverson, 2009; Cuban & Jandric, 2015; Ertmer
& Ottenbreit-Leftwich, 2010; Fredriksson et al., 2009). It is in these divergent environments where the combination of first- and second-order barriers will alter the effect on the integration of ICT in the classroom (Ertmer & Ottenbreit-Leftwich, 2010; C. Kim et al., 2013; Rogers, 2003; Yong Zhao & Cziko, 2001).

**School culture and barriers.** While each identified barrier can be analyzed as a standalone barrier, often these barriers are interrelated and directly or indirectly affect each other and the integration of ICT into the classroom (Alkhawaldeh & Menchaca, 2014; Ertmer, 2005; Groff & Mouza, 2008; Tondeur, Valcke, & van Braak, 2008; Yong Zhao & Cziko, 2001). This interrelatedness of barriers can be found when researchers identify several barriers to successful ICT integration at the same school site (An & Reigeluth, 2012; Groff & Mouza, 2008; Hew & Brush, 2007; Yali Zhao & Bryant, 2006). It is this identification of multiple barriers at each school that links the overall success of ICT integration to school culture (Groff & Mouza, 2008).

Somekh (2008) found that most schools do not have a culture that is conducive to ICT integration. She went on to state,

> In general, schools that successfully implement school-wide pedagogical changes aimed toward technology integration report: 1) having ample technology resources, 2) focusing on changing pedagogy with technology, 3) developing teachers’ skills within authentic contexts, 4) providing support, and 5) providing opportunities for teachers to discuss problems with peers and facilitators and explore solutions over time. (Somekh, 2008, p. 450)

For example, Belk (2013) found that a district initiative led to the purchase of interactive whiteboards for each classroom in the district’s schools but did not consider the required
infrastructure improvements or the school culture, and many interactive whiteboards were still in their boxes 3 years later. In addition to the lack of professional development, the group responsible for the implementation of the project did not consider the school culture during the integration of this ICT project (Belk, 2013; Straub, 2009).

School culture appears to be the most common and consistent barrier to successful ICT integration (Alkhawaldeh & Menchaca, 2014; Cuban et al., 2001; Cui & Vowell, 2013; Preston, Moffatt, et al., 2015; Tondeur, Valcke, & van Braak, 2008). Each teacher’s decision to use or not use technology in the classroom is part of the larger ICT integration of a school (Ertmer & Ottenbreit-Leftwich, 2013). Often, teachers will identify first- and second-order barriers that may not be present but are part of the perceived school culture (Ertmer & Ottenbreit-Leftwich, 2013; Eteokleous, 2008; Peeraer & Van Petegem, 2012; Preston, Moffatt, et al., 2015). In a qualitative study of 12 teachers who all had demonstrated award-winning technology practices, Ertmer et al. (2012) found that even when one teacher had strong positive beliefs about ICT in the classroom, the school culture, rooted in traditional teaching strategies, created a barrier threshold that she was unable to overcome.

While school culture plays a significant part in the successful integration of ICT in the classroom, at the secondary level this may further be broken down into subject-specific departments (Daniels et al., 2013; Ertmer & Ottenbreit-Leftwich, 2010). These “microcultures” may work more independently and not follow the general school culture when it comes to ICT integration (Daniels et al., 2013; Ertmer & Ottenbreit-Leftwich, 2013; Tondeur et al., 2013). This cohesiveness appears to be connected with the subject
area focus and the similar applications of ICT to achieve a common goal or vision (Ertmer et al., 2012).

**Reducing Barriers to ICT Integration**

Approaches to reducing barriers to ICT integration in the classroom are as varied as the barriers themselves (Ertmer & Ottenbreit-Leftwich, 2013; Keengwe et al., 2008; Tearle, 2003). Since first- and second-order barriers are often interrelated, approaches that address both appear to be more effective than approaches that only focus on a single barrier (Ertmer et al., 1999). Researchers tend to agree that the argument is not whether equipment, support, or training is more important, but rather barrier-reducing strategies that address all areas with a focus on teachers’ philosophies and mindsets are required to effectively integrate ICT into classrooms (Ertmer & Ottenbreit-Leftwich, 2010; Lim et al., 2013; Tearle, 2003). However, large-scale changes to promote ICT integration into the classroom also require specific areas of need to be addressed (Cuban, 2001; Ertmer & Ottenbreit-Leftwich, 2013; Inan & Lowther, 2010; Watson, 2005).

**Technology tools.** Ensuring a school has an adequate level of technology in its classrooms is essential for successful ICT integration (Cuban, 2001; Shapley et al., 2010b; Tondeur, Valcke, & van Braak, 2008). In 1995, the U.S. Congress OTA recommended that each teacher should have access to a computer. Subsequent reports from the U.S. Department of Education raised this adequate level of technology to include student access to computers in 2000, a goal of 1:1 student-to-computer ratio in 2010, and high-speed Internet with access to openly licensed educational resources (U.S. Congress OTA, 1995; U.S. DOE OET, 2010; U.S. DOE OET, 2016).
For schools to reach these recommended levels of technology, funding needs to be provided annually and specifically allocated for improving the schools’ access to technology (Hannafin, 2008; Lim et al., 2013; O’Dwyer et al., 2005). Removing the barrier of access to computers can positively alter the perceptions of teachers about ICT in the classroom (Russell et al., 2003). In addition, providing the appropriate technology tools enables teachers to focus on delivery of instruction and curriculum designed around robust ICT classrooms (Lim et al., 2013; Mueller et al., 2008; Prestridge, 2012). Teachers also need access to easy-to-use software that supports 21st-century learning (Cennamo et al., 2014; Tondeur, Valcke, & van Braak, 2008).

An effective strategy for increasing ICT in the classroom through the reduction of this first-order barrier is to implement a 1:1 laptop program (Cennamo et al., 2014; Collins & Halverson, 2009; Schoepp, 2004; Tondeur, Valcke, & van Braak, 2008). The concept of a 1:1 laptop program allows students to explore and develop technology skills that will support their learning (Hannafin, 2008). Weston and Bain (2010) argued that 1:1 laptop programs have pushed the integration of ICT in the classroom further than any other initiative. With the costs for laptops continuing to drop and even lower cost options, such as netbooks, available, 1:1 laptop programs are powerful first-order-barrier-reducing strategies that may also address crucial second-order barriers related to teachers’ perceptions about ICT use (Ertmer et al., 2012; Halverson & Smith, 2010; Weston & Bain, 2010).

The essential component to reducing the barrier of access to technology is funding (Lim et al., 2013). Successful ICT integration requires the initial funding and a multiyear plan to support the computers, infrastructure, and software upgrades (Cuban, 2001; Lim
et al., 2013; Shapley et al., 2010b; Tondeur et al., 2007; U.S. DOE OET, 2016). Funding sources may include federal, state, and local agencies; business partnerships; passing bonds; grants; and fundraisers (Chapman, 2013). Understanding that removing the first-order barrier of technology tools is an ongoing process that requires visionary planning and appropriate funding is essential to successful ICT integration into the classroom (Tearle, 2003; Vermillion, Young, & Hannafin, 2007; Yong Zhao & Cziko, 2001).

**Technology support.** Another strategy that can reduce first-order barriers is to provide teachers and students with direct and real-time technology support (Bynog, 2013; Hannafin, 2008; Machado & Chung, 2015). This support can come from teachers on-site or in iterant positions, technology coordinators or specialists, and staff in classified positions designed to provide technology support for teachers and the school (Banoglu, 2011; Hannafin, 2008; Vanderlinde & van Braak, 2011). Having individuals assigned to support the integration of technology has proven to increase the level of successful integration, but the variations in how these individuals are used makes assessing the level of their support difficult to measure (P.-S. Hsu & Sharma, 2008; Machado & Chung, 2015). While most researchers agree that providing any technology support is essential to successful ICT integration, the position of an on-site technology coordinator may be the most effective (Banoglu, 2011; R. Brown, 2011; Hannafin, 2008; Machado & Chung, 2015; Tearle, 2003; Vanderlinde & van Braak, 2011; Yali Zhao & Bryant, 2006).

An on-site technology coordinator can be a teacher, a pseudo-administrator, or an administrator, and utilizing this position is an effective approach to reducing barriers to technology integration (Banoglu, 2011; Hannafin, 2008; Machado & Chung, 2015; Vanderlinde & van Braak, 2011). A site technology coordinator is able to provide
coordinated technology support, conduct professional development, and organize technology resources to support student learning (R. Brown, 2011; Vanderlinde & van Braak, 2011). In a study of 134 high school principals in Turkey, Banoglu (2011) found that technology coordinators led to pioneering schools into ICT integration and helped increase principals’ capacity in technology leadership and teaching skills. However, an international study of 21 countries conducted by Rutkowski et al. (2011) found that technical support was not associated with successful ICT integration for active learning activities. This suggests that while technology support and technology coordinators may be effective for ICT integration, they may not be crucial for ICT integration to support active learning or close the digital-use divide (Rutkowski et al., 2011).

**Time and professional development.** While technology tools and support are generally designed to reduce first-order barriers, providing time to use technology and professional development to learn effective strategies for ICT use may reduce both first- and second-order barriers (Cuban, 2001; Ertmer, 1999; Funkhouser & Mouza, 2013; U.S. DOE OET, 2016; Yali Zhao & Bryant, 2006). Time can be allocated for three strategies: (a) specific professional development trainings, (b) teachers to practice using technology, and (c) teachers to work collaboratively on the use of ICT in the classroom (Ertmer, 1999; Gorder, 2008; Hannafin, 2008; Machado & Chung, 2015; Tondeur et al., 2013). While researchers have disagreed as to which use-of-time strategy is the most effective in supporting ICT integration, there is agreement that without established time for teachers to learn how to use ICT in the classroom, the integration of ICT for student learning will be diminished (Machado & Chung, 2015; Tondeur et al., 2013; U.S. DOE OET, 2016).
**Professional development.** Whether in preservice teacher credential programs, new teacher induction programs, or programs designed for veteran teachers, professional development is crucial for successful ICT integration (Bai & Ertmer, 2008; R. Brown, 2011; Coley et al., 1997; Ertmer & Ottenbreit-Leftwich, 2010; Gorder, 2008; Yong Zhao & Cziko, 2001). However, schools and districts often tend to favor spending on purchasing equipment to reduce the first-order barrier of access instead of spending on professional development, which can address both first- and second-order barriers such as the teachers’ skills and motivation to use ICT (Staples, Pugach, & Himes, 2011). It is this disproportionate spending practice that leads to new technology purchases being misused or underutilized and, in some settings, never leaving their original packaging (Gorder, 2008; Preston, Moffatt, et al., 2015). Celik and Yesilyurt (2013) surveyed 471 preservice teachers to find that professional development designed to teach how to use ICT in the classroom was crucial for teachers to develop a positive attitude toward ICT. This finding was supported by a more in-depth qualitative study conducted by Wright and Wilson (2011), in which 10 teachers were interviewed 5 years into the profession. They found that the four teachers who were highly successful in integrating ICT for student learning had participated in extensive professional development (Wright & Wilson, 2011).

Researchers have also identified several factors that make professional activities more effective (R. Brown, 2011; Ertmer & Ottenbreit-Leftwich, 2013; U.S. DOE OET, 2016). One factor is to ensure the professional development is relevant to the interests of the teachers (R. Brown, 2011). This concept includes alignment of training to the desired outcomes and ensuring the training is perceived as useful by the participants (R. Brown,
In addition to matching teachers’ needs, effective professional development needs to occur on a regular basis and in an organized format (R. Brown, 2011; Russell et al., 2003). Professional development should use real-world examples and provide opportunities for teachers to practice using the technology (Mueller et al., 2008; Wu et al., 2008). This type of professional development may include modeling the desired applications, hands-on practicing, and collaborative discussions about teachers’ classroom designs (Belland, 2009; Mueller et al., 2008; Russell et al., 2003; Vermillion et al., 2007). More recently, researchers have identified that professional development conducted virtually across districts, states, and even countries can be highly effective (Ertmer & Ottenbreit-Leftwich, 2013; U.S. DOE OET, 2016). This model allows for increased teacher choice in the types of professional development, greater access to recent research, and the ability to collaborate with professional educators who share similar beliefs about pedagogy in the same area or across the world (Ertmer & Ottenbreit-Leftwich, 2013; U.S. DOE OET, 2016).

**Providing time.** In addition to planned and formalized professional development, allowing teachers time to experiment and collaborate is also effective in supporting ICT integration (Ertmer & Ottenbreit-Leftwich, 2010; C. Kim et al., 2013; Preston, Moffatt, et al., 2015; Yong Zhao & Frank, 2003). Simply funding the necessary technology tools and professional development for ICT, without providing time to practice the use of ICT in the classroom, reduces the effectiveness of ICT integration (Gorder, 2008; Yong Zhao & Frank, 2003). Establishing time for teachers to practice using ICT in the classroom or to develop lessons that utilize technology for active learning will help shape future professional development needs (Preston, Moffatt, et al., 2015).
Researchers agree that established collaboration time and time dedicated to practice using technology are needed for successful ICT integration (Ertmer & Ottenbreit-Leftwich, 2010; Gorder, 2008; C. Kim et al., 2013). Establishing learning communities and time for collaboration is one approach that allows teachers time to discuss and support each other in the integration of ICT into the classroom (P.-S. Hsu & Sharma, 2008; Ottenbreit-Leftwich & Cullen, 2006; Park & Ertmer, 2008a). In addition, creating virtual learning communities allows teachers to focus on a specific topic in technology, teaching, or other relevant areas with teachers across the world (Gorder, 2008; C. Kim et al., 2013). Schools that establish a formalized lesson study program provide an opportunity for teachers to collaborate, practice and observe the lessons, and then make corrections to enhance learning (Ertmer & Ottenbreit-Leftwich, 2010). Furthermore, lesson study allows for teachers, administrators, and technology coordinators to work together to design technology-rich lessons that promote active learning (Ertmer & Ottenbreit-Leftwich, 2010).

Providing time for teachers to collaborate appears to be one of the most effective techniques for reducing barriers to integrating ICT for active learning in the classroom (Ertmer et al., 2007; C. Kim et al., 2013; Ottenbreit-Leftwich & Cullen, 2006; Rutkowski et al., 2011; Yong Zhao & Frank, 2003). This strategy benefits both novice and veteran teachers, allows for administrators to observe and identify areas of strength and concerns, and can identify areas of professional development needs (C. Kim et al., 2013; U.S. DOE OET, 2016). The concept of collaboration and time also promotes the teachers themselves as a way to reduce barriers to ICT integration.
Teachers as barrier reducers. Since teachers’ personal and professional beliefs about technology in the classroom and their philosophy of education both significantly impact the level at which ICT is integrated into the classroom, supporting these beliefs or trying to change them is a crucial aspect of reducing barriers to ICT integration (An & Reigeluth, 2012; Aslan & Reigeluth, 2013; Cuban & Jandric, 2015; Ertmer et al., 2012; Preston, Moffatt, et al., 2015; Prestridge, 2012). Changing these beliefs has proven to be a difficult task; however, researchers have identified that teachers working in collaboration may assist in changing beliefs toward ICT in the classroom (Aslan & Reigeluth, 2013; Prestridge, 2012). When teachers with positive attitudes toward ICT in the classroom and teachers with constructivist pedagogical beliefs work with other teachers, there is an increase in ICT integration and a focus on ICT to support active learning (Alghamdi & Prestridge, 2015; Sincar, 2013). Therefore, it is essential that site principals are able to ensure that teachers with constructivist approaches to education and those who possess positive beliefs about ICT in the classroom are on their campuses or at least that teachers are regularly provided with access to these individuals in professional development settings or in virtual collaborative groups (Alghamdi & Prestridge, 2015; Ertmer & Ottenbreit-Leftwich, 2013; Preston, Moffatt, et al., 2015; Sincar, 2013).

Systemic changes to barrier reduction. Each of the specific approaches toward reducing barriers to ICT integration can be interrelated into a systemic change process (Frank et al., 2004; Rogers, 2003; Tearle, 2003; Yong Zhao & Cziko, 2001; Yong Zhao & Frank, 2003). These systemic change processes should address the various components of ICT integration, including infrastructure and hardware, curriculum and pedagogy, students’ needs, and school culture (Cuban, 2001; Somekh, 2008; U.S.
Many of the requirements for more successful ICT integration can be addressed in a school or district technology plan (Hew & Brush, 2007; Lim et al., 2013).

**Technology plan.** A technology plan is a comprehensive document that allows all stakeholders to understand the multiyear directions the school or district has planned for using technology (Chapman, 2013). These plans can range from an outline of the recommended infrastructure upgrades to a robust delivery of the technology vision that incorporates all aspects of ICT in the school (Fishman & Zhang, 2003; Schoepp, 2004). Highly effective technology plans will address technology tools, technology support, administrative support, and professional development or release time for teachers (Chapman, 2013; Lim et al., 2013).

The initial designing of a technology plan requires a committee approach that includes teachers, administrators, and technology experts (Chapman, 2013). As the plan evolves, parents, students, and other community members should be included to ensure the plan meets the needs of the school (Chapman, 2013). More effective technology plans are constantly revisited to ensure the technology tools, the curriculum, and the social context remain in alignment with the school vision (Halverson & Smith, 2010). Failure to design an evolving technology plan may result in highly restrictive barriers that remain in place and prevent successful ICT integration (Chapman, 2013; Hew & Brush, 2007; P.-S. Hsu & Sharma, 2006; Lim et al., 2013).

**Frameworks and models.** Designing and evaluating ICT integration into the classroom can be completed through the use of the technological pedagogical content knowledge (TPACK) model or the substitution, augmentation, modification, redefinition
(SAMR) model (Abbitt, 2011; Chai, Koh, & Tsai, 2011; Kihoza, Zlontnikova, Bada, & Kalegele, 2016; Koehler, Mishra, & Cain, 2013; Puentedura, 2013). Mishra and Koehler (2006) introduced the TPACK model as a template for teachers or school leadership to design and evaluate instruction by analyzing the relationship and overlap of teachers’ technical, pedagogical, and content knowledge (Abbitt, 2011; Kihoza et al., 2016; Koehler et al., 2013). This approach allows teachers, school site administrators, and district administrators to develop targeted professional development opportunities that address any area of weakness (Abbitt, 2011; Chai et al., 2011; Koehler et al., 2013). Similarly, Puentedura (2013) developed the SAMR model to evaluate how ICT is integrated into the classroom (Kihoza et al., 2016). However, the SAMR model is designed to support individual teachers’ integration of ICT to support active learning (Kihoza et al., 2016; Puentedura, 2013). Together, the TPACK and SAMR models can greatly increase the level of ICT integration for active learning both in the classroom and at the school site (Chai et al., 2011; Kihoza et al., 2016).

**School design and culture.** The U.S. Congress OTA (1995) recommended that technology innovations should be built into the school design and school culture to improve student learning. This concept was further supported by Cuban (2001), who stated, “School structures and historical legacies carry so much weight that, unless changed, they will retard widespread use of technology and hinder substantial changes in classroom practices” (p. 180). Successful and lasting ICT integration requires changes to existing school cultures and structures (Lowther et al., 2008; Somekh, 2008).

In a quantitative study, O’Dwyer et al. (2005) surveyed over 1,400 middle school teachers and found that when a school has a culture that allows for changing factors
related to instruction, the integration of ICT is quicker and more effective. These factors of school culture include having a shared vision, allowing teachers flexibility with curriculum, and facilitating collaborative practices. Additionally, schools that involve the local community and develop strong parent support also increase the success of ICT integration (Anthony & Patravanich, 2014; Hannafin, 2008; P.-S. Hsu & Sharma, 2008; O’Dwyer et al., 2005; Watson, 2005). Researchers agree that ICT integration processes that address the entire school and simultaneously address first- and second-order barriers are more successful than approaches that focus solely on one or two major barriers (Ertmer, 1999; Hermans et al., 2008; P.-S. Hsu & Sharma, 2008; C. Kim et al., 2013).

Schools that are designed to provide adequate access to technology have more successful computer-using teachers (Becker, 1994). Adequate access to technology goes beyond providing a computer to each teacher and includes time to collaborate with other computer-using educators and professional development designed around pedagogical changes (Somekh, 2008; Tearle, 2004). Schools can also develop easy access points to learning resources related to ICT that further support ICT integration, which include 1:1 laptop environments and handheld devices (U.S. DOE OET, 2016).

**The principal’s role in reducing barriers.** Each concept or activity identified as a barrier or a reduction to a barrier toward the integration of ICT to increase active learning is directly or indirectly influenced by the principal (Alghamdi & Prestridge, 2015; Daniels et al., 2013; Ertmer & Ottenbreit-Leftwich, 2013; Tondeur et al., 2007; U.S. Congress OTA, 1995; U.S. DOE OET, 2016). Principals are able to establish the practices and supports that have a strong influence on the culture of the school (Daniels et al., 2013). The pedagogical beliefs of principals will influence the teachers who are
hired, professional development opportunities for teachers, levels of technology support, and the amount of collaboration time that is provided to teachers (Alghamdi & Prestridge, 2015; Anthony & Patravanich, 2014). In their case study, Anthony and Patravanich (2014) found, “The principal is uniquely positioned to encourage the initiative to support building and district goals, reward outstanding applications or technology, and effectively communicate details about the initiative with staff, central office administrators, students, and others” (p. 15).

Early research in this area identified the principal’s level of comfort with technology as a strong indicator of the school’s level of technology use (U.S. Congress OTA, 1995). In addition, the integration of innovative approaches toward teaching, including ICT, is consistently linked to the principal (Coley et al., 1997). Principals who embrace and promote their role as change agents are more successful at establishing practices and policies that support ICT integration (Frank et al., 2004; Muir-Herzig, 2004; O’Dwyer et al., 2005). To help ensure effective ICT integration into the classroom, principals need to establish practices at their sites that reduce first- and second-order barriers in a systematic way (Alghamdi & Prestridge, 2015; Ertmer & Ottenbreit-Leftwich, 2013).

Building a culture of collaboration and providing the necessary technical support are two crucial aspects of successful ICT integration (Daniels et al., 2013; H. Kim et al., 2012; Tondeur et al., 2007). Researchers have found that when teachers are involved in the design and implementation of ICT integration, the process and classroom applications are more effective (Anthony & Patravanich, 2014; Preston, Moffatt, et al., 2015; Tondeur et al., 2007). It is through this collaborative approach that teachers begin to understand
their new roles in ICT-rich classrooms and the support they need to provide for each other and their students (H. Kim et al., 2012).

Principals are in the position to establish teams of teachers to help design their technology plans, identify technology coordinators or technology support, and create the vision for their schools’ ICT integration (Anthony & Patravanich, 2014; Preston, Moffatt, et al., 2015). Furthermore, principals can reduce barriers to ICT integration by hiring teachers who have constructivist approaches toward teaching and have developed skills in the use of technology for active learning (Alghamdi & Prestridge, 2015; Anthony & Patravanich, 2014). Developing a culture of innovation and support that helps define new roles for teachers while providing both professional development and time to practice is essential to promote confidence and creativity with technology (Anthony & Patravanich, 2014; Preston, Moffatt, et al., 2015).

**Leadership**

**The Principal**

Just as the educational settings have changed, so has the role of the principal. During the 1980s and 1990s, the more conservative government changed the concept of schools to one of accountability based on a corporate model with the principal as the top-down manager (McEwen, Carlisle, Knipe, Neil, & McClure, 2002). As the workload and responsibilities increased, the model of a solitary leader gave way to a more collaborative leadership approach (Lashway, 2002; Marsh, 1997; McEwen et al., 2002). This concept of vertical leadership allowed for teachers to participate in more leadership roles, thus allowing the work to be more equally distributed, especially in the area of student outcomes (Marsh, 1997; McEwen et al., 2002). Vertical, or shared, leadership also
allows for district administration, principals, and teachers to collaboratively establish learning goals and objectives for student achievement and outcomes (Hoy & Sabo, 1997).

Today, successful principals are visionary leaders, are instructional leaders, and still maintain the duties of a manager (Fink & Resnick, 2001; McEwen et al., 2002; Sahin, 2013). These duties include teacher coaching and mentoring, managing resources, and involving all stakeholders in understanding and supporting the shared vision (Alghamdi & Prestridge, 2015; Beytekin, 2014; Sahin, 2013). Being able to manage these tasks may prove to be too difficult for some principals. Sahin (2013) found in semistructured interviews with principals that only half of the 37 principals interviewed did more than the routine required school maintenance.

Principals, just as with teachers, require targeted professional development to become effective instructional leaders (U.S. DOE OET, 2016). Beytekin (2014) studied the leadership in 150 Turkish high schools for 21st-century leadership skills and found that principals who displayed excellence in professional practices did the following:

(a) Allocate time, resources, and access to ensure ongoing professional growth in technology fluency and integration. (b) Facilitate and participate in communities that stimulate, nurture and support administrators, faculty, and staff in the study and use of technology. (c) Promote and model effective communication and collaboration among stakeholders using digital age tools. (d) Stay abreast of educational research and emerging trends regarding effective use of technology and encourage evaluation of new technologies for their potential to improve student learning. (p. 444)
These concepts are in alignment with the findings of other researchers who identified effective principals in the area of student achievement in 21st-century learning skills (Alghamdi & Prestridge, 2015; Sahin, 2013; Schrum & Levin, 2012; Seong & Ho, 2012).

The principal and technology. To successfully integrate ICT into the classroom, it is essential for a school to have a principal who understands technology and how to address the multiple barriers to ICT integration (Bektas, 2014; P.-S. Hsu & Sharma, 2008; Richardson et al., 2013). The level of technology in a school is greatly affected by the quality of the principal (Bektas, 2014; Sincar, 2013). Chang (2012) and Waxman et al. (2013) found that most principals understand the importance and benefits of a technology-rich learning environment. However, this is an area of emerging research, and there is limited research on effective school technology and what specific trainings principals need to become successful technological leaders (McLeod et al., 2011). To assist in organizing the direction of school-based ICT for administrators, the ISTE (2009) developed five standards for administrators in the domains of visionary leadership, digital-age learning culture, excellence in professional practice, systemic improvement, and digital citizenship.

Digital citizenship, as related to reducing barriers to ICT integration, requires principals to ensure equitable access to digital tools (ISTE, 2009). Furthermore, principals are expected to model appropriate social interactions related to technology through collaborative tools (Beytekin, 2014; ISTE, 2009). With the increase in handheld devices and social media platforms used in education, this standard is an emerging area of research (Beytekin, 2014; Campbell et al., 2013; Cottone, 2013; Garwood, 2013; Ramirez, 2012).
Systemic improvement is essential for the successful integration of ICT into classrooms and a necessary skill for principals to reduce barriers to ICT integration (Beytekin, 2014; Creighton, 2003; Groff & Mouza, 2008; ISTE, 2009; Richardson et al., 2013). Researchers agree that this is a difficult standard for principals to address due to the limited resources, continual changing of technology, and lack of adequate research on the short- and long-term effects of ICT in the classroom (Bebell, O’Dwyer, Russell, & Hoffmann, 2010; Machado & Chung, 2015; Sincar, 2013). Principals who are successful in integrating ICT ensure systemic improvement through the development of a multiyear technology plan that addresses equipment, technology support, and professional development (Chapman, 2013; Lim et al., 2013; Sincar, 2013). Understanding the connection between equipment, technology support, and professional development will help principals reduce many first- and second-order barriers (Machado & Chung, 2015; U.S. DOE OET, 2016).

Making schoolwide technology changes and improvement requires a focus on communication, monitoring, and evaluation (Schlechty, 2001). This process is difficult due to the limited amount of research available to guide district-level leaders in making informed policy and budget decisions to support the principal’s ability to implement successful change practices (Bebell et al., 2010; Sincar, 2013). Creating more decentralized environments that allow principals more autonomy in addressing technology equipment, technology support, and professional development may greatly reduce the barriers to systemic technology improvement (Machado & Chung, 2015; Richardson et al., 2013; Vanderlinde et al., 2009).
Excellence in professional practice is a standard that reduces the first- and second-order barriers related to teachers’ beliefs and practices (Alghamdi & Prestridge, 2015; ISTE, 2009). Principals who promote a positive belief about ICT in the classroom and empower teachers to use ICT for active learning create environments of excellent professional practices (Alghamdi & Prestridge, 2015; Beytekin, 2014; Staples et al., 2011). Principals who are successful in promoting excellence in professional practice are constantly in the classrooms, have participated in professional development related to ICT and active learning, and promote a positive belief about ICT (Alghamdi & Prestridge, 2015; Beytekin, 2014; Hadjithoma-Garstka, 2011; Machado & Chung, 2015; Russell et al., 2007; Sincar, 2013). Hadjithoma-Garstka (2011) surveyed over 1,000 teachers and conducted a detailed case study of four schools and found that principals who had a people versus process approach were much more successful in promoting excellence in professional practices and reduced more second-order barriers to ICT integration.

Unfortunately, most researchers have indicated that excellence in professional practice is an area of weakness for the majority of principals (Eteokleous, 2008; Machado & Chung, 2015; Russell et al., 2007; Sincar, 2013). A possible cause for this is the limited amount of training provided to principals in the area of professional practices or how to take an active role in technology leadership (Beytekin, 2014; Chang, 2012). Another possible cause is the lack of support principals receive in addressing reluctant teachers or understanding how to support teachers who want to use ICT for active learning activities (Machado & Chung, 2015; Sincar, 2013).
A digital-age learning culture is a standard that is directly affected by the principal (ISTE, 2009). To ensure a digital-age learning culture is present in a school, the principal needs to articulate the expectations and outcomes for student learning, ensure the technology provided promotes digital-age learning, and actively demonstrate an understanding of digital-age learning (Creighton, 2003; ISTE, 2009; Papa, 2011). This includes actively using digital tools and practices that promote collaboration and ICT use for active learning (Papa, 2011). Addressing the standards of digital citizenship, systemic improvement, and excellence in professional practice all support a digital-age learning culture, yet developing a clear vision through a visionary leadership approach may be the most important trait for a principal to ensure successful ICT integration for active learning (ISTE, 2009; U.S. DOE OET, 2016).

**Visionary leadership.** The ISTE (2009) defined visionary leadership as follows: “Administrators inspire and lead development and implementation of a shared vision for comprehensive integration of technology to promote excellence and support transformation throughout the organization” (para. 1). This includes involving all stakeholders in the shared vision of technology education, collaboratively designing technology plans that support the shared vision, and advocating on the local, state, and federal levels to secure funding to support the shared vision and technology plan (Beytekín, 2014; ISTE, 2009; U.S. DOE OET, 2016). It is a visionary leadership approach that allows a principal to accomplish the other standards identified by ISTE (2009) and reduce barriers to ICT integration (U.S. DOE OET, 2016).

Developing a shared vision, involving all stakeholders in the shared vision, and aligning tasks and actions to the shared vision are essential for visionary leadership
The shared vision keeps all efforts focused when problems, issues, or barriers arise (Ertmer, 1999; Senge, 1994). In a quantitative study of 1,474 teachers in 104 elementary schools, Kurland et al. (2010) found that school vision was a significant predictor of a principal’s transformational leadership style and that principals with strong visionary leadership skills also had schools with strong organizational learning practices. For a principal to be an effective and successful technology leader, developing a shared vision and practicing visionary leadership is essential (Daniels et al., 2013; Kirby, Paradise, & King, 1992; Kurland et al., 2010; Schlechty, 2001).

**Technology leadership.** Most researchers have found that visionary leadership skills are commonly linked with strong technology leaders (Ertmer & Ottenbreit-Leftwich, 2010; Hannafin, 2008; P.-S. Hsu & Sharma, 2008; Seong & Ho, 2012). P.-S. Hsu and Sharma (2008) conducted a 6-year qualitative case study of seven principals and found that visionary leadership was a significant factor in successful technology integration. This finding was supported in later research by Seong and Ho (2012), who found that first- and second-order barriers to ICT integration were greatly reduced by principals with visionary leadership skills. A lack of technology leadership and shared vision tends to result in unaligned ICT practices in the classroom, thus reducing the positive effect of ICT integration (Seong & Ho, 2012).

In contrast, Banoglu (2011) found that principals at schools with significant levels of ICT integration had lower competency in visionary leadership but higher competency in communication skills. Waxman et al. (2013), in their research, surveyed 311 principals and found that years of experience and gender may have a greater influence on
ICT integration in the classroom than visionary leadership. However, both studies indicated that visionary leadership and shared vision were more commonly not mentioned rather than absent and recommended further research in this area (Banoglu, 2011; Waxman et al., 2013).

Initial successful ICT integration may be possible without an effective technology leader (Banoglu, 2011; McLeod et al., 2011; Waxman et al., 2013). However, the initial success may not last without effective visionary and technology leadership from the principal (McLeod et al., 2011). Principals with a positive attitude toward ICT and effective communication skills may be able to successfully integrate ICT in some areas of the school, but it appears that strong visionary and technology leadership skills are required for sustaining ICT integration into the classrooms and reducing barriers to ICT integration (Chang, 2012; Cui & Vowell, 2013; Kirby et al., 1992; Richardson et al., 2013). Developing the necessary skills in technology leadership and management, developing a technology plan, and directing technology support staff require principals to receive professional development during their university coursework and throughout their careers (Afshari, Bakar, Luan, & Siraj, 2012; R. Brown, 2011; Cui & Vowell, 2013).

**Professional development for principals.** Most university programs for individuals to earn their administrative credential do not have a course dedicated to ICT in schools (Richardson et al., 2013). Therefore, it is essential that technology leadership and ICT skills are interwoven into all coursework designed for school administrators (Hayashi & Fisher-Adams, 2015; Richardson et al., 2013; Seong & Ho, 2012). Educators entering university programs expect technology to be utilized and will not enroll in credential programs that are lacking in ICT and ICT development training (Hayashi &
Fisher-Adams, 2015). Yet, even university programs with strong ICT integration are not enough to develop principals who can create lasting ICT integration into classrooms for active learning and close the digital-use divide (R. Brown, 2011; U.S. DOE OET, 2016).

Schools and school districts should provide funding for ongoing professional development for principals to evolve into technology leaders (Hadjithoma-Garstka, 2011; Hayashi & Fisher-Adams, 2015; Trest, 2013; Waxman et al., 2013). While initial trainings need to ensure that principals have basic classroom technology skills, follow-up trainings should focus on developing a technology vision and linking ICT to support active learning in the classroom (Hadjithoma-Garstka, 2011; Hew & Brush, 2007).

Follow-up activities to support the development of technology leaders may address digital networking, learning in the digital age, and how to integrate ICT in all subject areas (Hayashi & Fisher-Adams, 2015). Unfortunately, many principals have indicated that they struggle in finding access to professional development in the area of technology leadership due to a lack of opportunities and a lack of funds reserved for principals’ professional development (Sincar, 2013).

Summary
Middle schools are uniquely positioned on the chronological timeline of the educational process to effectively use ICT and active learning for student success and close the digital-use divide (Downes & Bishop, 2012; Hansen, 2014; U.S. DOE OET, 2016; Wu et al., 2008). Students in learning environments that utilize active learning supported by rich ICT environments regularly outperform students in traditional learning environments (Kelley, 2012; Prensky, 2012; Schmid et al., 2009). To support these environments, federal, state, and local governments have spent billions of dollars over the
past 4 decades to support ICT for schools and have greatly increased access to ICT for teachers and students (U.S. DOE OET, 2016). Yet, despite the research supporting active learning through ICT and increased funding, major barriers still remain to the integration of ICT and active learning to close the digital-use divide (Ertmer, 1999; U.S. DOE OET, 2016).

Fortunately, researchers have identified solutions to many of the barriers to successful ICT integration for active learning, including resource management, teacher support, and systemic changes (Hannafin, 2008; Machado & Chung, 2015; Somekh, 2008; U.S. DOE OET, 2016). However, simply adding technology required by federal and district mandates has done little to improve the integration of ICT and active learning (Cuban & Jandric, 2015; Hannafin, 2008; Preston, Wiebe, et al., 2015; Tondeur et al., 2007). Teachers’ perceptions of ICT, active learning, and the educational process are all factors that affect the integration of ICT and the closing of the digital-use divide (Albirini, 2006; Ertmer & Ottenbreit-Leftwich, 2010; Lim et al., 2013).

Ultimately, the level of success of ICT integration to support active learning and close the digital-use divide is directly related to the principal (Bektas, 2014; Coley et al., 1997; Hartsell & Wang, 2013; Shapley et al., 2010b). The principal is responsible for developing the shared vision, developing the technology plan, teacher selection and support, and distribution of ICT throughout the school (Afshari et al., 2012; Berrett, Murphy, & Sullivan, 2012; Staples et al., 2011; U.S. DOE OET, 2016). Understanding principals’ perceptions of the integration of ICT for active learning is important for ensuring students are developing 21st-century learning skills to succeed in tomorrow’s world (Aslan & Reigeluth, 2013; Bebell et al., 2010; U.S. DOE OET, 2016).
CHAPTER III: METHODOLOGY

Overview

This chapter restates the purpose of the study and the supporting research questions. It explains the design of the research, identifies the study population, and provides rationale for the selected sample. Next, the research instrument is described and concerns about validity and reliability are addressed. Lastly, the data collection and analysis processes are explained, and the limitations of the study are identified.

Purpose Statement

The purpose of this qualitative phenomenological study was to explore and describe the barriers to the integration of information and communication technology (ICT) to support active learning in the classroom as perceived by middle school site principals.

Research Questions

The central research question was, What are the barriers that middle school principals perceive affect the integration of the active use of technology for student learning? In addition, the following subquestions guided the research:

1. How do middle school site principals reduce or eliminate barriers to effectively integrate the active use of technology in the classroom for student learning?
2. How do middle school site principals determine if the active use of technology is effectively integrated in the classroom to increase student learning?

Research Design

To explore and describe the perceptions of middle school principals toward barriers to the integration of active-use technology in the classroom, a qualitative study
was designed. Creswell (2007) wrote, “Qualitative research begins with assumptions, a worldview, the possible use of a theoretical lens, and the study of research problems inquiring into the meaning individuals or groups ascribe to a social or human problem” (p. 37). Qualitative studies require direct data collection related to participant perspectives that lead to rich narrative descriptions (McMillan & Schumacher, 2010).

Several research methods were reviewed and considered to complete this study. In order to understand middle school principals’ perceptions, a qualitative study with a phenomenological approach was deemed most appropriate. A phenomenological approach describes the experiences of the participants and looks to understand their voice (McMillan & Schumacher, 2010; Patten, 2014). Patton (2015) further explained, “Phenomenology aims at gaining a deeper understanding of the nature or meaning of our everyday experiences” (p. 115). McMillan and Schumacher (2010) indicated that a phenomenological study aims to analyze and describe the experiences of the participants from their perception. Furthermore, Giorgi (2012) stated, “Phenomenology does not dictate to phenomena but rather it wants to understand how phenomena present themselves to consciousness and the elucidation of this process is a descriptive task” (p. 6).

Research questions were developed in alignment with the concept of a central question followed by subquestions (Creswell, 2009). Creswell (2009) explained, “The central question is a broad question that asks for an exploration of the central phenomenon of concept in a study” (p. 129). Two subquestions were developed to help narrow the focus of the study and were used to guide the creation of the interview protocol (Creswell, 2009).
Phenomenological studies require the researcher to use bracketing (Willis, Sullivan-Bolyai, Knafl, & Cohen, 2016). Bracketing is when the researcher holds personal ideas, beliefs, and predetermined notions outside of the collection of data (Willis et al., 2016). Since the researcher had conducted an extensive literature review about barriers to information and communication technology (ICT) integration and actions that reduce these barriers, bracketing allowed the researcher to collect data regarding the lived experiences of the participants without allowing preconceived ideas to interfere with the data collection. This study described the perceptions of middle school principals toward barriers to ICT integration and not necessarily the actual barriers that may exist, thus making bracketing essential. Describing how the phenomenon of barriers to ICT integration is perceived by middle school principals required in-depth, semistructured interviews with middle school principals.

**Population**

The population of this study was middle and intermediate school principals. A population in a research study is the total group studied, while a sample is a group of individuals who will provide the data to make the generalizations about the population (Patton, 2015). McMillan and Schumacher (2010) stated, “A population is a group of elements or cases, whether individuals, objects, or events, that conform to specific criteria and to which we intend to generalize the results of the research” (p. 129). The target population for this study was principals at Southern California middle and intermediate schools.

The geographic region of Southern California was selected due to the researcher’s proximity and access to multiple school districts. At the time of the study, there were
1,298 middle schools in California, with 748 in the Los Angeles, Orange, Riverside, and San Bernardino Counties, making up over 57% of the state’s middle schools (California Department of Education [CDE], 2016). The researcher contacted a total of eight district superintendents or assistant superintendents to identify two principals in their districts who they believed would provide the widest range in variations in perceptions regarding barriers to ICT integration.

**Sample**

It was determined that a nonprobable, convenience sample would be used to identify school districts for this study and a purposeful sample would be used to select the participants. A convenience, or available, sample is a sample that is accessible to the researcher and is not random (McMillan & Schumacher, 2010). The eight school districts in this study were selected based on the researcher’s connections to the superintendents or assistant superintendents. A purposeful sample is a group of individuals who will be representative or informative about the topic of interest (McMillan & Schumacher, 2010). The participants were recommended to the researcher by their supervisors to provide a wide range of demographic characteristics.

The sample for this study included 16 intermediate and middle schools from eight different school districts in four counties of Southern California. While there was no probability in the selection of the districts, the criteria for principals to participate in this study were as follows:

- Each participant was a middle or intermediate school principal.
• Each participant had a minimum of 3 years of experience as a middle or intermediate school principal or a combined 5 years of experience as a middle or intermediate school site principal and assistant principal.

• Each participant was recommended by his or her superintendent or assistant superintendent to be knowledgeable about the integration of ICT into the classroom.

Additionally, by researching principals from eight districts, the researcher reduced the number of independent variables, such as funding models, that may have detracted from the focus of the research (McMillan & Schumacher, 2010). The sample size of 16 middle school principals provided the appropriate level of data saturation to answer the research questions and to elucidate most, if not all, opinions and perceptions of the target population (Kruth, 2015; Mason, 2010). Additionally, researchers agree that a sample size of 16 is adequate and appropriate for a phenomenological study (Creswell, 1998; Mason, 2010; Morse, 1994).

In order to reduce sampling bias, principals were selected from two school districts in each county by their supervisors. Sampling bias is when a researcher selects participants for the study who will produce findings that are in line with the researcher’s beliefs on the subject (McMillan & Schumacher, 2010). Prior to this study, the researcher ensured he did not know any of the participants, which further reduced sampling bias. To increase the response variability, or to ensure there were enough participants to have enough variability in the responses, principals from eight districts participated in this study (McMillan & Schumacher, 2010).

Before making generalizations about barriers to ICT integration for active learning, the reader should consider this information in connection with findings from the
literature review. The purposeful sampling of the 16 principals did not yield a random sample of middle and intermediate school principals across the United States, but this sample did add to the breadth of knowledge related to ICT integration in schools to support active learning (McMillan & Schumacher, 2010). Additionally, this information provides a more complete understanding of the principals’ perceptions regarding reducing barriers to ICT integration, especially in California schools, and adds to the overall understanding of this population.

**Instrumentation**

A semistructured interview protocol was designed using two conceptual frameworks. The semistructured format allows respondents to have greater range in answering the interview questions and following up with greater detail while keeping the conversation on topic to ensure validity (McMillan & Schumacher, 2010). Furthermore, participants are asked the same questions in a semistructured interview, but the open-ended questions allow participants to contribute as much detail as they feel is required (D. W. Turner, 2010).

Following Patton’s (2015) conceptual framework of interview questions, the researcher designed both closed- and open-ended questions in the domains of (a) experience/behaviors, (b) opinions/values, (c) feelings/emotions, (d) knowledge, (e) sensory, and (f) background/demographics. Additionally, the structure of the interviews followed Rubin and Rubin’s (2012) framework of main questions, follow-up questions, and probes to gather rich data that answer the research questions. The use of probing questions allowed the researcher to delve deeper into the topic and gather additional information to better understand the participants’ answers (Harrell & Bradley,
Lastly, the interview questions were assessed for validity and reliability by experts in the fields of ICT and active learning. Two experts were selected who both had earned doctoral degrees, had experience with qualitative research and development of interview instruments, and were in leadership roles requiring the use of ICT for active learning. Based on their input, the interview questions and interview protocol were revised. Additionally, a field test was conducted to assess the effectiveness of the interview protocol for data collection.

Validity

According to McMillan and Schumacher (2010), validity is “the degree of congruence between the explanations of the phenomena and the realities of the world” (p. 330). Content validity is the degree to which the instrument measures the content it is designed to measure (Patten, 2014). Ensuring content validity in research is essential for qualitative, phenomenological studies (Golafshani, 2003). To improve content validity, the interview protocol and questions were reviewed by the two experts in the areas of ICT integration for active learning and qualitative research, and adjustments were made based on their feedback.

Descriptive validity is a measure of how accurately the data collected reflect what the participants said and meant (Thomson, 2011). The researcher used open-ended questions during semistructured interviews to allow the participants to speak openly and provide additional comments to ensure their meaning was conveyed. Each interview was recorded and field notes gathered regarding participants’ mannerisms and tone to ensure accuracy. These notes and recordings were transcribed and provided to the participants to check for accuracy.
Interpretative validity is a measure of how well the research captures the meaning or perceptions of the participants (Thomson, 2011). Ensuring the perceptions of the participants were recorded, and not the perceptions of the researcher, was essential to the research. To increase the interpretative validity, follow-up and probing questions were utilized to assess the perceptions of the participants (Rubin & Rubin, 2012; Thomson, 2011).

Reliability

An instrument is said to be reliable if it produces consistent results when used with multiple participants and over time (Patten, 2014). To improve the reliability of the interview questions, the researcher developed an interview protocol (Jacob & Furgerson, 2012; Rubin & Rubin, 2012). This protocol included open-ended initial questions, possible follow-up questions, and concepts to probe further discussion (Rubin & Rubin, 2012). Prior to starting the research, the interview questions and interview protocol were field tested with two principals who did not participate in the study. Additionally, a pilot study was conducted with a middle school principal who was not included in the study to further improve the reliability and validity. To ensure the researcher was unbiased during the interviews, an experienced interviewer was used to observe the field test and pilot study to provide feedback related to verbal and nonverbal communication that the researcher expressed that may have influenced the participants’ responses. This expert had earned a doctoral degree and had extensive experience in qualitative research and interviewing. Adjustments and refinements were made to the interview protocol and questions based on the feedback and critique from the experienced interviewer and the participants in the field study and pilot study (Patrick et al., 2011).
Data Collection

To ensure this study met all required ethical standards, approval from the Brandman University Institutional Review Board (BUIRB) was required. Creswell and Plano Clark (2011) stated, “Permission needs to be sought from multiple individuals and levels in organizations, such as individuals in charge of sites, from people providing the data . . . and from campus-based institutional review boards (IRBs) to collect data from individuals and sites” (p. 175). The BUIRB is made up of faculty members who are experts in the field of qualitative research and review research proposals for the protection of human subjects. The approval for this study was granted on November 17, 2016 (see Appendix B). All participants were given an informed consent form to complete prior to the research (Appendix C).

Prior to the start of the data collection process, the researcher took steps to ensure legal and ethical considerations were addressed as well as to increase the validity and reliability of the study. In developing the interview protocol, the areas of showing respect, honoring promises, not using pressure tactics, and the concept of “do no harm” were addressed and applied (Rubin & Rubin, 2012). The responses from the field test were recorded using two recording devices and transcribed, and field notes were collected. An expert in qualitative research, who had earned a doctoral degree and was experienced with coding qualitative data, observed the field test and recommended some adjustments to the interview protocol to increase the validity and reliability of the interview data.

The principals who participated in this study were recommended by cabinet-level administrators in the participating districts via e-mail communication. This step allowed
the researcher to address any of the districts’ internal requirements for conducting research. Once each principal was identified, the researcher contacted him or her by phone to introduce himself, briefly explain the study, and arrange for an interview time. Also at this time, the confidentiality of the study was explained. Each interview was scheduled for an hour and took place at the principal’s school site at a time the participant selected. Participants were given the interview protocol, including the questions and possible follow-up questions, via e-mail prior to the interviews.

The interviews were conducted in person at locations the participants chose. Each interview was recorded with a digital MP3 recording device, the garage band application with a MacBook Pro, and the digital recorder on the iPhone 6. To ensure accuracy, the interviews were transcribed, and the participants received a copy of the transcription and a digital recording of their interviews. To protect anonymity, all personal information, including names of the participants, schools, and districts, was changed to pseudonyms (DiCicco-Bloom & Crabtree, 2006). In addition, the researcher took field notes during the interviews to capture additional data in the form of nonverbal communication (Rubin & Rubin, 2012).

**Data Analysis**

Each of the interview recordings was transcribed and reviewed by the researcher and participant for accuracy. These transcriptions and field notes from the interviews were uploaded into NVivo software. NVivo software allowed the researcher to code the data from the interviews for common themes or reoccurring trends.

The researcher developed specific codes and themes for the data and then used comparative methods to find similarities and differences (Patton, 2015). The codes were
developed by the researcher to identify events and topical markers, examples, concepts, and themes (Rubin & Rubin, 2012). During the data review and analysis, as repeated themes and concepts emerged, codes were adjusted to further separate out the information (Patton, 2015).

In addition to pilot testing the interview questions and field testing the interview protocol, the researcher used a research expert to review a sample of the transcribed interview data to add interrater reliability to the study. This expert had earned a doctorate and had experience with qualitative research by conducting analyses of interview transcripts using the NVivo software. Interrater reliability is established through the use of two or more researchers to independently analyze and code data to establish more consistency in the findings (Armstrong, Gosling, Weinman, & Marteau, 1997; Morse, 1997; Patton, 2015). The researcher and the research expert met to compare their independent analyses from samples of the data and made adjustments to increase the reliability of the analysis.

**Limitations**

1. The study used a nonprobable sample of middle school principals (McMillan & Schumacher, 2010).
2. Results from this study were limited to the sample of middle school principals from eight different districts in four counties in Southern California.
3. Results of this study were limited to the perceptions of the 16 middle school principal participants from eight different school districts in Southern California.
Summary

While there is substantial research on barriers to ICT integration into classrooms and the perceptions of principals related to ICT integration, there is very limited research on middle school principals’ perceptions of ICT integration for active learning. This phenomenological study analyzed the perceptions of middle school principals toward barriers to ICT integration for active learning and their perceptions of the digital-use divide (U.S. DOE OET, 2016). The research may provide direction and suggestions to support middle school principals in understanding barriers to ICT integration and active learning and how to close the digital-use divide.
CHAPTER IV: RESEARCH, DATA COLLECTION, AND FINDINGS

Active learning supported by information and communication technology (ICT) has been identified as an effective approach for teaching middle school students (Downes & Bishop, 2012; Kelley, 2012; U.S. DOE OET, 2016). There are many components to support ICT integration and the use of active learning activities, including funding new technology, maintaining the equipment, and training for teachers, support staff, and administrators (Cuban & Jandric, 2015; U.S. DOE OET, 2016). Often the significance of the barriers to ICT-supported active learning is related to the level of funding allocated for ICT integration. In addition to funding, many other barriers exist that may limit the integration of ICT into classrooms and reduce the number of active learning activities (Ertmer et al., 2009). Researchers have recommended many potential solutions to these barriers, and ultimately, the individual who has the most influence to reduce these barriers is the site principal (Bektas, 2014; Hartsell & Wang, 2013).

This chapter describes the responses of 16 principals from four Southern California counties to identify their perceptions of the barriers associated with ICT integration to support active learning in middle schools. The purpose of the study, research questions, methodology, and the population of the study are reviewed. Next, the data are presented from each participant by research question and then by overall themes that answer the research questions.

Purpose Statement

The purpose of this qualitative phenomenological study was to explore and describe the barriers to the integration of information and communication technology
(ICT) to support active learning in the classroom as perceived by middle school site principals.

**Research Questions**

This study was designed to answer the following central research question: What are the barriers that middle school principals perceive affect the integration of the active use of technology for student learning? In addition, the study also was designed to answer the following subquestions:

1. How do middle school site principals reduce or eliminate barriers to effectively integrate the active use of technology in the classroom for student learning?
2. How do middle school site principals determine if the active use of technology is effectively integrated in the classroom to increase student learning?

**Research Methods and Data Collection Procedures**

Extensive research exists on ICT integration and on active learning, but there are very limited studies that have analyzed these two concepts and the role of the principal. This gap between ICT for passive learning and active learning has been identified as the digital-use divide (U.S. DOE OET, 2016). This qualitative phenomenological study used open-ended interview questions in a semistructured setting to identify the perceptions of middle school principals toward barriers to the integration of ICT to support active learning.

The interviews consisted of seven main interview questions, with probing questions available if needed to gather additional data. Interview Questions 1 and 4 were designed to answer the central research question by identifying the perceptions middle school principals had about barriers to the integration of ICT. Interview Questions 5, 6,
and 7 were designed to answer Research Subquestion 1 in determining the actions
principals had taken to reduce these barriers. Interview Questions 2 and 3 were designed
to answer Research Subquestion 2 regarding the student active learning at the principals’
school sites (see Table 1).

Table 1

Alignment of Interview Questions With Research Questions

<table>
<thead>
<tr>
<th>Research question</th>
<th>Corresponding interview questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central question: What are the barriers that middle school principals perceive affect the integration of the active use of technology for student learning?</td>
<td>Questions 1, 4</td>
</tr>
<tr>
<td>Subquestion 1: How do middle school site principals reduce or eliminate barriers to effectively integrate the active use of technology in the classroom for student learning?</td>
<td>Questions 5, 6, 7</td>
</tr>
<tr>
<td>Subquestion 2: How do middle school site principals determine if the active use of technology is effectively integrated in the classroom to increase student learning?</td>
<td>Questions 2, 3</td>
</tr>
</tbody>
</table>

Eight superintendents or assistant superintendents were contacted to identify two
principals in each of their districts who met the requirements of the study and would be
good participants. The eight districts were selected to represent four counties and had
superintendents or assistant superintendents whom the researcher personally knew or
with whom he had established a connection. Once the superintendents or assistant
superintendents provided their approval—or, if required, the approval of the district’s
research review team—recommended principals were contacted via e-mail or phone to
request their participation in the study. Principals who agreed to participate were sent the
informed consent form, interview protocol, and the Brandman University Research Participant’s Bill of Rights (see Appendix D).

Participants agreed to be recorded for this study and returned the signed informed consent form to the researcher in person. Interviews were scheduled and conducted in each participant’s office. Interviews were recorded using a MacBook Pro and the GarageBand application. In addition, an iPhone 6 with the application Recorder and a digital voice recorder were used as backup recording devices. The recordings of the interviews were immediately sent to a professional transcription service. The transcriptions were reviewed by the researcher and the participants, and corrections were made to ensure accuracy. The edited transcriptions were uploaded to the NVivo coding application used for qualitative data analysis. The interview transcriptions were coded to identify themes and patterns. To increase the reliability of the data, an interrater reliability approach was used. A doctor of education and expert in qualitative research coded one of the initial transcriptions and compared this coded document with that of the researcher. Once a high level of agreed-upon accuracy was established, the requirement of interrater reliability was met.

**Population/Sample**

Participants in this study were middle or intermediate school principals from Orange, Los Angeles, Riverside, and San Bernardino Counties. Criteria for this study included being a middle or intermediate school principal with at least 3 years of experience in that position at the time of the study or 5 years of experience as a middle school administrator and having a minimum of 5 years of teaching experience. Each of the participants met the criteria for this study.
The sample for this phenomenological study was determined using a nonprobable, convenience sampling approach. McMillan and Schumacher (2010) explained that a nonprobable sample is a sample that is available to the researcher and not random. While the sample was nonprobable to the researcher, each participant was recommended by his or her superintendent or assistant superintendent as an individual who would be a good representative of the population.

The researcher selected two participants from each of the two school districts within each of the four counties. The total sample size for this study was 16 participants. Prior to the interviews, the participants completed a brief survey about their backgrounds in education (see Table 2), thus ensuring each participant met the criteria for the study.

Table 2

<table>
<thead>
<tr>
<th>Participant</th>
<th>County</th>
<th>Age</th>
<th>Gender</th>
<th>Years as teacher</th>
<th>Years in administration</th>
<th>Years as a middle school principal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participant A</td>
<td>Los Angeles</td>
<td>50-59</td>
<td>F</td>
<td>12</td>
<td>17</td>
<td>5</td>
</tr>
<tr>
<td>Participant B</td>
<td>Los Angeles</td>
<td>40-49</td>
<td>M</td>
<td>8</td>
<td>13</td>
<td>6</td>
</tr>
<tr>
<td>Participant C</td>
<td>Los Angeles</td>
<td>30-39</td>
<td>M</td>
<td>7</td>
<td>8</td>
<td>3</td>
</tr>
<tr>
<td>Participant D</td>
<td>Los Angeles</td>
<td>40-49</td>
<td>F</td>
<td>9</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Participant E</td>
<td>Orange</td>
<td>30-39</td>
<td>M</td>
<td>10</td>
<td>7</td>
<td>3</td>
</tr>
<tr>
<td>Participant F</td>
<td>Orange</td>
<td>40-49</td>
<td>M</td>
<td>6</td>
<td>19</td>
<td>13</td>
</tr>
<tr>
<td>Participant G</td>
<td>Orange</td>
<td>30-39</td>
<td>F</td>
<td>9</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>Participant H</td>
<td>Orange</td>
<td>40-49</td>
<td>F</td>
<td>20</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>Participant I</td>
<td>Riverside</td>
<td>40-49</td>
<td>F</td>
<td>6</td>
<td>10</td>
<td>2</td>
</tr>
<tr>
<td>Participant J</td>
<td>Riverside</td>
<td>40-49</td>
<td>M</td>
<td>6</td>
<td>12</td>
<td>7</td>
</tr>
<tr>
<td>Participant K</td>
<td>Riverside</td>
<td>40-49</td>
<td>M</td>
<td>5</td>
<td>16</td>
<td>8</td>
</tr>
<tr>
<td>Participant L</td>
<td>Riverside</td>
<td>40-49</td>
<td>M</td>
<td>7</td>
<td>13</td>
<td>8</td>
</tr>
<tr>
<td>Participant M</td>
<td>San Bernardino</td>
<td>40-49</td>
<td>F</td>
<td>13</td>
<td>9</td>
<td>2</td>
</tr>
<tr>
<td>Participant N</td>
<td>San Bernardino</td>
<td>50-59</td>
<td>F</td>
<td>12</td>
<td>15</td>
<td>5</td>
</tr>
<tr>
<td>Participant O</td>
<td>San Bernardino</td>
<td>50-59</td>
<td>F</td>
<td>5</td>
<td>22</td>
<td>7</td>
</tr>
<tr>
<td>Participant P</td>
<td>San Bernardino</td>
<td>50-59</td>
<td>M</td>
<td>9</td>
<td>15</td>
<td>9</td>
</tr>
</tbody>
</table>
Presentation of the Data

Data Analysis by Participant

The data collected in this study were analyzed in two ways. First, data from each participant were analyzed for the central research question and research subquestions to determine important themes. The participants were given alphabetic pseudonyms to protect their anonymity. The participants were ordered by county and then by the order in which they were interviewed. After the important themes were established, the data were analyzed collectively to develop common themes and patterns.

Participant A. Participant A was a female middle school principal from Los Angeles County. Table 3 summarizes Participant A’s responses by themes and patterns related to the central research question and two research subquestions.

Central research question. The central research question was, “What are the barriers that middle school principals perceive affect the integration of the active use of technology for student learning?” Participant A clearly identified the school district’s policies and practices as a barrier to integrating ICT. This included a lack of districtwide, cross-school-level use of ICT for active learning. Furthermore, Participant A indicated that the district technology department may not have been familiar with what the schools were trying to accomplish, stating,

One example is when we are implementing something that perhaps the district is not familiar with, perhaps it’s a new software program or even a new piece of technology that is not status quo, we have to do a little bit of a sales pitch.
### Table 3

**Participant A: Themes and Patterns in Responses to Research Questions**

<table>
<thead>
<tr>
<th>Research question</th>
<th>Theme/pattern</th>
</tr>
</thead>
</table>
| Central question: What are the barriers that middle school principals perceive affect the integration of the active use of technology for student learning? | • District alignment between elementary, middle, and high schools  
• District-level support for new implementation of ICT  
• Schools competing for same resources  
• Funding infrastructure, new hardware, and refresh programs  
• Lack of effective professional development  
• Teachers’ teaching styles and beliefs  |
| Subquestion 1: How do middle school site principals reduce or eliminate barriers to effectively integrate the active use of technology in the classroom for student learning? | • Autonomous decision making at the school level  
• Collaboration with district technology department  
• Providing a standard level of teacher-used technology  
• Providing adequate technology for students’ use including home use  
• Establishing university partnerships for training and donations  
• Providing ICT for innovative teachers  
• Finding effective external professional development and organizing internal professional development opportunities  
• Targeted integration of new ICT  
• Visionary leadership approaches  
• Piloting new ICT and concepts  
• Providing time for teacher collaboration and practice with ICT  
• Creating and maintaining a school culture of risk taking with ICT  |
| Subquestion 2: How do middle school site principals determine if the active use of technology is effectively integrated in the classroom to increase student learning? | • Cohort of students with a technology support elective  
• Observation of student projects  
• Aligning instruction with current standards and supported with technology  |

Participant A also indicated that other barriers to ICT integration were funding hardware in the form of students’ laptops, netbooks, and iPads; establishing and maintaining a robust wireless infrastructure; and funding a refresh program for teachers’ and students’ computers and devices. Participant A went on to note that new technology,
the infrastructure, and a refresh program were interconnected and often were competing factors for financial resources. She went on to state, “We had hoped to go two to one. But we’re not going to quite get there because we have to go back and refresh because some of the computers are just dying.” However, she did indicate that since her school received Title I funds from the federal government, funding was not a major barrier.

Final barriers mentioned by Participant A were professional development and teachers’ teaching styles. For professional development, she stated that finding highly effective training that is targeted for the teachers was difficult. She went on to state that most of the trainings she and her staff had attended were missing major follow-up components. Participant A went on to claim that most of the staff members were on board with using technology. She stated that very few teachers did not use ICT effectively in the classroom, and she believed this lack of effective use was due to their traditional teaching beliefs.

**Research Subquestion 1.** The first research subquestion was, “How do middle school site principals reduce or eliminate barriers to effectively integrate the active use of technology in the classroom for student learning?” Participant A mentioned several strategies she used to reduce barriers to ICT integration. First, Participant A had established a technology leadership team, made up of teachers from each of the departments, to lead the school’s ICT integration. Participant A believed this collaborative approach had reduced barriers related to teacher resistance and ensured the limited funds for ICT were used effectively. She explained this approach as “giving teachers a strong voice in the process.”
Participant A strongly believed that ensuring all teachers had a consistent level of ICT in the classroom and establishing schoolwide agreements such as teacher webpages to post assignments and grades and the use of Google Classroom to expand the learning day also reduced barriers to ICT integration. Additionally, Participant A stated that this consistent level required providing teachers with time to collaborate, help train each other, and explore and practice with the ICT and active learning activities.

**Research Subquestion 2.** The second research subquestion was, “How do middle school site principals determine if the active use of technology is effectively integrated in the classroom to increase student learning?” Participant A identified several ways ICT was used to support active learning. During her classroom and teacher website observations, she observed students completing several authentic research-based activities supported with the use of laptops and the Internet. Furthermore, students collaborated on projects in history and English classes to create video productions and other ICT-supported presentations.

**Participant B.** Participant B was a male middle school principal from Los Angeles County. Table 4 summarizes Participant B’s responses by themes and patterns related to the central research question and two research subquestions.

**Central research question.** The central research question was, “What are the barriers that middle school principals perceive affect the integration of the active use of technology for student learning?” Participant B expressed limited concerns for barriers to ICT integration for student learning. Participant B mentioned that a school’s wireless capacity, or bandwidth, is an area that must be addressed if a school is going to integrate ICT for student learning on a schoolwide level. While his school had a sufficient
Table 4

*Participant B: Themes and Patterns in Responses to Research Questions*

<table>
<thead>
<tr>
<th>Research question</th>
<th>Theme/pattern</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central question: What are the barriers that middle school principals perceive affect the integration of the active use of technology for student learning?</td>
<td>• School and district wireless infrastructure</td>
</tr>
<tr>
<td></td>
<td>• Funding a hardware refresh program</td>
</tr>
<tr>
<td></td>
<td>• School culture</td>
</tr>
<tr>
<td></td>
<td>• Teachers resisting technology</td>
</tr>
<tr>
<td>Subquestion 1: How do middle school site principals reduce or eliminate barriers to effectively integrate the active use of technology in the classroom for student learning?</td>
<td>• Building and sustaining a collaborative school culture of moving forward with technology</td>
</tr>
<tr>
<td></td>
<td>• Providing technology for staff and students, including home use</td>
</tr>
<tr>
<td></td>
<td>• Teachers attending professional development for ICT use in the classroom</td>
</tr>
<tr>
<td></td>
<td>• Developing internal professional development opportunities with follow-up support</td>
</tr>
<tr>
<td></td>
<td>• Establishing a gradual timeline for integrating ICT use</td>
</tr>
<tr>
<td></td>
<td>• Assistant principal</td>
</tr>
<tr>
<td></td>
<td>• Visionary leadership</td>
</tr>
<tr>
<td></td>
<td>• Using teacher leaders</td>
</tr>
<tr>
<td></td>
<td>• Providing release time for teachers</td>
</tr>
<tr>
<td></td>
<td>• Supporting risk taking and experimental approaches to ICT use</td>
</tr>
<tr>
<td>Subquestion 2: How do middle school site principals determine if the active use of technology is effectively integrated in the classroom to increase student learning?</td>
<td>• Classroom observations of open-ended assignments that produce a product</td>
</tr>
<tr>
<td></td>
<td>• Cross-curricular assignments to solve open-ended questions</td>
</tr>
<tr>
<td></td>
<td>• Evidence-based student presentations</td>
</tr>
</tbody>
</table>

wireless infrastructure at the time of the study, he explained that 7 years ago when the school began the push for more ICT for student use, the wireless infrastructure needed improvements. He still saw this as a major barrier for some schools, as he expressed,

We’ve had other schools that have come and toured ours that try and push out technology, and one of the things that we find out right away is that they don’t have the bandwidth that they need to be able to use the device or, for that matter, even the wireless network to begin with.
Participant B indicated that an additional barrier related to ICT integration was the funding needed to purchase the initial technology and to establish a refresh program. He explained that as technology improves, the hardware for students and teachers needs to be updated every 3-5 years to remain highly effective and relevant. Participant B added that funding required to maintain and repair the equipment may also be a barrier, especially when a school has a large number of laptops or tablets and allows students to take these devices home.

Participant B also mentioned that the teachers and the school culture can be barriers to ICT integration for active learning. He explained that as a school’s ICT capacity grows and more students have access to ICT, teachers may disagree on how the technology should be, or can be, used. Schools that do not have a collaborative culture will limit the cross-curricular integration of ICT for active learning. He went on to state that he believed this barrier stemmed from teachers who were afraid of not appearing omnipotent in front of the class.

Research Subquestion 1. The first research subquestion was, “How do middle school site principals reduce or eliminate barriers to effectively integrate the active use of technology in the classroom for student learning?” Participant B expressed that working to establish a school culture of collaboration and risk taking with ICT integration was an effective approach to reducing barriers to ICT integration for active learning. This included having collegial support for trying new active learning activities supported by ICT and a system for assessing the effectiveness of the lesson, including what would make the learning experience even more effective. This approach would also help reduce the barrier of teachers’ resistance due to a fear of looking foolish or unknowing in front
of the students. Furthermore, Participant B’s school used a technology coach by having a teacher released for one period a day to support other teachers with ICT integration and use.

Providing new ICT to teachers with enough time to explore and practice before using these devices in the classroom was another strategy Participant B used to help reduce barriers to ICT integration. He stated, “I gave them their iPads and asked them to start playing around with them and becoming comfortable with using the devices as an instructional tool.” This approach allowed for the teachers to develop the necessary skills to effectively use the iPads for instruction and support students with their devices. Additionally, providing time for teachers to attend formal professional development, attend internal or school-created professional development, and work together on designing learning experiences with ICT all helped reduce barriers to ICT integration. Participant B expressed that the value of this time was when it allowed for teachers “to share what they had learned with one another and help each other and coach each other with the new technology that they had learned.”

A phrase Participant B used to explain his approach to successful ICT integration for active learning was, “Go slow to go fast.” He supported this by explaining that the road his school took to become a 1:1 learning environment was one grade level at a time. This approach included piloting different devices and instructional strategies, providing formal professional development with follow-up support, and regularly monitoring ICT use. During this implementation process, the staff discovered that many students did not have ICT available outside of the classroom, so a procedure for students to check out the
devices was created, and the computer labs were opened for students to work on their projects.

**Research Subquestion 2.** The second research subquestion was, “How do middle school site principals determine if the active use of technology is effectively integrated in the classroom to increase student learning?” Participant B explained that his school may be unique in that the students regularly were engaged in several ICT-based, active learning, cross-curricular projects and activities. One example of ICT used to support active learning was having students explore the ancient architecture of the dome, design their own dome, and compare these structures to modern domes. A second example was having students analyze text from Victorian novels and synthesize this with data collected about the Victorian era to answer open-ended questions and then present their findings and opinions through various technology-supported platforms.

**Participant C.** Participant C was a male middle school principal from Los Angeles County. Table 5 summarizes Participant C’s responses by themes and patterns related to the central research question and two research subquestions.

**Central research question.** The central research question was, “What are the barriers that middle school principals perceive affect the integration of the active use of technology for student learning?” Participant C clearly believed that the most significant barriers to ICT integration were related to a lack of devices (i.e., Chromebooks) for student use and the wireless infrastructure to support these devices. He explained that the school had 11 Chromebook carts in use every day and that teachers often had to wait to get access to these carts. When Participant C asked the staff about ICT needs, they definitively answered that they needed more Chromebooks for student use. However,
### Table 5

**Participant C: Themes and Patterns in Responses to Research Questions**

<table>
<thead>
<tr>
<th>Research question</th>
<th>Theme/pattern</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central question: What are the barriers that middle school principals perceive affect the integration of the active use of technology for student learning?</td>
<td>• Lack of support from district technology administrators</td>
</tr>
<tr>
<td></td>
<td>• Lack of funding for student devices</td>
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<tr>
<td></td>
<td>• Lack of devices for students</td>
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<tr>
<td></td>
<td>• Ineffective district and school wireless infrastructure</td>
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<td></td>
<td>• Lack of professional development opportunities for teachers</td>
</tr>
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<td></td>
<td>• Students not having access to tech outside of school</td>
</tr>
<tr>
<td></td>
<td>• Teacher demographics and lack of knowledge</td>
</tr>
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<td></td>
<td>• Traditional teaching styles</td>
</tr>
<tr>
<td></td>
<td>• Lack of time for teachers for training and developing lessons with ICT</td>
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</tbody>
</table>

| Subquestion 1: How do middle school site principals reduce or eliminate barriers to effectively integrate the active use of technology in the classroom for student learning? |                                                                 |
|                                                                                   | • Providing devices for student use                                            |
|                                                                                   | • Providing formal and internal professional development opportunities         |
|                                                                                   | • Personally providing technology and classroom support                       |
|                                                                                   | • Creating a school culture of risk taking with ICT                           |
|                                                                                   | • Visionary leadership                                                        |
|                                                                                   | • Providing technology support                                                 |
|                                                                                   | • Providing time for developing lessons                                        |
|                                                                                   | • Establishing a teacher team approach to ICT integration                     |
|                                                                                   | • Using on-site teachers as technology coaches                                |

| Subquestion 2: How do middle school site principals determine if the active use of technology is effectively integrated in the classroom to increase student learning? |                                                                 |
|                                                                                   | • Schoolwide use of Google Classroom                                          |
|                                                                                   | • Students developing websites, presentations, and interactive applications  |

Participant C also explained that the school’s and district’s wireless infrastructure could not accommodate a schoolwide 1:1 program at the time of the study. He said, “The district has been a little bit resistant to order more Chromebooks because they’re afraid that once we receive more devices to connect to the Wi-Fi, it’s just going to bog down the system.”
Participant C identified another barrier to ICT integration for active learning as a lack of professional development. He believed that the barrier of a lack of professional development was related to the limited amount of time rather than reluctant teachers. Furthermore, Participant C believed that this barrier compounded two additional barriers of the teachers’ lack of knowledge and the teachers’ using traditional teaching styles. First, Participant C explained how some teachers were unaware of how to add ICT and active learning activities to a lesson. Second, Participant C explained that some teachers still believed they must direct students at all times, and this traditional teaching style prevented students from exploring new ways to actively learn using ICT.

**Research Subquestion 1.** The first research subquestion was, “How do middle school site principals reduce or eliminate barriers to effectively integrate the active use of technology in the classroom for student learning?” Participant C strongly believed that providing devices to students was crucial for reducing barriers to ICT integration for active learning. He explained that his school had purchased 11 Chromebook carts and had plans for additional carts. Related to this approach, he also stressed the importance of expanding the district’s and school’s wireless capabilities to support the increase in the number of student devices.

Participant C also explained the importance of providing professional development for the integration of ICT for active learning. This approach included bringing in outside presenters and developing internal professional development opportunities. Participant C was also clear that these professional development opportunities must be followed up by providing time for teachers to work with the new material and concepts both individually and collaboratively. To allow this, Participant C
provided time monthly for teachers to collaborate on lessons and support each other in the integration of ICT for active learning activities.

Participant C identified providing technology support to teachers as another way to reduce barriers to ICT integration for active learning. This support was provided in two different formats. First, Participant C stated he would visit the teachers’ classrooms to provide the real-time support. He said, “When teachers wanted to start using Chromebooks, I would personally go, and I said, ‘Look, let’s go in and what period you want me in there, and I will be there the entire period.’” Participant C explained that this support allowed teachers to take additional risks with integrating ICT, as they knew they had immediate support. Second, Participant C had all of the school’s leadership team trained in basic technology support and ways to integrate ICT for active learning. These teacher leaders were available during their conference periods to go into classes or collaborate to provide support for integrating ICT for active learning.

Lastly, Participant C shared that building a school culture of risk taking was important to increase the use of ICT for active learning. Participant C explained that he told the staff, “It’s failing forward, and it’s okay to stretch yourself,” as the push to integrate ICT for active learning was beginning and continued. He also shared that he celebrated with teachers and expressed his pride for their efforts to include more ICT on a regular basis for active learning activities.

**Research Subquestion 2.** The second research subquestion was, “How do middle school site principals determine if the active use of technology is effectively integrated in the classroom to increase student learning?” Participant C shared that students were regularly developing webpages, participating in interactive collaboration, and developing
presentations. In addition, most teachers used a virtual classroom environment to extend the learning day with collaboration activities, having students conduct research, and authentic writing and presentations. Lastly, Participant C identified an increase in the use of applications that had more interactive activities and increased active learning opportunities.

Participant D. Participant D was a female middle school principal from Los Angeles County. Table 6 summarizes Participant D’s responses by themes and patterns related to the central research question and two research subquestions.

Table 6

**Participant D: Themes and Patterns in Responses to Research Questions**

<table>
<thead>
<tr>
<th>Research question</th>
<th>Theme/pattern</th>
</tr>
</thead>
</table>
| Central question: What are the barriers that middle school principals perceive affect the integration of the active use of technology for student learning? | • Lack of funding for hardware and wireless infrastructure  
• Lack of funding for devices for student use  
• Lack of time for teachers to develop ICT lessons  
• Assessing student work  
• Traditional teaching styles  
• Lack of teacher knowledge of the potential for ICT use and active learning |
| Subquestion 1: How do middle school site principals reduce or eliminate barriers to effectively integrate the active use of technology in the classroom for student learning? | • Providing formal and internal professional development opportunities  
• Organizing fundraisers for additional ICT  
• Encouraging the development of a non-ICT backup lesson  
• Visionary leadership approaches  
• Providing real-time technology support  
• Creating a school culture supportive of risk taking with ICT  
• Providing time for teachers to collaborate on ICT and active learning lesson development |
| Subquestion 2: How do middle school site principals determine if the active use of technology is effectively integrated in the classroom to increase student learning? | • Virtual classrooms  
• Hands-on learning software and applications  
• Student-created interactive documents and presentations |
Central research question. The central research question was, “What are the barriers that middle school principals perceive affect the integration of the active use of technology for student learning?” Participant D identified the lack of devices and Chromebooks as a major barrier to the use of ICT for active learning. She explained, “We have 10 Chromebook carts here, and they’re booked up solid every single day, never available. When you ask teachers, ‘What do you need from me?’ ‘We need more Chromebooks.’” Participant D added that the school’s and district’s wireless infrastructure also needed to be updated to handle the increased number of students using wireless devices. This barrier was directly related to the funding allocated to the school for purchasing new ICT and the district’s allocations for increasing the capacity of the wireless network.

Participant D also explained that some teachers’ lack of knowledge of how to incorporate ICT for active learning and traditional teaching styles were additional barriers to ICT integration. She stated, “Some teachers feel like, ‘If I don’t know the technology, I can’t use it in my classroom.’” Furthermore, it was this traditional teaching approach that limited the use of ICT for active learning activities, especially activities that provided students with choice or alternative ways to demonstrate learning. An example Participant D provided was when the teachers would tell students they were going to make a PowerPoint presentation instead of allowing the students to choose their form of presentation software or application. Additionally, teachers were struggling with how to assess active learning activities and projects supported by ICT. These new approaches were often not in alignment with traditional teaching styles and therefore may not have been used as often.
**Research Subquestion 1.** The first research subquestion was, “How do middle school site principals reduce or eliminate barriers to effectively integrate the active use of technology in the classroom for student learning?” Participant D identified that finding additional funding sources was an approach that had helped reduce the barrier of the limited number of devices for students’ use. She had used fundraisers, community partnerships, and local foundations to gain access to additional funding for ICT. Furthermore, Participant D shared how she actively engaged in conversations with the district technology team about the need for a robust and expansive wireless network to support the additional student devices.

Participant D offered and organized formal and internal professional development opportunities for teachers to increase their capacity to use ICT for active learning. The formal trainings included attending conferences about the use of ICT for active learning. For internal professional development, Participant D had teachers self-select inquiry groups. She explained that approximately half of the teachers used this time for developing skills for Google Classroom in a “self-driven and self-chosen professional development.” Participant D believed that the combination of formal professional development and teacher-driven, internal professional development was an effective strategy for reducing barriers to ICT integration for active learning.

Lastly, Participant D shared some visionary leadership approaches. These included having dialogues with teachers about how the classroom of the future will look and what will need to change. This visionary approach helped teachers understand that with the integration of ICT and active learning activities, some old and traditional activities and approaches to the educational process were no longer required.
Research Subquestion 2. The second research subquestion was, “How do middle school site principals determine if the active use of technology is effectively integrated in the classroom to increase student learning?” Participant D shared that ICT was regularly used in her school to support active learning. She observed students conducting virtual dissections, analyzing and manipulating math problems, and developing presentations. Most teachers had a virtual classroom environment where students could collaborate and discuss current topics and projects. Participant D also shared that she observed students developing interactive documents and projects that demonstrated analysis, synthesis, and evaluation of the content and then presenting this information through the use of ICT.

Participant E. Participant E was a male intermediate school principal from Orange County. Table 7 summarizes Participant E’s responses by themes and patterns related to the central research question and two research subquestions.

Central research question. The central research question was, “What are the barriers that middle school principals perceive affect the integration of the active use of technology for student learning?” Participant E shared that the lack of funding for ICT was a significant barrier for certain schools including his current school. He explained, “This is always the barrier. I have teachers that want more technology than we can provide, and if we can’t provide the technology, it’s not there to be used.” Participant E noted that his school had 10 laptop or Chromebook carts, with six dedicated to specific teachers and four available for checkout. While the six teachers with the carts had ICT readily available, those teachers without often did not use ICT due to the need to check out the cart.
Participant E: Themes and Patterns in Responses to Research Questions

<table>
<thead>
<tr>
<th>Research question</th>
<th>Theme/pattern</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central question: What are the barriers that middle school principals perceive affect the integration of the active use of technology for student learning?</td>
<td>• Lack of district level direction and planning</td>
</tr>
<tr>
<td></td>
<td>• Funding for ICT hardware</td>
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<td></td>
<td>• Lack of professional development opportunities</td>
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<tr>
<td></td>
<td>• Teachers not attending professional development</td>
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<td></td>
<td>• Lack of teacher knowledge</td>
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<td></td>
<td>• Lack of alignment between activities and district level assessments</td>
</tr>
<tr>
<td>Subquestion 1: How do middle school site principals reduce or eliminate barriers to effectively integrate the active use of technology in the classroom for student learning?</td>
<td>• Providing ICT for student use on a regular basis</td>
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<tr>
<td></td>
<td>• Providing formal professional development</td>
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<tr>
<td></td>
<td>• Providing for teacher collaboration on ICT use</td>
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<td></td>
<td>• Providing teacher leaders in ICT use</td>
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<tr>
<td></td>
<td>• Assistant principal</td>
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<tr>
<td></td>
<td>• Using a leadership team to integrate ICT into lesson design and school culture</td>
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<td></td>
<td>• Provide a technology support teacher on site</td>
</tr>
<tr>
<td>Subquestion 2: How do middle school site principals determine if the active use of technology is effectively integrated in the classroom to increase student learning?</td>
<td>• Observations of students conducting research and writing</td>
</tr>
<tr>
<td></td>
<td>• Students participating in a virtual classroom</td>
</tr>
<tr>
<td></td>
<td>• Students engaged in ICT supported collaboration</td>
</tr>
</tbody>
</table>

Participant E also identified teachers’ lack of knowledge in the use of ICT for active learning as a barrier. He connected this barrier to the lack of professional development opportunities for ICT use, or the lack of teachers wanting to participate in these professional development opportunities was another barrier to ICT integration for active learning. Participant E further expressed that most teachers would participate in professional development for ICT use, but the lack of opportunities and limited space at the district-level training were greater barriers; only a limited number of teachers were not willing to participate. Other teachers simply refused to participate in professional development trainings outside of the school day.
Lastly, Participant E identified a barrier that stemmed from the district level. He explained that there was a lack of district-level direction on the use of ICT in the classroom. This created a barrier in that there was limited or no alignment in the direction the district was going for the use of ICT to support active learning. He went on to support this claim with the fact that the district-level assessments did not address any ICT use and therefore left teachers questioning the importance of ICT and active learning.

**Research Subquestion 1.** The first research subquestion was, “How do middle school site principals reduce or eliminate barriers to effectively integrate the active use of technology in the classroom for student learning?” Participant E emphasized the need to provide ICT for regular student use as a highly effective strategy for reducing barriers to ICT to support active learning. He explained his firsthand experiences watching the use of ICT for active learning greatly increase once laptops, Chromebooks, or handheld devices were readily available for students. This also reduced the barrier of any checkout process that might hinder a teacher from providing ICT for student use.

Participant E also shared a strategy that providing time for teachers to collaborate led to a reduction of barriers to ICT use for active learning. He elucidated that this time could be spent discussing concepts from professional development opportunities, sharing best practices for ICT use for active learning, and exploring future professional development opportunities. Participant E supported this claim of effective collaboration time by sharing that this process led to the idea of having teachers and administrators from the district attend the Computer Using Educators conference. In turn, this professional development opportunity provided both teachers and administrators with
additional training on effective ways to integrate ICT for active learning. Additionally, Participant E added the importance of having a site leadership team support the collaborative process. He explained that teachers could use “both our Instructional Leadership Team teachers as well as our department chairs as point people for technology” when involved in collaboration time or lesson planning.

Finally, Participant E stated that providing time for teachers to observe effective use of ICT for active learning was another strategy for reducing barriers to ICT use. He explained that this process reduced the barriers related to teachers not believing students could do this work, fear of not knowing how to use the technology, and the logistics of using ICT in a 1:1 setting. Additionally, Participant E shared that time could also be provided for teachers who were advanced in ICT use or the school librarian, who was a technology leader, to go into a teacher’s classroom to support the integration of ICT for active learning activities.

Research Subquestion 2. The second research subquestion was, “How do middle school site principals determine if the active use of technology is effectively integrated in the classroom to increase student learning?” Participant E shared that the most common use of ICT for active learning was through research and authentic writing assignments. Additionally, the use of Google Classroom and other virtual classroom platforms was another way students were more actively involved in the learning process. Lastly, Participant E stated that students could also be involved in group projects and presentations that used ICT for research and developing the presentation.
Participant F. Participant F was a male intermediate school principal from Orange County. Table 8 summarizes Participant F’s responses by themes and patterns related to the central research question and two research subquestions.

Table 8

*Participant F: Themes and Patterns in Responses to Research Questions*

<table>
<thead>
<tr>
<th>Research question</th>
<th>Theme/pattern</th>
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</thead>
</table>
| **Central question:** What are the barriers that middle school principals perceive affect the integration of the active use of technology for student learning? | • Lack of training for principals on ICT integration  
• Allocating fiscal resources and ICT hardware  
• Purchasing ineffective hardware and software  
• Developing coaches for supporting ICT integration  
• Missing or ineffective school technology plan  
• Student teacher programs without ICT pedagogy  
• Veteran teachers reluctant to use ICT in the classroom  
• Lack of teacher knowledge in using ICT for instruction  
• Traditional teaching styles  
• Time constraints in teaching both content and ICT use |
| **Subquestion 1:** How do middle school site principals reduce or eliminate barriers to effectively integrate the active use of technology in the classroom for student learning? | • Building robust wireless infrastructure  
• Providing ample computers and devices for student and teacher use  
• Providing formal and informal professional development opportunities  
• Using outside consultants for developing a technology plan  
• Visionary leadership style  
• Adopting new curriculum with ICT built into the programs  
• Providing time for teachers to collaborate  
• Using a teacher leadership team  
• Developing a strong technology plan |
| **Subquestion 2:** How do middle school site principals determine if the active use of technology is effectively integrated in the classroom to increase student learning? | • Using substitution, augmentation, modification, redefinition (SAMR) as an observation tool  
• Observations of students creating presentations and collaborating with ICT support  
• Students participating in a virtual classroom environment |

*Central research question.* The central research question was, “What are the barriers that middle school principals perceive affect the integration of the active use of
technology for student learning?” Participant F identified several barriers to integrating ICT for active learning. These barriers were in the areas of teachers’ knowledge and teaching style, funding, the school’s culture, and technology organization. Participant F indicated that the barriers related to the teachers seemed to be the most significant.

Participant F believed that teachers had a difficult task of covering the content curriculum and incorporating ICT within the time constraints of the class period or even within the school year. For veteran teachers, Participant F explained that it was difficult “if a teacher has been teaching for a long time, planning in one way, and now you are plugging in technology and active learning.” Participant F followed this statement with questions teachers asked: “How do I plan? How do I prepare? How do I change my thinking?” Further contributing to the problem, Participant F shared that he did not believe that the universities were teaching new teachers how to integrate ICT into lessons and were still using traditional teaching styles as a form of instruction.

Participant F also shared that in his experience, funding was not a major barrier to ICT integration, but the allocation of the funds could be a barrier. Participant F provided an example of a subscription-based program for virtual labs that actually ended up being more expensive than doing the same lab in a hands-on environment. According to Participant F, deciding on how funds should be used was the barrier, not the funds themselves. Additionally, Participant F shared that misuse of these funds created a barrier of purchasing ineffective ICT and therefore creating negative opinions about ICT integration among the teaching staff.

Lastly, Participant F shared that a lack of a comprehensive school technology plan was a major barrier to integrating ICT for active learning. Participant F believed that
without an effective school technology plan, funds would be misused, professional
development opportunities would not be identified or appropriately funded, and teachers
would not be provided with direction for how ICT could support active learning.
Furthermore, Participant F shared that he was not aware of any training available to
principals on how to develop an effective technology plan. He believed this lack of
principal training was a barrier that would magnify all other barriers to ICT integration.

**Research Subquestion 1.** The first research subquestion was, “How do middle
school site principals reduce or eliminate barriers to effectively integrate the active use of
technology in the classroom for student learning?” Participant F believed that having
ample ICT in the form of laptops, devices, and a robust wireless network was an
important step to increase ICT in the classroom. He went on to explain that his current
school had over a 1:1 ratio of students to devices and utilized laptops, Chromebooks,
 iPads, and surface tablets with a wireless system able to accommodate all ICT-related
activities. He believed this level of ICT hardware allowed him and the staff to focus on
reducing other barriers to ICT integration.

Another strategy Participant F believed was effective to increase the use of ICT
for active learning was providing time for teachers to attend professional development
and collaborate. Participant F believed the most effective professional development was
the use of “educational technology workshops” where teachers were provided with
opportunities to “get in there with other colleagues that are doing it and seeing it.”
Furthermore, Participant F stated that these trainings should be ongoing and that teachers
should be provided with time at their school site to collaborate with each other on best
practices and ways to use ICT for active learning.
Finally, Participant F shared that the most effective strategy for reducing barriers to ICT integration was a visionary leadership approach and the development of an effective school technology plan. Participant F shared that he believed that purchases of ineffective ICT hardware, teachers’ reluctance to use ICT, and a lack of active learning supported by ICT were often related to poor or no planning. In clarification, Participant F explained that a technology plan would require staff to answer questions related to ICT purchases and uses like, “How often did you use it? Did it achieve what you needed to do? Is it something that is sustainable?” Additionally, Participant F expressed that this type of planning would require additional training for principals and teachers to create effective school technology plans.

**Research Subquestion 2.** The second research subquestion was, “How do middle school site principals determine if the active use of technology is effectively integrated in the classroom to increase student learning?” Participant F stated that using the substitution, augmentation, modification, redefinition (SAMR) model for classroom observations was a way he could determine if ICT was being used for active learning. This approach allowed him to quickly assess if ICT was being used for active or passive learning. Additionally, Participant F said he knew several teachers were using active learning activities including student blogs and discussion boards to engage in conversations about the content. In conclusion, Participant F shared that during classroom observations, he observed students engaged in creating and delivering presentations with the use of ICT.
Participant G. Participant G was a female middle school principal from Orange County. Table 9 summarizes Participant G’s responses by themes and patterns related to the central research question and two research subquestions.

Table 9

Participant G: Themes and Patterns in Responses to Research Questions

<table>
<thead>
<tr>
<th>Research question</th>
<th>Theme/pattern</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central question: What are the barriers that middle school principals perceive affect the integration of the active use of technology for student learning?</td>
<td>• Resistance from parents and community members</td>
</tr>
<tr>
<td></td>
<td>• Lack of alignment between ICT and district-level assessments</td>
</tr>
<tr>
<td></td>
<td>• Funding a refresh program for ICT hardware</td>
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<td></td>
<td>• Limited professional development opportunities</td>
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<tr>
<td></td>
<td>• Ineffective professional development with little or no follow-up</td>
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<td></td>
<td>• Teachers’ lack of confidence and knowledge in using ICT</td>
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<td></td>
<td>• Students’ lack of knowledge in using ICT</td>
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<td></td>
<td>• Traditional teaching style</td>
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<tr>
<td></td>
<td>• Lack of teacher planning</td>
</tr>
<tr>
<td></td>
<td>• Time for teaching content and ICT use</td>
</tr>
<tr>
<td>Subquestion 1: How do middle school site principals reduce or eliminate barriers to effectively integrate the active use of technology in the classroom for student learning?</td>
<td>• Provide ICT for student use</td>
</tr>
<tr>
<td></td>
<td>• Provide formal and informal professional development opportunities</td>
</tr>
<tr>
<td></td>
<td>• Utilize schoolwide ICT practices for administrative duties</td>
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<td></td>
<td>• Provide parent training on ICT use</td>
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<tr>
<td></td>
<td>• Provide time for teachers to observe ICT use in the classroom</td>
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<tr>
<td></td>
<td>• Use a district- and school-based technology coach</td>
</tr>
<tr>
<td></td>
<td>• Teacher collaboration on ICT use</td>
</tr>
<tr>
<td>Subquestion 2: How do middle school site principals determine if the active use of technology is effectively integrated in the classroom to increase student learning?</td>
<td>• Observations of students using ICT for presentations</td>
</tr>
<tr>
<td></td>
<td>• Virtual classroom platforms</td>
</tr>
<tr>
<td></td>
<td>• Project-based learning (PjBL)</td>
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</tbody>
</table>

Central research question. The central research question was, “What are the barriers that middle school principals perceive affect the integration of the active use of
technology for student learning?” Participant G stated that many barriers to ICT integration for active learning were related to teachers’ lack of training and traditional teaching styles. Participant G explained that she believed that “teachers who don’t have confidence in their pedagogy or they don’t have technology strategies and just have some basic instruction” would struggle in integrating ICT or active learning activities. Participant G added that this barrier was evident during classroom observations and follow-up conversations with teachers, explaining,

SAMR is such a different concept for our teachers. They have been teaching for years, and I still find that within all this, we hit these plateaus, and we have to go back and revisit and ask questions like, “Where are you? What are your lessons? What are you trying to accomplish?”

Participant G further explained her belief that the barrier of teachers’ lack of knowledge in integrating ICT for active learning was compounded by limited effective professional development opportunities for teachers. Participant G explained that the district offered professional development on using ICT in the classroom, but there was a lack of follow-up training and limited attention given to addressing the needs of adult learners. These factors continued to hinder teachers from learning how to integrate ICT for active learning.

Participant G also indicated that funding for ICT hardware could be a barrier to integrating ICT for active learning. At the time of the study, Participant G’s school had a 1:1 student-to-computer ratio, but the costs to refresh the laptops, Chromebooks, and devices were a barrier that needed to be addressed. However, Participant G believed that
the district would provide the funds necessary to keep the school as a 1:1 learning environment.

Additional barriers Participant G discussed were related to time. This included time for teachers to plan and a time constraint related to teaching the content curriculum versus the skills for using ICT. She felt that many teachers did not spend the time necessary to apply backward curriculum mapping to develop lessons in which ICT was used for active learning and for students to produce relevant and authentic work. Also, teachers felt pressure to prepare students to succeed on district-level assessments that did not measure ICT use or require active learning. This led to a barrier of time in the classroom required to teach and cover the content that would be on the district-level assessment.

A final barrier Participant G identified was resistance from parents. She explained that the demographics of the school tended to be at a lower socioeconomic level, and some parents felt that as more activities of school went online, they were less able to support their students. Participant G added that some community members questioned the amount of money spent on ICT versus the value in student learning. This concern appeared to be related to passive learning activities using ICT that could be completed without ICT at a lesser cost and at the same level of effectiveness.

Research Subquestion 1. The first research subquestion was, “How do middle school site principals reduce or eliminate barriers to effectively integrate the active use of technology in the classroom for student learning?” Participant G strongly believed that providing a 1:1 student-to-device program was crucial to reducing barriers to ICT integration for active learning. Her current school had accomplished this level of ICT
and used a checkout system so that students had Chromebooks at home as well. Additionally, this level of ICT for the students had driven the direction for the school’s internal, informal professional development opportunities.

Participant G shared that the school’s professional development always included how to integrate ICT, specifically the students’ use of the Chromebook, for regular daily instruction. She shared that this approach had led to an increase in ICT use and shifted the focus to more active learning activities. Furthermore, these professional development opportunities included a section on addressing the desired student outcome, which included active learning products. Also, Participant G believed that providing time for teachers to observe each other was helpful to get teachers started with ICT use, but she felt that this strategy was a short-term approach and did not provide sustainable change.

For sustainable change that increased the use of ICT for active learning, Participant G strongly felt that time for teachers to collaborate on a global level and teacher coaching were essential. She went on to identify several teachers who had increased their use of ICT for active learning through participation in teacher blogs and on-site collaboration time. Additionally, Participant G strongly felt that the use of the district technology coach and her on-site technology coach had helped teachers increase their use of effective ICT for active learning. Specifically, these coaches could ask specific questions and provide solutions to help lower teachers’ anxiety toward ICT use, coplan or coteach a lesson using ICT for active learning, or explore new approaches to ICT for active learning together with the teachers. The coaches could also help plan and deliver some of the professional development that targeted the teachers’ specific needs.
Participant G also stated that a strategy that had helped teachers use more ICT and increase their comfort level with technology was to push out information through the use of ICT. This included using the educational management system, Haiku, for daily reminders, professional development opportunities, and other forms of information. This had helped teachers become more familiar with the educational management system, and a few teachers now regularly used Haiku with their students. Participant G added that training for parents had started, but additional training would be helpful in reducing the barrier of parent and community member resistance.

**Research Subquestion 2.** The second research subquestion was, “How do middle school site principals determine if the active use of technology is effectively integrated in the classroom to increase student learning?” Participant G shared that as more teachers were using Haiku, she was better able to observe and monitor student work. This educational management system included student portfolios highlighting their activities, projects, and products. This system allowed Participant G to assess the level of active versus passive learning activities. Additionally, through her regular classroom observations, she observed students regularly using Chromebooks and devices, like iPads, to research and construct authentic products. Furthermore, Participant G acknowledged an increase in project-based learning (PjBL) activities that utilized ICT for the research, analysis, and presentation of information.

**Participant H.** Participant H was a female middle school principal from Orange County. Table 10 summarizes Participant H’s responses by themes and patterns related to the central research question and two research subquestions.
Table 10

Participant H: Themes and Patterns in Responses to Research Questions

<table>
<thead>
<tr>
<th>Research question</th>
<th>Theme/pattern</th>
</tr>
</thead>
</table>
| Central Question: What are the barriers that middle school principals perceive affect the integration of the active use of technology for student learning? | • Lack of funding for student devices and wireless infrastructure  
• Lack of professional development  
• Lack of student access to ICT outside of school  
• Teachers’ demographics  
• Teachers’ lack of knowledge  
• Traditional teaching styles  
• Lack of time for professional development, collaboration, and preparation |
| Subquestion 1: How do middle school site principals reduce or eliminate barriers to effectively integrate the active use of technology in the classroom for student learning? | • Provide ICT for student and teacher use  
• Provide internal professional development opportunities  
• Visionary leadership approach  
• Piloting ICT use with skilled teachers  
• Providing technology support  
• Providing time for teachers to develop ICT-based lessons and attend trainings  
• Developing a school culture of regular ICT use  
• Utilizing school site and district teacher coaches for ICT |
| Subquestion 2: How do middle school site principals determine if the active use of technology is effectively integrated in the classroom to increase student learning? | • Virtual classrooms  
• PjBL supported with student presentations  
• Hands-on, ICT-supported simulations and labs |

Central research question. The central research question was, “What are the barriers that middle school principals perceive affect the integration of the active use of technology for student learning?” Participant H believed that the principal barrier to ICT integration for active learning was student access to devices and the level of wireless connectivity. She explained that schools increasing their student use of ICT would encounter the barriers of funding the devices and then ensuring the wireless network is
adequate to ensure all students can have simultaneous Internet access. Moreover, until this barrier is addressed, additional barriers are more difficult to reduce or eliminate.

Participant H shared that the teachers’ proximity to retirement, knowledge, and teaching styles were all potential barriers to integrating ICT for active learning. First, Participant H explained that successfully integrating ICT for active learning may take several years, and teachers who were close to retiring were more likely to resist new approaches to teaching that required ICT. Second, teachers did not understand how to effectively integrate ICT for active learning or how to develop lessons that used ICT to support active learning. Lastly, some teachers had a traditional teaching style. Participant H explained,

Teachers are used to being the absolute expert in the classroom, and now all of a sudden this is something that is brand new to them, and they are not the experts:

“What happens if things go wrong? How do I do that?”

Teachers who had traditionally been the providers of information found ICT to be a challenge to their ability to appear all knowing.

Lastly, Participant H believed that the lack of time teachers had to attend professional development and prepare lessons that used ICT to support active learning was a significant barrier to integrating ICT for active learning. Participant H explained that afterschool trainings were not always attended and that it could be difficult to secure substitute coverage for teachers to attend professional development trainings during the day. Lastly, it would take a considerable amount of time for teachers to develop new lessons that integrated ICT for active learning. Participant H explained, “This also
requires a lot of time in it because you have to redo all of your lessons, all of your activities, everything, and I think that can be a little daunting to people.”

**Research Subquestion 1.** The first research subquestion was, “How do middle school site principals reduce or eliminate barriers to effectively integrate the active use of technology in the classroom for student learning?” Participant H strongly believed that providing ICT for students and teachers was essential for increasing the use of ICT in the classroom. She stated, “One thing that has been a top priority of mine is just getting them [devices] in the classroom; let’s just start using them.” Believing the barrier of access to ICT was the most significant was also supported by the comment, “Why train teachers on something they think they are not going to be able to use, they do not have access to?”

A second approach Participant H used to reduce the barriers to integrating ICT for active learning was providing internal professional development. This was accomplished by surveying the staff for their ICT needs and then working with teacher leaders to develop targeted professional development activities for the staff. Participant H explained that this approach had led to significant improvements in the amount of ICT used in the classroom. Furthermore, she had identified teachers who had a strong understanding of ICT and active learning and utilized their skills in supporting internal professional development activities and providing direct support to struggling or resistant teachers.

Another strategy was to provide time for teachers to use ICT and develop lessons that utilized ICT to support active learning. Participant H stated, “Twice a year for each department, I do an all-day sub for them so that they can have an opportunity to come together as a team, do some sort of lesson creation.” She also believed that providing
time built a school culture of support and allowed for teachers to assist each other in the integration of ICT for active learning.

Lastly, Participant H used visionary leadership approaches to help reduce barriers to integrating ICT for active learning. These approaches included pilotng new ideas for ICT integration with specific teacher leaders who had specific ideas and goals for how ICT would support active learning and ultimately student achievement. Additionally, Participant H identified the need to increase student use of ICT outside of the school day. This approach may include checking out Chromebooks and working with families to receive wireless Internet access.

Research Subquestion 2. The second research subquestion was, “How do middle school site principals determine if the active use of technology is effectively integrated in the classroom to increase student learning?” Participant H explained that most core teachers used Google Classroom and that this had led to an increase in active learning activities. This included students completing both PjBL and problem-based learning (PBL) activities that required ICT, student collaboration, and developing presentations. Teachers were also looking to student-created, interactive digital portfolios that would house ICT-supported active learning projects.

Participant I. Participant I was a female intermediate school principal from Riverside County. Table 11 summarizes Participant I’s responses by themes and patterns related to the central research question and two research subquestions.

Central research question. The central research question was, “What are the barriers that middle school principals perceive affect the integration of the active use of technology for student learning?” Participant I indicated that the skills of both the
Table 11  
Participant I: Themes and Patterns in Responses to Research Questions

<table>
<thead>
<tr>
<th>Research question</th>
<th>Theme/pattern</th>
</tr>
</thead>
</table>
| Central question: What are the barriers that middle school principals perceive affect the integration of the active use of technology for student learning? | • Understanding digital citizenship  
• School and district wireless infrastructure  
• Establishing and funding a hardware refresh program  
• Student knowledge and skills  
• Teachers’ traditional teaching style  
• Teachers’ lack of knowledge  
• The principal’s skills and knowledge  
• Time to teach computer skills  
• Limited professional development opportunities for teachers |
| Subquestion 1: How do middle school site principals reduce or eliminate barriers to effectively integrate the active use of technology in the classroom for student learning? | • Bring-your-own-device (BYOD) program  
• Utilize the district educational technology resources  
• Funding hardware for students and teachers  
• Professional development for ICT use in the classroom  
• Internal professional development activities  
• Assistant principal  
• Setting goals for ICT use  
• Providing classes supported by ICT outside of the school day  
• Changing the school culture  
• Utilizing a teacher technology leader |
| Subquestion 2: How do middle school site principals determine if the active use of technology is effectively integrated in the classroom to increase student learning? | • Observations of students using online writing supports  
• Virtual classrooms |

students and the teachers were barriers to integrating ICT for active learning. Participant I explained that many of the middle school students at her school lacked basic computer skills and understanding of digital citizenship. She had observed that students were entering middle school without a basic understanding of using ICT for learning and that teachers were unprepared to teach these basic skills along with teaching digital citizenship. Additionally, Participant I stated that the staff consisted of many veteran
teachers who were afraid of using ICT and did not have a basic understanding of how ICT could be used to support student learning. She expressed, “They are uncomfortable with technologies, so that lack of training or experience depletes what the kids may get in the classroom.” She went on to explain that many teachers were more comfortable with traditional teaching techniques such as lecture and pencil-and-paper worksheets.

Participant I also linked the lack of both student and teacher skills with ICT to time constraints. She explained that teachers felt pressure to cover the content, and if time was spent teaching ICT skills or applications, they would fall behind the district pacing guide. Participant I also explained that some teachers indicated they did not have time to attend additional training or professional development for ICT integration into the classroom.

Participant I also shared that funding was another barrier to integrating ICT. While her school had an adequate level of technology for both teachers and students, Participant I indicated that many of the devices and laptops were more than 4 years old and in need of replacing or repair. Furthermore, Participant I’s school was a much older building that required additional upgrades and infrastructure hardware to run the wireless system. Even the school’s computer labs that were directly supported by the district servers could not maintain the level of connectivity to support all students using ICT at the same time.

**Research Subquestion 1.** The first research subquestion was, “How do middle school site principals reduce or eliminate barriers to effectively integrate the active use of technology in the classroom for student learning?” Participant I expressed that having ICT for student use was crucial for reducing barriers to ICT integration. She explained
that the school had purchased several laptop and iPad carts for the core content classes, and additional laptop carts were ordered to provide a 1:1 environment in English classes. Additionally, all teachers had classrooms equipped with technology to support students’ learning.

Participant I also explained that changing the school culture had also helped reduce barriers to ICT integration. These strategies included putting homework assignments online, using virtual classrooms, and utilizing a teacher technology leader. Expanding on the teacher technology leader, Participant I explained that he was working with teachers to incorporate more technology into their daily lessons. This teacher technology leader had supported the school’s “bring-your-own-device” (BYOD) program and social media efforts and had supported teachers in using more Internet-based activities.

Finally, Participant I shared that she also found ways to provide additional opportunities for students to use ICT to support their learning. With over 60% of the school population qualifying as socioeconomically disadvantaged, many did not have access to technology at home. The school provided computer labs both before and after school to support students using ICT for their learning.

**Research Subquestion 2.** The second research subquestion was, “How do middle school site principals determine if the active use of technology is effectively integrated in the classroom to increase student learning?” Participant I stated that she observed ICT for active learning in her classroom observations. These activities included students conducting webquests, conducting authentic research through the Internet, and participating in virtual classrooms like Google Classroom and Class Dojo. Additionally,
she shared that students used electronic tablets in math to complete and share their math assignments and projects.

**Participant J.** Participant J was a male intermediate school principal from Riverside County. Table 12 summarizes Participant J’s responses by themes and patterns related to the central research question and two research subquestions.

Table 12. Participant J: Themes and Patterns in Responses to Research Questions

<table>
<thead>
<tr>
<th>Research question</th>
<th>Theme/pattern</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central question: What are the barriers that middle school principals perceive affect the integration of the active use of technology for student learning?</td>
<td>• Funding ICT for student use&lt;br&gt;• Providing professional development opportunities&lt;br&gt;• Reluctant veteran teachers&lt;br&gt;• Traditional teaching styles&lt;br&gt;• Teachers’ lack of knowledge in using ICT</td>
</tr>
<tr>
<td>Subquestion 1: How do middle school site principals reduce or eliminate barriers to effectively integrate the active use of technology in the classroom for student learning?</td>
<td>• Providing ICT for teachers and students&lt;br&gt;• Providing ongoing, formal professional development opportunities&lt;br&gt;• Providing internal professional development opportunities&lt;br&gt;• Using ICT for more staff-wide activities and communication&lt;br&gt;• Providing time for collaboration&lt;br&gt;• Use of a school-based technology committee</td>
</tr>
<tr>
<td>Subquestion 2: How do middle school site principals determine if the active use of technology is effectively integrated in the classroom to increase student learning?</td>
<td>• Student use of writing and editing programs&lt;br&gt;• Virtual classroom environments&lt;br&gt;• Schoolwide AVID strategies supported by ICT</td>
</tr>
</tbody>
</table>

**Central research question.** The central research question was, “What are the barriers that middle school principals perceive affect the integration of the active use of technology for student learning?” Participant J strongly believed that teachers’, specifically veteran teachers’, lack of knowledge and traditional teaching styles were
major barriers to integrating ICT for active learning. He said, “Most of my staff has been
teaching for 15 to 20 years, and this [ICT] is a foreign object to them.” He added that
even when the veteran teachers used ICT in the classroom, it was in a teacher-directed
way or through passive learning techniques. Furthermore, he also explained that he
believed this barrier was related to teachers’ limited skills in using ICT and limited
professional development opportunities to improve these skills.

Participant J added that funding for ICT for student use was also a barrier. He
indicated that his current school site used computer labs and a limited number of laptop
carts, which created a constraint on access to ICT. While he acknowledged that this was
a barrier, he clearly indicated that the teacher training was still a larger issue that needed
to be addressed.

Participant J shared that the use of a technology committee was a strategy that
could help increase the use of ICT for active learning. At the time of the study, the
technology committee at his school was surveying teachers to determine specific needs
related to ICT equipment and professional development or training needs. This
committee could then set the course for the school when it came to funding additional
ICT purchases and plan for professional development.

Research Subquestion 1. The first research subquestion was, “How do middle
school site principals reduce or eliminate barriers to effectively integrate the active use of
technology in the classroom for student learning?” Participant J stated that teachers
needed formal professional development that included regular follow-up training and
internal, informal professional development on a regular basis at the school site.
Participant J explained, “We had a great system of what they called symposiums where in
your summer time and winter break time and spring break where teachers can go for up to 5 days.” He added that this system also gave teachers up to 5 release days for lesson planning, observing other teachers, or follow-up trainings. Teachers participating in the symposiums made significant growth in the areas of the professional development, including ICT use. Participant J strongly believed that bringing back the symposiums system for ICT integration for active learning would have long-lasting, positive effects.

Additionally, Participant J added that on-site professional development would help increase ICT use for active learning. His approach would include a monthly “Technology Tuesday” where on-site teachers could present lessons, activities, and concepts around the use of ICT for active learning. Participant J added that these trainings could follow the same themes of the symposiums for more alignment with the district and other schools.

Lastly, Participant J acknowledged that even though the school had more than tripled the number of computers, laptops, and devices for student use, there was still a need for additional hardware to further increase the use of ICT for active learning. At the time of the study, all teachers on-site had Surface Pro laptops, which addressed the need for staff to have ICT hardware. Participant J believed that moving the school to a 1:1 student-to-computer ratio through the use of Chromebook carts in all core classes would eliminate the barrier of access to ICT. This, then, would allow the focus to shift to professional development for integrating ICT in the classroom for active learning.

**Research Subquestion 2.** The second research subquestion was, “How do middle school site principals determine if the active use of technology is effectively integrated in the classroom to increase student learning?” Participant J had noticed an increase in the
use of ICT for student writing and editing, specifically in seventh-grade English classes. These classes also had more use of student-created presentations. Another example of ICT-supported active learning was the use of virtual classrooms through educational management systems such as Canvas and Blackboard. Lastly, Participant J stated that Advancement Via Individual Determination (AVID) strategies were being reorganized to use ICT to support the active learning process. These strategies included the use of ICT for supporting inquiry questions and virtual collaboration on projects.

**Participant K.** Participant K was a male middle school principal from Riverside County. Table 13 summarizes Participant K’s responses by themes and patterns related to the central research question and two research subquestions.

**Central research question.** The central research question was, “What are the barriers that middle school principals perceive affect the integration of the active use of technology for student learning?” Participant K identified that a district’s weak or insufficient wireless network is a major barrier to integrating ICT. He clarified that at the time of the study, his district’s wireless network was robust and could accommodate all students online, but this took 5 years to accomplish. Similarly, Participant K noted that if the wireless network becomes reliable but ICT in the classroom is unreliable, this would also be a barrier to ICT integration for active learning. Participant K explained that his current school was 1:1, and when the Chromebooks were not accessible due to connectivity or battery power issues, teachers became frustrated and more reluctant to use ICT.
### Table 13

**Participant K: Themes and Patterns in Responses to Research Questions**

<table>
<thead>
<tr>
<th>Research question</th>
<th>Theme/pattern</th>
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<tbody>
<tr>
<td>Central question: What are the barriers that middle school principals perceive affect the integration of the active use of technology for student learning?</td>
<td>• Unreliable or weak wireless network</td>
</tr>
<tr>
<td></td>
<td>• Lack of district openness to new ICT</td>
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<td></td>
<td>• Lack of professional development opportunities for teachers</td>
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<td></td>
<td>• Unreliable ICT in the classrooms</td>
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<td></td>
<td>• Lack of ICT access for students outside of the school day</td>
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<tr>
<td></td>
<td>• Teacher knowledge in using ICT</td>
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<tr>
<td></td>
<td>• Traditional teaching style</td>
</tr>
<tr>
<td>Subquestion 1: How do middle school site principals reduce or eliminate barriers to effectively integrate the active use of technology in the classroom for student learning?</td>
<td>• Funding for ICT devices and wireless network</td>
</tr>
<tr>
<td></td>
<td>• Establishing a 1:1 environment</td>
</tr>
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<td></td>
<td>• Providing formal and internal professional development opportunities</td>
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<td></td>
<td>• Assistant principal</td>
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<tr>
<td></td>
<td>• Principal-directed use of ICT</td>
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<td></td>
<td>• Visionary leadership approaches</td>
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<tr>
<td></td>
<td>• Using teachers as ICT coaches</td>
</tr>
<tr>
<td>Subquestion 2: How do middle school site principals determine if the active use of technology is effectively integrated in the classroom to increase student learning?</td>
<td>• Virtual classrooms</td>
</tr>
<tr>
<td></td>
<td>• STEM activities</td>
</tr>
<tr>
<td></td>
<td>• Interactive software and applications</td>
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<td></td>
<td>• PjBL and problem-based learning (PBL) activities</td>
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</tbody>
</table>

Another barrier to integrating ICT for active learning identified by Participant K was a lack of professional development opportunities for teachers or teachers’ unwillingness to attend these professional development opportunities. He believed that a lack of time for teachers to attend these trainings, instead of a lack of desire, was the reason they did not attend these professional development opportunities. Participant K believed that by not attending regular professional development opportunities related to ICT, teachers would not apply the most effective use of ICT in the classroom. Furthermore, Participant K explained that even teachers who regularly used ICT for
active learning needed refresher professional development to continue to improve in their
teaching and development of lessons with ICT for active learning.

Lastly, Participant K identified barriers to the integration of ICT for active
learning that were related to teachers’ knowledge of ICT and traditional teaching styles.
Participant K said, “Technology changes all the time and depending on where the teacher
is in their comfort zone, in their exploration zone, how proficient they are, and how they
can successfully integrate that into their classroom routines.” Teachers’ lack of
knowledge in using ICT for active learning was identified as a major barrier to
integrating ICT. Additionally, traditional teaching styles were identified as a barrier to
ICT integration and active learning lessons and activities. Teachers who had more
traditional teaching styles viewed active learning with ICT as a lack of control over the
learning process. Participant K stated,

The barrier is there are still teachers that feel like a well-run classroom is students
are listening to your demands, doing what you ask them to do because you, as the
teacher, know the content and it’s being delivered, and it should be accepted that
way, no questions asked.

Research Subquestion 1. The first research subquestion was, “How do middle
school site principals reduce or eliminate barriers to effectively integrate the active use of
technology in the classroom for student learning?” Participant K clearly believed that an
important step to reducing barriers to ICT integration for active learning was to invest in
a robust wireless network and ICT components for teachers and students. To accomplish
this, Participant K explained the importance of a district that supported these efforts
through modernization bonds, allocating sufficient funding for ICT, and staffing
appropriately for maintenance of the district’s infrastructure and hardware. Furthermore, Participant K strongly believed that ensuring the school kept a 1:1 student-to-device ratio was crucial for ensuring ICT for active learning was occurring on a regular basis. He explained, “If, for instance, a computer for every student is part of the free public education, then I need to do what I can do to make sure they have that.” Without overcoming these barriers, there is a limited chance that a school can successfully integrate ICT for active learning.

Participant K also believed that offering and having teachers attend regular professional development related to ICT and active learning would help reduce the barriers related to teachers’ knowledge and traditional teaching styles. He explained that when teachers approached him with training and professional development ideas, he was very open to providing the funds or release time for them to attend and participate. Furthermore, he used a system where teachers who attended these trainings could then offer internal professional development opportunities for other teachers. This approach helped bring the concepts and ideas to the school for more reluctant teachers.

Building on the professional development, Participant K also used the teachers who had been trained and excelled in ICT use as coaches and support for the staff. He explained,

Identify some lead teachers that use technology effectively and offering those teachers to provide learning experiences for other teachers, to help move them along, releasing them from their classrooms so they can model and support teachers that are less comfortable with the use of technology in the classrooms.
Participant K believed this approach could address barriers to ICT integration for active learning by using direct training, hands-on learning, and one-to-one coaching, and allowing teachers to observe expert teaching using ICT for active learning in a classroom setting. Furthermore, Participant K shared that he had hired a teacher as a technology coach to provide real-time training and technology support until the staff began to successfully integrate ICT for active learning.

Participant K also demonstrated and shared visionary leadership skills, techniques, and approaches. He explained some forward-thinking ideas like moving science notebooks to a web-based, interactive format, eliminating backpacks and paper and exclusively using Chromebooks and the Internet, and employing schoolwide PjBL and PBL as the method for instruction. He believed these approaches had helped the school establish a successful 1:1 learning environment that would only grow to incorporate more active learning opportunities for students.

**Research Subquestion 2.** The second research subquestion was, “How do middle school site principals determine if the active use of technology is effectively integrated in the classroom to increase student learning?” Participant K shared that most of the school used Google Classroom as a virtual learning environment to support active learning activities. Based on observations and conversations, he knew students engaged in peer editing, collaboration, and discussions through the use of ICT. Additionally, students participated in virtual, self-directed labs and various open-ended web activities.

**Participant L.** Participant L was a male middle school principal from Riverside County. Table 14 summarizes Participant L’s responses by themes and patterns related to the central research question and two research subquestions.
Table 14

Participant L: Themes and Patterns in Responses to Research Questions

<table>
<thead>
<tr>
<th>Research question</th>
<th>Theme/pattern</th>
</tr>
</thead>
</table>
| Central question: What are the barriers that middle school principals perceive affect the integration of the active use of technology for student learning?        | • Lack of funding for ICT  
• Lack of district openness to new ICT  
• Ineffective professional development  
• Teachers’ demographics  
• Teachers’ lack of knowledge about ICT and active learning  
• Traditional teaching styles  |
| Subquestion 1: How do middle school site principals reduce or eliminate barriers to effectively integrate the active use of technology in the classroom for student learning? | • Help create district culture that supports ICT  
• Help develop curriculum that requires ICT and active learning  
• Providing ICT for teacher and student use  
• Provide formal and internal professional development opportunities  
• Assistant principal  
• Display an openness to new ideas and progressive ICT use  
• Visionary leadership approach  
• Piloting new programs  
• Providing on-site technology support  
• Providing time for teachers to collaborate and develop lessons for ICT and active learning  
• Provide teacher coaches for ICT  |
| Subquestion 2: How do middle school site principals determine if the active use of technology is effectively integrated in the classroom to increase student learning? | • Virtual classrooms  
• Observing lessons that require ICT and active learning  
• Students collaborating and creating projects  |

Central research question. The central research question was, “What are the barriers that middle school principals perceive affect the integration of the active use of technology for student learning?” Participant L believed that the most significant barriers to integrating ICT for active learning were related to teachers’ skills and traditional teaching styles. Participant L believed that the first challenge was for teachers to develop classroom procedures for using ICT effectively for active learning. He cited the times
when his school started a BYOD program and the initial deployment of Chromebook carts. Teachers were apprehensive about using the devices, and there were several issues with misuse, damage, and theft. More significantly, the teachers’ traditional teaching style created additional barriers to ICT integration. Participant L shared that some teachers used “an electronic version of the textbook” as their ICT integration and only provided passive learning instruction. He went on to add, “They are just sort of reluctant to let go of things, and they still teach the way they were taught.”

Participant L clearly believed that the barriers related to teachers’ skills and traditional teaching styles were compounded by the barrier of ineffective professional development in the use of ICT for active learning. He identified that all-day professional development about ICT without providing hands-on activities was ineffective for teachers to increase the use of ICT for active learning. Teachers reported being frustrated with this format of professional development and preferred a balance between learning about ICT for active use and practicing with ICT for active use. Additionally, Participant L strongly stressed the need for differentiated professional development. All teachers have different skills in using ICT, so the professional development should be tailored to meet their needs and skill level.

Lastly, Participant L explained that a barrier to integrating ICT for active learning could be the approach toward ICT at the district level. He explained that if district-level administrators in educational services or technology services are not open to new ideas and approaches to using ICT for active learning, then barriers are created. Participant L provided examples of requiring one format, stopping pilot ICT programs, and limiting teachers’ and students’ access to the Internet. Participant L explained that he understood
caution and protective measures, but not having open dialogues about these policies would hinder progressive thinking and uses of ICT for active learning.

**Research Subquestion 1.** The first research subquestion was, “How do middle school site principals reduce or eliminate barriers to effectively integrate the active use of technology in the classroom for student learning?” Participant L provided many examples of ways a principal could reduce or eliminate barriers to ICT integration for active learning. One approach he identified as being very effective was designing curriculum that requires ICT and active learning. He explained that the math and English departments at his school had developed units of study that all required ICT and active learning through ongoing and culminating activities. This approach not only required the use of ICT for active learning but had also helped teachers develop additional lessons that utilized ICT for active learning.

Additionally, Participant L strongly believed that providing effective formal and internal professional development was essential to reducing barriers to ICT integration. These professional development opportunities included summer academies, release-day trainings, and afterschool meetings. Furthermore, for these trainings to be effective, the teachers needed direct exposure to the ICT, teaching strategy, and the active learning activity. Participant L explained that the incorporation of real experiences and uses was the approach he and the staff took when designing internal professional development opportunities.

To support the professional development opportunities and the integration of ICT for active learning, Participant L provided release time for teachers to collaborate and design ICT lessons, technology support, and coaching opportunities. Teachers within
departments had common prep periods to work collaboratively in designing highly effective lessons that utilized ICT for active learning. Participant L provided release time for teachers to assist each other with technical issues and also arranged for district-level technology support when needed. Also, Participant L used on-site technology coaches to assist in the planning, delivery, and evaluation of lessons with ICT for active learning.

Participant L also expressed the need to provide ICT for teachers and students. Even with the school having a 1:1 student-to-computer ratio, Participant L was still looking at additional ways to integrate new and progressive ICT for supporting active learning. He shared, “We are going to be placing the large-format displays. The large screens will have one 55-inch monitor with a touch screen, and we’re going to have either three or four smaller ones around the classroom.” Participant L shared that these pilot classrooms would have a completely new configuration and furniture to promote collaboration and ICT use for active learning.

Lastly, Participant L clearly discussed and demonstrated visionary leadership approaches to integrating ICT for active learning. These approaches included piloting new ICT, developing progressive active learning lessons, and looking for new ways to support students with the use of ICT. Participant L shared that his approach when working with teachers who wanted to integrate ICT was to be reflective. Furthermore, Participant L worked with staff to develop goals that would push the use of ICT forward and collaboratively assess the learning of the students.

Research Subquestion 2. The second research subquestion was, “How do middle school site principals determine if the active use of technology is effectively integrated in the classroom to increase student learning?” Participant L shared that most of his
teachers used Google Classroom as a form of virtual learning environment. Students regularly used ICT to complete PBL and PjBL activities. In addition, students also used the virtual classroom to collaborate and develop presentations. Also, in English and math, the curriculum required students to use ICT to engage in active learning activities and then produce authentic writing, presentations, or other success criteria.

**Participant M.** Participant M was a female middle school principal from San Bernardino County. Table 15 summarizes Participant M’s responses by themes and patterns related to the central research question and two research subquestions.

Table 15

*Participant M: Themes and Patterns in Responses to Research Questions*

<table>
<thead>
<tr>
<th>Research question</th>
<th>Theme/pattern</th>
</tr>
</thead>
</table>
| Central question: What are the barriers that middle school principals perceive affect the integration of the active use of technology for student learning? | • Lack of district-level planning  
• Limited devices for student use  
• Insufficient district-level funding for ICT  
• Funding for ICT refresh  
• Teachers not participating in professional development  
• Limited support for teachers  
• Lack of teacher professionalism  
• Teacher knowledge  
• Traditional teaching style  
• Lack of planning and collaboration by teachers |
| Subquestion 1: How do middle school site principals reduce or eliminate barriers to effectively integrate the active use of technology in the classroom for student learning? | • BYOD  
• Professional development with specific follow-up support  
• Use of a teacher technology leader  
• Internal professional development opportunities  
• Building relationships  
• Providing collaboration time |
| Subquestion 2: How do middle school site principals determine if the active use of technology is effectively integrated in the classroom to increase student learning? | • PjBL  
• AVID strategies  
• Student BYOD activities  
• Student-generated problems and assignments |
Central research question. The central research question was, “What are the barriers that middle school principals perceive affect the integration of the active use of technology for student learning?” Participant M clearly stated that the lack of district funds and lack of district planning for ICT were major barriers to ICT integration. Participant M indicated that there was no clear direction for ICT integration or use and that principals were not aware of a districtwide technology plan. Furthermore, Participant M shared, “We were supposed to have purchased, received tablets, and were going to pilot them in one grade level, and I don’t know what happened there; it just fell by the wayside, and they were never given to us.” It was clear that this was very frustrating for Participant M. She went on to add that a large amount of the district’s ICT funds were distributed through a grant-writing process, putting all of the secondary schools in competition for the funds. Participant M explained that there was only enough funding to replace some of the older computers on campus.

Participant M also stated that the lack of ICT for student use was another major barrier to ICT integration. She stated, “We have computer labs that teachers can sign up to go into, but the planning piece is so crucial, because the labs aren’t always available.” Participant M explained that her school had a few older laptop carts that were in need of replacing and no tablets available for students. She explained that this lack of computers and devices for students was a major barrier that negatively impacted the teachers’ ability to integrate ICT into the classroom for active learning.

Participant M believed that the lack of ICT available created a barrier for teachers to attend professional development for integrating ICT to support active learning. She added that teachers would go to the training but complain that their school did not have
the ICT available for students. This led to resistance from the teaching staff to attending future professional development for ICT use. Furthermore, Participant M added that teachers also shared that often the professional development did not have ongoing support built in, nor did the district or school provide additional, just-in-time support for ICT integration.

Lastly, Participant M clearly stated, “The biggest barrier is teacher knowledge.” She clarified this by identifying the school’s culture and teaching staff as barriers to integrating ICT. Participant M stated that in general, the teachers rarely collaborated and were resistant to adding ICT in the classroom for student use. This had led to a general lack of professionalism among staff, who in turn had very low attendance for professional development opportunities; thus, the staff had limited skills in integrating and using ICT. This had created a school culture of traditional teaching techniques with few new ideas and limited active learning activities for students.

**Research Subquestion 1.** The first research subquestion was, “How do middle school site principals reduce or eliminate barriers to effectively integrate the active use of technology in the classroom for student learning?” Participant M identified that one way to reduce the lack-of-devices barrier was to support a BYOD program. She said that one of her teachers was promoting the use of smartphones in her classroom as a way to integrate ICT. While this program was limited to one class at the time of the study, Participant M believed this could be the start of more ICT use for active learning schoolwide.

Participant M also believed that both formal and informal professional development opportunities were effective strategies for reducing the barriers of limited
teacher knowledge of ICT and traditional teaching beliefs. For formal professional development, Participant M clearly laid out a strategy of follow-up support. After the initial training, she said, “I want to see a digital lesson, I want to see project-based learning using this tool in technology, and tell me what you got, and that could be half a day sub.” These principal follow-ups on the desired outcomes of the training and providing teachers with time to plan and collaborate would lead to an increase in ICT use for active learning. To further support formal professional development, Participant M used informal professional development opportunities designed by on-site teachers. These informal professional development opportunities were designed to show teachers how to integrate ICT within the constraints of the school’s current ICT capacity.

Participant M also identified that providing time for teachers to collaborate and plan together would help increase ICT integration for active learning. She identified a few teachers who had progressive teaching styles and were having success with ICT for active learning. By providing more opportunities for reluctant teachers to work with the more progressive teachers, she believed that students would be provided with more opportunities to use ICT for active learning activities and projects.

A final strategy Participant M identified was relationship building. Participant M shared that building strong and effective relationships with district-level administrators and teachers was crucial for reducing barriers to ICT integration. She said that with strong relationships, a principal is able to engage in reflective conversations. Participant M said,
I go and look at a lesson, okay, and then say, “Tell me, what did you think?”

“Okay, the next time I come in, this is what I [would] like to see, and that’s where you’re going to start to see your instruction change.”

Participant M believed that this approach allowed her to work with teachers at their current level of ICT integration and support them as they increased the use of ICT for active learning.

**Research Subquestion 2.** The second research subquestion was, “How do middle school site principals determine if the active use of technology is effectively integrated in the classroom to increase student learning?” Participant M indicated that active learning often occurred with her AVID teachers. These teachers had been trained in engagement and active learning strategies and were beginning to integrate more ICT for student use. Students used ICT for research and presentations; however, this was mostly limited to the history department. Participant M shared that she observed these activities in her classroom observations and through conversations with the teachers.

**Participant N.** Participant N was a female middle school principal from San Bernardino County. Table 16 summarizes Participant N’s responses by themes and patterns related to the central research question and two research subquestions.

**Central research question.** The central research question was, “What are the barriers that middle school principals perceive affect the integration of the active use of technology for student learning?” Participant N clearly stated that the lack of computers and devices was a major barrier to ICT integration. At the time of the study, Participant N’s school only had one laptop cart and two desktop computer labs; however, the computer labs were only available 12 weeks out of the 36-week school year due to
Table 16

Participant N: Themes and Patterns in Responses to Research Questions

<table>
<thead>
<tr>
<th>Research question</th>
<th>Theme/pattern</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central question: What are the barriers that middle school principals perceive affect the integration of the active use of technology for student learning?</td>
<td>• Limited computers and devices</td>
</tr>
<tr>
<td></td>
<td>• District restrictions on wireless use</td>
</tr>
<tr>
<td></td>
<td>• Limited professional development targeted for teachers’ current abilities</td>
</tr>
<tr>
<td></td>
<td>• Missing technology support</td>
</tr>
<tr>
<td></td>
<td>• Limited teacher knowledge</td>
</tr>
<tr>
<td></td>
<td>• Missing district-level support</td>
</tr>
<tr>
<td></td>
<td>• Traditional teaching style</td>
</tr>
<tr>
<td>Subquestion 1: How do middle school site principals reduce or eliminate barriers to effectively integrate the active use of technology in the classroom for student learning?</td>
<td>• Professional development with clear examples, objectives, and follow-up support</td>
</tr>
<tr>
<td></td>
<td>• Purchasing laptops for student use</td>
</tr>
<tr>
<td></td>
<td>• Teacher leaders in technology</td>
</tr>
<tr>
<td></td>
<td>• Assistant principal</td>
</tr>
<tr>
<td></td>
<td>• Administration or ICT-skilled teachers modeling strategies</td>
</tr>
<tr>
<td></td>
<td>• Frequent use of ICT</td>
</tr>
<tr>
<td>Subquestion 2: How do middle school site principals determine if the active use of technology is effectively integrated in the classroom to increase student learning?</td>
<td>• Research supported by ICT</td>
</tr>
<tr>
<td></td>
<td>• Students engaged in the scientific process</td>
</tr>
</tbody>
</table>

district and state assessment constraints. This barrier had led the staff to be uninterested in exploring ICT integration for active learning since the basic equipment was not available at the school. Compounding this barrier was the restrictive district policy on outside devices using the wireless network, and over 90% of the students were identified as socioeconomically disadvantaged, thus making a BYOD program unrealistic.

Participant N also indicated that limited technology support from the district level was a barrier. Participant N stated that the school’s designated technology support person was shared between three schools and often did not have the time to support the needs of
the teachers. This barrier added to the reluctance of the teachers toward using ICT even in passive learning activities.

Participant N shared that teachers’ lack of knowledge and no or ineffective professional development opportunities also were major barriers to ICT integration. First, she indicated that the limited amount of technology available for students reduced the interest of teachers to attend professional development opportunities related to ICT use in the classroom. This was combined with the teachers’ past experiences of ineffective, 1-day professional development opportunities that did not prepare the teachers to effectively use ICT for student learning. Participant N indicated that one example of an ineffective professional development training provided the teachers with a highly engaging lesson using ICT but no strategies to develop a follow-up lesson or transfer these skills to future lessons.

A final barrier Participant N mentioned was related to school culture. She mentioned that the school’s leadership team did not believe their students were capable of using ICT effectively or appropriately. During a recent leadership team training, a consultant had shown a video clip of students working on laptops, which resulted in some members of the leadership team stating, “Well that’s their kids; if some of our kids were that bright. . . .” Furthermore, Participant N shared that in the past the school leadership team said they did not purchase laptops because the students would destroy or steal them. She went on to clarify that while this had changed, the school was now further behind in the integration of ICT for active learning.

**Research Subquestion 1.** The first research subquestion was, “How do middle school site principals reduce or eliminate barriers to effectively integrate the active use of
technology in the classroom for student learning?” Participant N indicated that the most effective strategy for reducing the barriers to ICT integration for active learning was to purchase student laptops in the form of laptop carts. She stated that laptop carts would allow each student to have access to the Internet and applications to conduct authentic research and develop presentations. She also believed that by increasing the number of laptop carts on campus, the teachers would be more willing to develop lessons and activities that utilized active learning techniques.

Secondly, Participant N believed that providing targeted professional development based on the current reality of the school community and needs of the teachers and students would greatly reduce barriers to ICT integration. This would be followed up by providing teachers with time to develop these skills and lessons. She explained this strategy as “providing ongoing training, not just a 1-day training, and then we could provide school time, we could provide time for teachers to share amongst each other with someone to train all of us and make it ongoing.” Participant N strongly believed this would be a highly effective system for integrating more ICT into the classroom, sustaining this practice, and providing the skills for the teachers to expand their use of ICT for active learning.

Lastly, Participant N indicated that additional technology support would be required to support teachers for regular use of ICT in the classroom. At the time of the study, the teachers relied on the computer lab teacher due to the limited amount of technology support provided by the district. However, Participant N believed that additional release time for the computer lab teacher or increased hours of district-level
technology support would be necessary for the school to expand the use of ICT for active learning.

**Research Subquestion 2.** The second research subquestion was, “How do middle school site principals determine if the active use of technology is effectively integrated in the classroom to increase student learning?” Participant N shared that she observed students, mainly in science classes, using ICT to research various scientific topics. She indicated that through her class observations, she observed some active learning activities, but they rarely used ICT. These activities included hands-on labs, class and group discussions, and student presentations.

**Participant O.** Participant O was a female middle school principal from San Bernardino County. Table 17 summarizes Participant O’s responses by themes and patterns related to the central research question and two research subquestions.

**Central research question.** The central research question was, “What are the barriers that middle school principals perceive affect the integration of the active use of technology for student learning?” Participant O indicated that providing ICT for student use was a major barrier to ICT integration for active learning. Participant O stated that some of the academic departments at her school were waiting for laptop carts to be delivered and were sharing the limited number of computers available for student use at the time of the study. She added that this increase in the number of laptop carts also required upgrades to the school’s wireless infrastructure and that this may also be a barrier to ICT integration.

Participant O also believed that ineffective software and applications were barriers to ICT integration. She stated that teachers and students resisted using
Participant O: Themes and Patterns in Responses to Research Questions

<table>
<thead>
<tr>
<th>Research question</th>
<th>Theme/pattern</th>
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</table>
| Central question: What are the barriers that middle school principals perceive affect the integration of the active use of technology for student learning? | • Providing hardware for teachers and students  
• Wireless infrastructure  
• Ineffective software and applications  
• Teachers’ knowledge about ICT use  
• Traditional teaching style |
| Subquestion 1: How do middle school site principals reduce or eliminate barriers to effectively integrate the active use of technology in the classroom for student learning? | • Use of district ICT support staff  
• Providing laptops and devices for teacher and student use  
• On-site and district ICT support staff  
• Providing time for teachers to collaborate and practice with ICT  
• Creating and maintaining a school culture that welcomes ICT  
• Principal-directed ICT use  
• Supporting teachers to help each other  
• Supporting risk taking with ICT use |
| Subquestion 2: How do middle school site principals determine if the active use of technology is effectively integrated in the classroom to increase student learning? | • Observations of simulation activities  
• Students creating and delivering presentations  
• Virtual collaboration between students and teachers  
• Research and problem solving |

applications and software that required too many steps or were not intuitive to the user. In turn, requiring teachers and students to use these types of software and applications would not only create immediate barriers but would also create barriers to future ICT use for teachers and students.

Lastly, Participant O indicated that teachers were barriers to ICT integration for active learning. Participant O stated that one way teachers were a barrier was when they were fearful of the unknown with ICT or how to use new technology in the classroom. She said, “For teachers, there was that fear of the unknown” and followed up by adding that teachers would ask, “What am I supposed to do? How am I supposed to integrate it
properly? Is it going to take this much time to set it up and get the kids logged on?” In addition, she added that some teachers still preferred to use a traditional teaching style. She believed this was related to their fear of using ICT in the classroom and also their own lack of understanding of ICT. Additionally, she added that teachers who did not regularly use ICT in their professional and personal lives were less likely to use ICT in the classroom.

**Research Subquestion 1.** The first research subquestion was, “How do middle school site principals reduce or eliminate barriers to effectively integrate the active use of technology in the classroom for student learning?” Participant O initially shared that her school “has always been pretty comfortable with technology” and that the school culture itself reduced barriers to ICT integration. She went on to say that as a principal, one way she reduced barriers to ICT integration was to support and maintain the school culture of ICT use. Participant O stated that supporting this school culture of ICT use was accomplished through connecting teachers who could help each other with ways to use ICT in the classroom or solve problems that arose with ICT.

Another technique Participant O used to support a school culture of ICT use was to allow teachers to take risks with ICT and promote teacher collaboration. She stated that she told teachers, “Just play with it. You do not have to use it fully; just try something.” Additionally, she also connected teachers with peers who could assist them and supported regular, informal teacher collaboration. Participant O provided an example that on their minimum days, teachers would often get together to create lessons that used ICT for active learning, discuss and solve issues with ICT, and support each other with ICT integration.
Additionally, Participant O believed that the technology support from the district and at the school site greatly reduced barriers to ICT integration for active learning. This included the systemic rollout of new ICT, the initial training, and the follow-up support. Participant O indicated that the school only received regular technology support 1 day a week from the district but had a library paraprofessional who was very skilled in ICT use.

**Research Subquestion 2.** The second research subquestion was, “How do middle school site principals determine if the active use of technology is effectively integrated in the classroom to increase student learning?” Participant O stated that she observed examples of active learning supported by ICT almost daily and that the use of ICT for active learning increased every year. Some examples she provided included ICT-based simulation activities for mathematical calculations; student collaborative research and presentations using laptops; and online, interactive collaboration between students and teachers. Participant O added that “teachers start and then turn it over to the kids to investigate, to find, to create” and that this type of active learning was happening on a regular basis.

**Participant P.** Participant P was a male middle school principal from San Bernardino County. Table 18 summarizes Participant P’s responses by themes and patterns related to the central research question and two research subquestions.

**Central research question.** The central research question was, “What are the barriers that middle school principals perceive affect the integration of the active use of technology for student learning?” Participant P identified three general barriers to ICT integration for active learning. These areas were related to professional development,
Table 18

*Participant P: Themes and Patterns in Responses to Research Questions*

<table>
<thead>
<tr>
<th>Research question</th>
<th>Theme/pattern</th>
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</thead>
<tbody>
<tr>
<td>Central question: What are the barriers that middle school principals perceive affect the integration of the active use of technology for student learning?</td>
<td>• Lack of professional development opportunities</td>
</tr>
<tr>
<td></td>
<td>• Ineffective professional development</td>
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<tr>
<td></td>
<td>• Teachers’ age</td>
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<tr>
<td></td>
<td>• Teachers’ lack of knowledge of ICT</td>
</tr>
<tr>
<td>Subquestion 1: How do middle school site principals reduce or eliminate barriers to effectively integrate the active use of technology in the classroom for student learning?</td>
<td>• Supporting the district culture</td>
</tr>
<tr>
<td></td>
<td>• Utilizing the district technology support</td>
</tr>
<tr>
<td></td>
<td>• Providing ICT for students and teachers</td>
</tr>
<tr>
<td></td>
<td>• Providing time for teachers to work with ICT</td>
</tr>
<tr>
<td></td>
<td>• Providing time for teacher collaboration</td>
</tr>
<tr>
<td></td>
<td>• Developing and supporting a school culture that embraces ICT</td>
</tr>
<tr>
<td></td>
<td>• Assistant principal</td>
</tr>
<tr>
<td></td>
<td>• School visits to observe ICT use</td>
</tr>
<tr>
<td></td>
<td>• Use of teacher coaches</td>
</tr>
<tr>
<td>Subquestion 2: How do middle school site principals determine if the active use of technology is effectively integrated in the classroom to increase student learning?</td>
<td>• Observing students developing their own presentations supported by ICT</td>
</tr>
<tr>
<td></td>
<td>• Students conducting research and exploration through ICT</td>
</tr>
<tr>
<td></td>
<td>• Students engaged in teaching others with ICT</td>
</tr>
</tbody>
</table>

Participant P indicated that there was generally a lack of professional development opportunities provided by the district to support ICT integration. He explained that this was due to the newly adopted curriculum in English, mathematics, and science requiring extensive professional development. While these professional development trainings covered aspects of ICT, ICT integration was not the primary focus. Additionally, Participant P indicated that the professional development was not always
planned to be sustaining or address the new teachers who entered the district after the initial adoption year.

Secondly, Participant P stated that teachers toward the end of their career were less likely to integrate ICT into the classroom for active learning activities. Participant P said, “They struggle with it and then just knowing what to do with it.” Furthermore, Participant P indicated that older teachers tended to not troubleshoot problems with ICT and, because of this, would either not try ICT at all or would stop using ICT at the first technical difficulty they encountered.

Lastly, Participant P indicated that teachers’ lack of knowledge in how to use ICT for active learning was a significant barrier to integrating ICT for active learning. Participant P explained this barrier from three different viewpoints. One viewpoint was that teachers struggled with knowing how to use ICT because there was an established curriculum pacing guide that did not clearly identify ICT use. Participant P explained a second viewpoint that unless teachers were already comfortable with technology, they would not venture off to try new ways to integrate ICT. A final viewpoint presented by Participant P was that teachers did not understand a bigger picture of why and how to integrate ICT into the classroom for active learning.

**Research Subquestion 1.** The first research subquestion was, “How do middle school site principals reduce or eliminate barriers to effectively integrate the active use of technology in the classroom for student learning?” Participant P believed that providing teachers with time to explore uses for ICT to support active learning and to collaborate with other teachers was essential to reducing barriers to ICT integration. Participant P stated that this type of exploration and collaboration was not likely to happen naturally,
so it was important for the principal to establish sufficient time for collaboration and ICT exploration. This included creating a master schedule of classes that had similar subject matter teachers on their conference period at the same time and establishing time after school dedicated to collaboration and ICT exploration. Participant P went on to explain that he had observed these collaboration times and found that teachers would identify pitfalls to ICT integration and develop strategies to prevent future issues while identifying successful strategies and sharing those with the group.

Participant P also indicated that providing ICT for all students and teachers, with ample technology support, was another effective approach to reducing barriers to ICT integration. He indicated that all English, math, and science classrooms at his school had laptop carts with a dedicated printer. Furthermore, each teacher had direct access to submit a help desk ticket for technical issues, and the district support team often responded within an hour or remotely solved the problem. Participant P stated that having this central support system allowed for updates to be uploaded to all devices remotely, thus reducing down time.

Another strategy identified by Participant P for reducing barriers to ICT integration was using teacher coaches. Participant P explained that teachers were more willing to have another teacher support them in the classroom than to have administrators support them. This collegial support had increased the use of ICT in the classroom for active learning. Supports provided by teacher coaches included lesson development, demonstrating ICT use, and technology support during instruction.

**Research Subquestion 2.** The second research subquestion was, “How do middle school site principals determine if the active use of technology is effectively integrated in
the classroom to increase student learning?” Participant P shared that he regularly observed students developing their own ICT-supported presentations. Furthermore, students used ICT to conduct authentic research and exploration of topics and ideas. This research and learning led to writing projects, presentations, or student-led classrooms all supported by ICT.

Data Analysis by Common Themes in Research Questions

In the following section, participant data are analyzed and presented as related to the central research question and the two research subquestions. The researcher analyzed all 16 participants’ responses to determine common themes for the central research question and the two research subquestions. The researcher established that themes identified by 50% or more of the participants would be labeled as common themes. It was determined that there were six common themes for the central research question, eight common themes for Research Subquestion 1, and two common themes for Research Subquestion 2.

Central research question. The central research question was, “What are the barriers that middle school principals perceive affect the integration of the active use of technology for student learning?” The 16 participants’ responses were analyzed to look for common themes. Table 19 displays the themes of all 16 participants that answered the central research question.

Common Theme 1: Teachers’ knowledge of ICT use for active learning. All but one of the participants identified teachers’ lack of knowledge of ICT use for active learning as a barrier to integrating ICT. One participant noted that this barrier was related to “how proficient they are and how they can successfully integrate that into their
Table 19

Central Research Question: Common Themes in All Participant Responses

<table>
<thead>
<tr>
<th>Theme</th>
<th>Number of respondents</th>
<th>Frequency of responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barriers related to teachers’ knowledge of ICT for active learning</td>
<td>15</td>
<td>42</td>
</tr>
<tr>
<td>Barriers related to funding requirements for ICT</td>
<td>14</td>
<td>51</td>
</tr>
<tr>
<td>Barriers related to traditional teaching styles</td>
<td>14</td>
<td>31</td>
</tr>
<tr>
<td>Barriers related to professional development</td>
<td>12</td>
<td>33</td>
</tr>
<tr>
<td>Barriers related to the district</td>
<td>9</td>
<td>32</td>
</tr>
<tr>
<td>Barriers related to school culture</td>
<td>8</td>
<td>15</td>
</tr>
<tr>
<td>Barriers related to time</td>
<td>7</td>
<td>12</td>
</tr>
<tr>
<td>Barriers related to teachers’ age</td>
<td>7</td>
<td>10</td>
</tr>
<tr>
<td>Barriers related to students</td>
<td>5</td>
<td>7</td>
</tr>
<tr>
<td>Barriers related to parents and the community</td>
<td>2</td>
<td>4</td>
</tr>
</tbody>
</table>

Note. The central research question was, “What are the barriers that middle school principals perceive affect the integration of the active use of technology for student learning?”

classroom routines.” Another participant explained this lack of knowledge as “just the lack of understanding how I could use this software, this device in my classroom,” which greatly impacts the integration of ICT for active learning.

**Common Theme 2: Funding for ICT.** Fourteen of the 16 participants said the lack of funding for ICT was a barrier to successfully integrating ICT for active learning. Participants identified purchasing new ICT for student and teacher use, building the wireless network for Internet connection, and being able to replace older laptops and devices as areas where funding was needed. One participant shared that when looking into increasing ICT use for active learning, his staff clearly stated, “We need more devices.”
Common Theme 3: Traditional teaching style. Fourteen of the 16 participants indicated that the traditional teaching style was a barrier to integrating ICT for active learning. Participants believed that the shift from the teacher leading every class to facilitating the integration of ICT to support active learning was a significant barrier. One participant explained that teachers, especially veteran teachers, have had many years of training to teach a specific way where students “sit there in your little row, you’re sitting up straight, feet flat on the floor,” while the teaching approach is “I’m talking, I’m talking, and then I’m assigning.”

Common Theme 4: Professional development. Over 70% of the participants perceived that there were significant barriers to integrating ICT for active learning related to the lack of professional development opportunities or lack of teachers participating in professional development opportunities. A participant explained, “We buy these laptops and we buy Smartboards, we buy all this stuff, and then there’s no, not enough training.” Several participants shared that many of the professional development opportunities did not have adequate follow-up training or practice on how to effectively use ICT for active learning. Another participant indicated that much of the professional development offered did not help teachers answer the questions, “How can I extend my classroom? What can technology offer that I couldn’t do without it?”

Common Theme 5: District culture. Over 50% of the participants perceived the district culture as a barrier to increasing the use of ICT for active learning and closing the digital-use divide. Two participants shared that their district culture was one of competition for limited ICT resources, thus creating schools that had far less ICT than
others. Another participant explained that the director of the technology department “was a barrier himself in a lot of ways” by not supporting sites with their ICT needs.

**Common Theme 6: School culture.** Half of the participants indicated that a school’s culture can be a barrier to integrating ICT for active learning. One participant shared that when teachers heard about using ICT for active learning, they would make comments like, “We don’t buy laptops because the kids destroy them.” Furthermore, some participants believed that school cultures in which traditional teaching styles and practices are ingrained prevent or hinder the integration of ICT and active learning activities. One participant explained, “If you’re going to make technology successful, then you’re going to have to have school culture that embraces it.”

**Research Subquestion 1.** Research Subquestion 1 was, “How do middle school site principals reduce or eliminate barriers to effectively integrate the active use of technology in the classroom for student learning?” Table 20 displays the themes of all 16 participants that answered Research Subquestion 1.

**Common Theme 1: Providing ICT.** One hundred percent of the participants stated that providing ICT was essential for reducing barriers to ICT integration for active learning. This included providing laptops, Chromebooks, or other devices for students as well as providing a sufficient wireless network to support the devices. One participant said that the barrier of access is eliminated when “students have access to technology whenever they need it and it is required to support what they’re doing in the classroom.” Several other participants explained that when access to student devices is a barrier, teachers are less likely to develop active learning lessons that are supported by ICT.
Table 20

Research Subquestion 1: Common Themes in All Participant Responses

<table>
<thead>
<tr>
<th>Theme</th>
<th>Number of respondents</th>
<th>Frequency of responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Providing ICT</td>
<td>16</td>
<td>42</td>
</tr>
<tr>
<td>Professional development</td>
<td>15</td>
<td>40</td>
</tr>
<tr>
<td>Teacher collaboration for ICT integration</td>
<td>13</td>
<td>30</td>
</tr>
<tr>
<td>Principal-directed integration of ICT</td>
<td>10</td>
<td>18</td>
</tr>
<tr>
<td>Promote a school culture of ICT use</td>
<td>9</td>
<td>25</td>
</tr>
<tr>
<td>Visionary leadership approaches</td>
<td>9</td>
<td>21</td>
</tr>
<tr>
<td>Provide technology support</td>
<td>9</td>
<td>15</td>
</tr>
<tr>
<td>Provide release time for teachers</td>
<td>9</td>
<td>12</td>
</tr>
<tr>
<td>Using a leadership team for ICT integration</td>
<td>7</td>
<td>12</td>
</tr>
<tr>
<td>Assistant principal</td>
<td>7</td>
<td>9</td>
</tr>
<tr>
<td>Teacher ICT coaches</td>
<td>6</td>
<td>18</td>
</tr>
<tr>
<td>Promote, celebrate, support teachers’ using ICT</td>
<td>6</td>
<td>9</td>
</tr>
<tr>
<td>Support a district culture of ICT integration</td>
<td>5</td>
<td>8</td>
</tr>
<tr>
<td>Secure funding for purchasing and maintaining ICT</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Piloting ICT</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>Use district support for ICT integration and use</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>AVID strategies</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>BYOD program</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Visiting other schools</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Building relationships with teachers</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Use the SAMR model</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Develop a technology plan</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Develop backup, non-ICT lessons</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Parent training for ICT use</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Use of outside consultants</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

*Note. Research Subquestion 1 was, “How do middle school site principals reduce or eliminate barriers to effectively integrate the active use of technology in the classroom for student learning?”*
Additionally, participants from schools that had achieved a 1:1 student-to-computer ratio strongly believed that this access had greatly supported the integration of ICT and increased active learning activities.

**Common Theme 2: Professional development.** Over 90% of the participants shared that professional development opportunities were essential for reducing barriers to ICT integration and increasing active learning. Participants identified both formal professional development conducted by the district office staff or outside vendors and internal professional development conducted by members of their staff as effective for reducing barriers to ICT integration. Before engaging in formal professional development, one participant explained, “It has to be research based, and I need to be able to see that it’s working some place.” This belief in the importance of ensuring the professional development is of a high quality and effective was shared by the majority of participants.

Also, the majority of participants shared that developing internal professional development helped teachers overcome barriers related to school culture. One participant explained the model for internal professional development as “doing surveys with the teachers and then trying to design a lot of your professional development opportunities around things they want to do.” This approach was shared by most of the participants, as it allowed for targeted professional development that directly supported the needs of the teachers at their schools.

**Common Theme 3: Teacher collaboration.** Over 80% of the participants believed that providing teachers with time to collaborate about ICT and active learning was an effective strategy for reducing barriers to ICT integration. Participants shared that
they provided this time through common preparation periods, providing substitute teachers for release time, establishing collaboration activities before or after school, and encouraging collaboration at staff meetings. One participant explained that these collaboration opportunities allow for teachers to “sit next to somebody who maybe is doing a lot of things using technology” and can share best practices.

**Common Theme 4: Principal-directed integration of ICT.** Ten of the 16 participants claimed that principal-directed use of ICT was a strategy for reducing barriers to ICT. One participant indicated that he gave “iPads to the whole staff and gave them a really great program to use; they did use it” because it was a directive. Another shared that “creating the school platform that insists on the technology usage” resulted in a significant increase in the use of ICT.

**Common Theme 5: Promote a school culture of ICT use.** Over 50% of the participants believed that promoting a school culture of ICT use for active learning could reduce barriers to ICT integration. This approach included principals promoting a culture of risk taking with ICT use in the classroom. Two participants described this approach as “failing forward,” while another participant expressed that he “embraces their [teachers’] inquisitive nature,” and if the lesson did not go as planned, he would ask, “What went wrong? Tell me what I can do to help you make it right the next time and what resources I can send you to make it better.”

**Common Theme 6: Visionary leadership approaches.** Nine of the 16 participants shared visionary leadership approaches as strategies for reducing barriers to ICT integration. Four of these participants indicated that piloting new ICT or active learning activities with individual teachers or departments helped promote schoolwide ICT and
active learning use in subsequent years. Other participants developed formal and informal technology plans that outlined integration goals for the next few years. One participant shared that she would support early adopters of ICT integration by providing the required technology but would follow this up with, “But it can’t just be about you; talk to me about how you’re going to share what you learn.”

**Common Theme 7: Provide technology support.** Over half of the participants explained that providing technology support was helpful in reducing or eliminating barriers to ICT integration. This strategy included working with the district support staff, hiring on-site technology support, and releasing teachers who could provide “just-in-time” technology support. One participant said, “I pay for somebody to be here full time 1 day a week that kind of takes care of our little things.” Another shared that for teachers, “just knowing they have the support available, I think, is huge.”

**Common Theme 8: Provide release time for teachers.** Over 50% of the participants explained that providing time for teachers to experiment with ICT and to develop active learning activities supported by ICT was an effective strategy for reducing barriers to ICT integration. This approach was more unstructured, and teachers were free to choose activities that they believed would help them increase their use of ICT to support active learning or close the digital-use divide. One participant explained this approach as “trying to provide more of an individualized approach to it in that sense.” Participants shared that this time could be spent observing other teachers, finding or attending professional development opportunities, or just “playing” with technology.

**Research Subquestion 2.** Research Subquestion 2 was, “How do middle school site principals determine if the active use of technology is effectively integrated in the
classroom to increase student learning?” Table 21 displays the themes of all 16 participants that answered Research Subquestion 2.

Table 21

*Research Subquestion 2: Common Themes in All Participant Responses*

<table>
<thead>
<tr>
<th>Theme</th>
<th>Number of respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Virtual classrooms</td>
<td>11</td>
</tr>
<tr>
<td>PjBL and PBL projects</td>
<td>9</td>
</tr>
<tr>
<td>Interactive applications and software</td>
<td>7</td>
</tr>
<tr>
<td>Student presentations supported by ICT</td>
<td>7</td>
</tr>
<tr>
<td>Student collaboration supported by ICT</td>
<td>5</td>
</tr>
<tr>
<td>Students engaged in the writing process supported by ICT</td>
<td>4</td>
</tr>
<tr>
<td>Students engaged in research supported by ICT</td>
<td>4</td>
</tr>
<tr>
<td>AVID strategies with ICT support</td>
<td>2</td>
</tr>
<tr>
<td>Students teach other students with ICT</td>
<td>1</td>
</tr>
</tbody>
</table>

*Note.* Research Subquestion 2 was, “How do middle school site principals determine if the active use of technology is effectively integrated in the classroom to increase student learning?”

**Common Theme 1: Virtual classrooms.** Close to 70% of the participants shared that they observed the use of a virtual classroom environment as evidence that active learning was being supported by ICT. These participants referred to Google Classroom and other learning management systems that promote discussions, sharing information and presentations, and hosting open-ended assignments. Several participants shared that these platforms can host authentic writing projects that allow for asynchronous learning.

**Common Theme 2: Project- and problem-based learning.** Over half of the participants stated that they observed students engaged in PjBL and PBL activities that were supported by ICT. One participant observed, “The teachers start and then turn it over to the kids to investigate, to find, to create.” Many of the participants who cited
PjBL and PBL explained that the integration of ICT to support the activity allowed for greater and more advanced research, synthesizing the information, and ultimately presenting it back to the class or teacher.

**Summary**

In this chapter, the responses from the 16 open-ended, semistructured interviews were presented. The central research question and two research subquestions were designed to obtain the perceptions of middle school principals about the barriers that exist to closing the digital-use divide at the middle school level. These results provided valuable insight into the perceptions of middle school principals regarding the integration of ICT to support active learning.

In total, 16 middle school principals were interviewed from eight different school districts in four counties in Southern California. Each principal participant was identified by his or her superintendent or assistant superintendent as a successful principal who would be beneficial to a study on ICT integration for active learning. All 16 participants were interviewed in person at their school sites. Each interview was recorded using the Garageband application on a MacBook Pro and then transcribed.

The analysis of the participants’ responses identified six common themes related to barriers to integrating ICT for active learning and thus closing the digital-use divide. First, participants perceived teachers’ lack of knowledge about ICT and active learning as a major barrier to closing the digital-use divide. Second, participants believed that a lack of funding for ICT was a barrier to successfully integrating ICT for active learning. Third, participants identified that teachers with more traditional teaching styles were less likely to use ICT for active learning. Fourth, participants believed that the lack of
effective professional development opportunities was a barrier to closing the digital-use divide. Fifth, participants believed that the district culture was a barrier to ICT integration. Finally, participants perceived the school culture as a barrier to integrating ICT for active learning.

Eight common themes were identified in analyzing the participants’ responses related to Research Subquestion 1, “How do middle school site principals reduce or eliminate barriers to effectively integrate the active use of technology in the classroom for student learning?” First, all participants identified that providing ICT to students and teachers was a strategy for reducing barriers to ICT integration. Second, participants believed that having teachers attend effective professional development opportunities would help close the digital-use divide. Third, participants perceived that having teachers collaborate around ICT use and active learning would reduce barriers related to ICT integration. Fourth, participants believed that having principal-directed use of ICT would increase the use of ICT for active learning. Fifth, participants believed that promoting a school culture of ICT use would reduce barriers to ICT integration and increase active learning opportunities for students. Sixth, participants expressed that visionary leadership approaches helped to reduce barriers to ICT integration. Seventh, participants believed that providing technology support increased the use of ICT in the classroom to support active learning activities. Lastly, participants perceived that providing release time for teachers for activities related to ICT and active learning would reduce barriers to closing the digital-use divide.

The analysis of responses resulted in two common themes related to Research Subquestion 2, “How do middle school site principals determine if the active use of
technology is effectively integrated in the classroom to increase student learning?” First, participants shared that the increased use of virtual classrooms provided evidence of an increase in the use of ICT to support active learning activities. Also, participants identified the increase in PjBL and PBL activities that are supported by ICT as examples that show the digital-use dividing is closing.
CHAPTER V: SUMMARY, CONCLUSIONS, IMPLICATIONS, AND RECOMMENDATIONS

Chapter V presents a summary of the study, including the purpose, research questions, methodology, population, and sample. The chapter identifies key findings and conclusions based on the research questions. Furthermore, Chapter V outlines implications for further action and recommendations for further research related to this topic. The chapter ends with the researcher’s personal reflections and final comments.

Summary of the Study

Purpose Statement

The purpose of this qualitative phenomenological study was to explore and describe the barriers to the integration of information and communication technology (ICT) to support active learning in the classroom as perceived by middle school site principals.

Research Questions

The central research question was, What are the barriers that middle school principals perceive affect the integration of the active use of technology for student learning? In addition, the following subquestions guided the research:

1. How do middle school site principals reduce or eliminate barriers to effectively integrate the active use of technology in the classroom for student learning?
2. How do middle school site principals determine if the active use of technology is effectively integrated in the classroom to increase student learning?
Methodology

This qualitative study used a semistructured interview protocol that included seven open-ended questions to elicit answers to the central research question and two research subquestions. This semistructured approach with open-ended questions allowed the participants to freely express their perceptions, ideas, and experiences related to the research questions (D. W. Turner, 2010; McMillan & Schumacher, 2010).

The semistructured format allows respondents to have greater range in answering the interview questions and following up with greater detail while keeping the conversation on topic to ensure validity (McMillan & Schumacher, 2010). Furthermore, participants are asked the same questions in semistructured interviews, but the open-ended questions allow participants to contribute as much detail as they feel is required (D. W. Turner, 2010). The 16 participants were given the interview questions in advance to prepare for the interview. Additionally, the terms information and communication technology (ICT) and active learning were defined at the beginning of each interview to ensure consistency. Each interview was recorded, and the participants received a transcribed copy of their individual interviews to review for accuracy of meaning and intent.

After conducting the interviews, the researcher used NVivo software to code the data by identifying key terms, ideas, and concepts that the participants provided. The researcher then analyzed the terms, ideas, and concepts for common themes related to the barriers to the integration of ICT for active learning and closing the digital-use divide.
Population and Sample

The population for this study was middle and intermediate school principals in California, with a target population of middle and intermediate school principals in the Southern California counties of Los Angeles, Orange, Riverside, and San Bernardino. The researcher identified eight school districts, two from each county, with a minimum of two middle or intermediate schools.

The sample for the study consisted of 16 middle or intermediate school principals selected using a nonprobable, convenience sampling technique. A convenience, or available, sample is one that is accessible to the researcher and is not random (McMillan & Schumacher, 2010). The eight districts in the study were selected based on the accessibility of the superintendents or assistant superintendents to the researcher. The participants were identified by their districts’ superintendent or assistant superintendent as principals who had experience in integrating ICT for active learning and would provide valuable insights related to the research questions. The researcher contacted each participant to schedule the interview.

Major Findings

The central research question and research subquestions for this study looked at the perceptions of middle and intermediate school principals of barriers to ICT integration for active learning, the strategies they believed reduced or eliminated these barriers, and examples of active learning they had experienced in closing the digital-use divide. The major findings of this study are organized by the central research question and research subquestions.
Central Research Question

What are the barriers that middle school principals perceive affect the integration of the active use of technology for student learning?

Major Finding 1. An important finding was that the principals in this study unanimously identified barriers related to teachers’ knowledge and/or traditional teaching styles as significant barriers to integrating ICT for active learning. Teachers’ lack of knowledge of ICT, lack of confidence in using ICT, and beliefs in traditional teaching styles are clear second-order barriers. A teacher’s skill level and confidence are significant factors and have a great influence on the amount of ICT used and how often ICT is used to support active learning (Alkhawaldeh & Menchaca, 2014; Cui & Vowell, 2013). The principals often interwove these barriers into their responses and had difficulty in distinguishing between these two barriers.

In explaining teachers’ lack of knowledge, principals used phrases like “just do not understand” or “if I [the teacher] don’t know the technology, I can’t use it in my classroom,” which implies the barrier of teachers’ lack of knowledge about ICT and active learning can be reduced or eliminated with a convergent approach such as offering professional development opportunities or training. Most principals in this study described the barrier of teachers’ lack of knowledge with the strategies they used or planned to use to reduce or eliminate this barrier. In other words, principals can clearly identify teachers’ lack of knowledge about integrating ICT for active learning and prescribe a solution to this barrier.

In contrast to teachers’ lack of knowledge, traditional teaching styles were presented as a barrier that was not as easily reduced or eliminated. The fourteen
principals who identified traditional teaching styles as a barrier to integrating ICT for active learning did not provide a recommended solution. This barrier is complicated and rooted in years of experiences, going back to the teachers’ own education, and thus it is difficult to reduce (Cuban & Jandric, 2015; Levin & Wadmany, 2008; Tondeur, Hermans, et al., 2008). Most principals believed this was a permanent barrier for some teachers. This finding is in alignment with the research related to the extreme difficulty in reducing second-order barriers (Bai & Ertmer, 2008; C. Kim et al., 2013).

**Major Finding 2.** While the first-order barrier of access to ICT has greatly diminished over the past 2 decades, all but one of the principals in this study indicated that providing ICT for student use is still a barrier. Depending on the level of ICT integration at the participants’ schools, this barrier was described in terms of an inability to provide computers or devices for students, the limited wireless capacity, or the need for a refresh program for older computers and devices. As principals described the ICT situation at their schools, it was clear that there was a large discrepancy in student access to ICT. This discrepancy ranged from a school having one Chromebook cart for each of the core departments to a school being close to 1.3 computers or devices for every student. Additionally, schools that had offered extensive ICT access for years were now realizing the barrier of needing to refresh the devices every 3-5 years.

Principals identified the significance of this barrier to the level of ICT the school and district had provided. Principals at sites close to, at, or above the 1:1 ratio of computers to students noted this as a barrier but not significant. In stark contrast, principals at sites with limited student access to ICT such as shared Chromebook carts or computer labs identified this as a major barrier to integrating ICT for active learning.
This barrier of student access to ICT is supported by researchers who have identified that ineffective logistics like computer labs or shared laptop carts greatly reduce the student use of ICT (Imazeki, 2014; Jones et al., 2014; Russell et al., 2004; U.S. DOE OET, 2016).

**Major Finding 3.** Close to 70% of the principals indicated that there are significant barriers related to professional development for integrating ICT into the classroom and supporting active learning. The 12 principals in this study who identified barriers related to professional development indicated a lack of funding for professional development, a lack of time for teachers to attend the professional development trainings, trainings with limited follow-up support, and/or ineffective training as root causes for this barrier. One principal mentioned several barriers such as, “I think because it [technology] is ever changing and because teachers are busy” and “teachers need to get some refreshers.” These perceptions of professional development as a barrier to ICT integration are supported by Ertmer et al. (2007) and Inan and Lowther (2010), who found that a lack of adequate professional development is a significant barrier for successful integration of ICT, as teachers may find that they are continuous beginners as ICT changes.

The 12 principals who identified barriers related to professional development commented on the complexity of professional development itself. One principal captured part of this complex issue with the statement, “You offer it during the day, and teachers are upset because you pulled them out of class. You offer it to them in the afternoon, they can get paid for it, and they don’t attend.” Others shared that the professional development offered may not match the needs of their teachers. Additionally, for new
ICT such as Chromebooks, Smartboards, and Google Classroom, a district may only offer a half-day training and no follow-up support. Also, teachers are often required to attend other professional development trainings, thus leaving ICT and active learning as an afterthought.

In addition to the constraints of logistics of offering professional development, principals noted the lack of differentiation and ineffective design in most professional development trainings. Many principals noted that “one-size-fits-all” professional development training often does not help the teachers who are in need of the training and only supports early adopters. One principal noted this lack of differentiation in that after a staff or district is trained, there is no follow-up or additional training in subsequent years for new teachers or those who need a refresher on the material. Furthermore, some professional development is not adjusted for a particular school’s ICT configuration and offers ideas and suggestions that the school is not able to provide.

Research Subquestion 1

How do middle school site principals reduce or eliminate barriers to effectively integrate the active use of technology in the classroom for student learning?

Major Finding 4. Principals unanimously identified that providing ICT for teachers and students is essential to reducing barriers to ICT integration for active learning. This finding is in alignment with the principals’ responses since all but one identified the lack of access to ICT as a significant barrier to ICT integration. Furthermore, researchers have identified that providing an adequate level of ICT is essential for successful ICT integration (Shapley et al., 2010b; Tondeur, Valcke, & van Braak, 2008). While many of the principals in this study were at schools where access to
ICT was no longer a barrier, each of these principals expressed that providing the devices to students and teachers and ensuring the wireless network could serve the entire school population greatly increased the use of ICT for active learning. Principals at schools below the 1:1 ratio, or a desired ratio, shared their goals to increase the level of ICT at their sites. Each principal explained that providing ICT, in any capacity, had reduced barriers to ICT integration.

In addition, all principals explained that continually refreshing the ICT capacity at their sites was part of the strategy to provide access to ICT and active learning activities. This refresh program included both the devices and hardware for teachers and students as well as keeping the wireless network updated. Six of the principals identified specific refresh timelines, or their districts had a refresh program as part of the Local Control Accountability Plan. The other 10 did not mention a specific plan and appeared to approach the strategy of a refresh program as needed.

Finally, two of the principals indicated that they had a Chromebook checkout program that allowed students to take the devices home, and four other principals shared their desire to start a similar program. The principals using a checkout program shared how this further increased the use of ICT for active learning, as projects and presentations could be developed and worked on outside of the classroom. They explained that these skills developed outside of the classroom had helped increase the level of ICT used for active learning during the school day. Although the other four principals who identified this strategy had not begun implementation, they believed this approach would increase the ICT used during the school day at their sites as well.
Major Finding 5. All principals except one shared that providing professional development is an effective strategy for reducing or eliminating barriers to ICT integration for active learning. Similar to providing access to ICT, this strategy is in alignment with the principals’ beliefs of significant barriers to integrating ICT. This strategy included attending formal professional development and encouraging teachers to attend formal professional development presented by the school district or internal professional development opportunities presented by teachers on staff. Wright and Wilson (2011) found that teachers involved in extensive professional development for using ICT in the classroom helped increase the use of ICT and reduced negative attitudes toward ICT.

Twelve principals identified examples of formal professional development as sending teams of teachers to the Computer Using Educators conference, sending them to the Google Summit, or hiring professional presenters to assist in the integration of ICT. These principals explained that professional presenters and trainers were used to work with the whole teaching staff, while the conferences were usually for teachers who had expressed an interest in ICT and active learning. After teachers were trained, the principals developed internal professional development opportunities for other staff members, with the newly trained teachers as the presenters and trainers.

Three principals also shared that hiring outside professional development providers or using the professional development offered by the district increased the use of ICT in the classroom. This strategy provides professional development to the entire staff, and principals strongly believed that this approach increased the integration of ICT for active learning. Additionally, these principals shared that this strategy helped keep
the entire school in alignment and would support teacher collaborative efforts since all
teachers had received the same training.

A final approach to professional development is providing internal professional
development presented by staff members. Again, 12 principals explained that internal
professional development allows for more targeted trainings based on the teachers’ needs.
This also ensures the training is designed around the school’s current level of ICT and
teachers’ skills with using ICT for active learning. With this strategy, follow-up
opportunities are readily available since the trainers are teachers or administrators on
staff. One principal explained this approach as identifying “lead teachers that use
technology effectively and offering those teachers to provide learning experiences for
other teachers to help move them along.” This approach also allows for teachers to
attempt more ICT use, knowing there is on-site support if needed.

**Major Finding 6.** Over 80% of the principals believed that providing time for
teachers to collaborate about the use of ICT for active learning was an effective strategy
for increasing ICT use. Researchers have supported this belief by indicating that
collaboration time dedicated to learning about and practicing with technology is needed
for the successful integration of ICT (Ertmer & Ottenbreit-Leftwich, 2010; Gorder, 2008;
C. Kim et al., 2013). One principal described this strategy as “you use the group to move
the group” and shared that his school had experienced a significant increase in ICT use
for active learning with this strategy.

Thirteen principals shared several approaches to providing time to collaborate,
including before- and afterschool meetings, early release days for students, common
preparation times for teachers, and release days for teachers. Researchers have agreed
that these strategies for increasing collaboration on the use of ICT are beneficial in reducing barriers to ICT integration (Ertmer & Ottenbreit-Leftwich, 2010; Gorder, 2008; C. Kim et al., 2013). Two principals shared that some of their teachers participated in virtual collaborative groups and that this practice had increased the use of ICT, especially for active learning, in their classrooms.

**Research Subquestion 2**

_How do middle school site principals determine if the active use of technology is effectively integrated in the classroom to increase student learning?_

**Major Finding 7.** There was limited agreement among the principals about examples of ICT for active learning and how ICT is used for active learning. The two most common examples provided were virtual classrooms and project-based learning (PjBL) or problem-based learning (PBL). Close to 70% of the principals identified virtual classrooms as an example of ICT-supported active learning, and just over 55% discussed PjBL and PBL activities.

Eleven principals identified virtual classrooms and provided examples of students participating in discussions and interactive problem solving to support the claim that virtual classrooms are active learning activities supported by ICT. This format also readily encourages the use of the Internet to research and support arguments and ideas in these collaborative discussions. Students who engage in collaborative, virtual interactions develop positive social digital citizenship skills and document-supported arguments, which are both skills that enhance ICT-supported active learning (An & Reigeluth, 2012; Azmin, 2016).
Nine principals identified PjBL and PBL as ICT-supported strategies and shared how students developed problem-solving, communication, and creative skills through these activities. Researchers have supported this belief in concluding that this student-centered approach toward problem solving and inquiry-based instruction leads to stronger communication and critical thinking skills (Bransford et al., 2000, Tyminski et al., 2013). The finding of only 55% of the principals identifying PjBL and PBL as examples of active learning supported by ICT is in alignment with research that has found that even teachers skilled in both ICT and active learning rarely use PjBL or PBL activities in their instruction (Palak & Walls, 2009; U.S. DOE OET, 2016).

**Unexpected Findings**

Only one principal mentioned a school technology plan as a strategy for reducing barriers to integrating ICT. This was an unexpected finding since each school district has a comprehensive educational technology plan and many districts require schools to also have a technology plan. A second unexpected finding was that only seven of the principals mentioned using a team approach as a strategy for reducing barriers to integrating ICT for active learning. Researchers identified these two strategies as highly effective for increasing ICT in the classroom (Anthony & Patravanich, 2014; Chapman, 2013; Lim et al., 2013).

**Conclusions**

By analyzing the common themes and major findings, the researcher found conclusions that address the central research question and two research subquestions. The following conclusions are aligned to the central research question and the two research subquestions.
Conclusion 1

Principals perceive both first- and second-order barriers to be potentially significant obstacles to the successful integration of ICT for active learning. Primarily, these barriers are the first-order barriers related to access to ICT and the second-order barriers related to teachers’ knowledge and traditional teaching styles. While these barriers were identified as potentially significant, the actual impact of these barriers varies from school to school and district to district.

Principals at schools with ICT available at a 1:1 ratio, or at a level where ICT was readily available for student use, identified access to ICT as a significant first-order barrier that had already been reduced. These principals viewed the barrier of access to ICT as involving the need to refresh their current devices or increase the wireless capacity at the school. In contrast, principals at schools and districts struggling to reach an adequate level of ICT integration perceived this significant barrier as a major obstacle to the successful integration of ICT. Regardless of a school’s current ICT capacity, the first-order barrier of access to ICT will remain a constant first-order barrier as ICT continually evolves (Tondeur et al., 2015; U.S. DOE OET, 2016).

All principals perceive that second-order barriers related to teachers’ knowledge of ICT and teachers’ traditional teaching styles are significant barriers to integrating ICT for active learning. A teacher’s personal and professional beliefs about ICT and teaching style are major factors related to the level of ICT integrated into the classroom for active learning (Cuban & Jandric, 2015; Daniels et al., 2013; C. Kim et al., 2013). Even with ample access to ICT, extensive professional development, and a school culture supportive of ICT and active learning, the second-order barriers related to teachers’ beliefs and
teaching styles remain as significant obstacles to the use of ICT for active learning (C. Kim et al., 2013).

**Conclusion 2**

Principals are able to identify approaches to reduce first-order barriers even if they are unable to utilize or execute these strategies. However, principals appear to have more difficulty in identifying specific approaches or strategies to reduce second-order barriers (Ertmer & Ottenbreit-Leftwich, 2010; C. Kim et al., 2013). In most cases, principals who are successful in reducing second-order barriers specifically related to teachers try several strategies simultaneously. These strategies include providing collaboration time, using teacher coaches, and offering formal and internal professional development. Due to this multiple-strategy approach, it is difficult to determine the overall effectiveness of any one specific strategy, yet researchers have identified each of these strategies as effective in increasing ICT for active learning (Alghamdi & Prestridge, 2015; Celik & Yesilyurt, 2013; Preston, Moffatt, et al., 2015).

Organizing these strategies for reducing barriers into a collaboratively designed technology plan is an effective, overarching strategy (Chapman, 2013; Lim et al., 2013). This approach allows schools to maximize the use of their limited resources and address the specific barriers at the site. Since only one principal in this study specifically mentioned the use of a collaboratively designed technology plan as a strategy for reducing barriers to ICT integration (see Table 20 in Chapter IV), this approach appears to be dramatically underused.
Conclusion 3

Principals are in an influential position to reduce or eliminate both first- and second-order barriers to the successful integration of ICT for active learning (Bektas, 2014; Chang, 2012; Sincar, 2013; Waxman et al., 2013). Principals with visionary leadership approaches address barriers to the integration of ICT with effective strategies that reduce or eliminate these barriers. These strategies include identifying the technology tools needed for supporting the use of ICT for active learning as well as the training and support required for teachers.

Both the International Society for Technology in Education (ISTE, 2009) and the U.S. Department of Education, Office of Educational Technology (U.S. DOE OET, 2016) have identified school site leadership in the area of ICT integration as an essential component for schools to increase the use of ICT for active learning and close the digital-use divide. Principals who display skills and attributes in this area have developed approaches that have greatly reduced barriers to ICT integration. However, many principals have received little or no training in the specific area of integrating ICT into a school setting (McLeod et al., 2011). Principals in this study supported this claim of limited professional development opportunities specifically for school-site ICT integration.

This limited professional development for principals in integrating ICT is a barrier to successfully integrating ICT into schools. The fact that only one principal in this study mentioned a school technology plan as a strategy to reduce barriers to ICT integration supports the claim that effective technology plans to strategically reduce or
eliminate barriers to technology integration in public school classrooms are still not being developed or executed (U.S. DOE OET, 2016).

**Conclusion 4**

Principals understand the difference between ICT used for passive learning and ICT used for active learning. The level of ICT used for active learning is directly related to the presence of the first- and second-barriers and the impact of strategies and approaches to reduce these barriers. Virtual classrooms that support student collaboration and PjBL and PBL are examples of ICT used to support active learning.

The use of virtual classrooms is an effective approach to increasing ICT use for active learning (Adewale, Ibam, & Alese, 2012). Virtual classrooms promote using the Internet for research and student collaboration and allow teachers to upload active learning activities to be completed in class or outside of the school day (Adewale et al., 2012). Principals in this study identified virtual classrooms as an effective use of ICT to support active learning while also increasing student engagement.

Principals also recognize the effectiveness of ICT-supported PjBL and PBL activities to support active learning. Researchers have identified the advantages of these constructivist approaches, including acquiring knowledge, applying new knowledge, and creating final products or presentations (Barron et al., 1998; Blumenfeld et al., 1991; Stefanou et al., 2013). Adding ICT to PjBL and PBL activities provides students with real-world access to information, the opportunity to collaborate with experts in the field, and the ability to produce authentic products and presentations that can be shared on a global scale for learning (Chen & Chou, 2015; Cuban, 2001; U.S. DOE OET, 2016).
**Implications for Action**

The conclusions identified suggest implications for further action. The individuals or groups are identified, as are the specific steps required to support the action.

**Implication for Action 1**

District-level administrative teams should develop professional development training for principals to develop effective technology plans with an emphasis on ICT for active learning. This training is crucial for principals to understand the importance of (a) using a collaborative approach to develop a plan and set specific goals; (b) budgeting for ICT purchases and refresh of technology; and (c) identifying the specific supports the teachers will need, including specific professional development opportunities. Once trained, principals could then begin the process of revising or developing and executing an effective technology plan for their school site.

Principals should work collaboratively with staff members to establish a 1-, 3-, and 5-year ICT integration plan to support active learning. Initial steps would be establishing the current inventory of ICT, the needs of the teachers, and annual goals for student-to-computer ratios. Furthermore, schools moving toward a 1:1 student-to-device ratio should plan the organized abandonment of standalone computer labs for academic support. This plan should include funding and potential funding sources to purchase new devices, refresh aging devices, and maintain or update the wireless capacity of the school site. Additionally, the district’s technology department should be involved, or at least consulted, as the plan is developed and implemented.
Moreover, the technology plan should address specific active learning activities and supports such as virtual classrooms, PjBL and PBL lessons, and ICT-supported collaboration, critical thinking, and creative activities. The technology plan should outline the expected percentage of instructional time spent for ICT and active learning. Furthermore, teachers should be consulted to determine what additional supports are required for reaching these goals, including technology support, professional development, and just-in-time instructional coaching. Knowing the specific needs of the staff will allow principals to organize professional development that is appropriate for reducing or eliminating the barriers to ICT integration for active learning.

**Implication for Action 2**

Principals and their assistant principals should observe all teachers on a regular basis to establish the levels of ICT use and the number of active learning activities versus passive learning activities. Understanding what is happening in the classroom is essential to developing supports for teachers to increase ICT use for active learning. These data should also be considered during the development of the technology plan.

Additionally, classroom observation data will help principals identify where their teachers fall on the spectrum between traditional teaching styles and constructive approaches to education. This will help guide discussions about the integration of ICT and how to best support active learning activities.

Lastly, principals should carefully consider the teaching philosophies of candidates for new teaching positions. Ensuring teachers entering into the school have constructivist beliefs, are comfortable with ICT use, and use a student-centered approach
will increase the level of ICT use and help develop a school culture of ICT use for active learning and other student-centered approaches.

**Implication for Action 3**

Principals should work collaboratively with other principals and their teachers to review (a) the ISTE standards; (b) the recommendations from the U.S. DOE OET to close the digital-use divide; (c) the technological pedagogical content knowledge (TPACK) model; and (d) the substitution, augmentation, modification, redefinition (SAMR) model to design an assessment tool for determining the effectiveness of using ICT for active learning. This background knowledge on ICT integration for active learning will provide principals with a framework for establishing and evaluating ICT use in the classroom. Additionally, this approach will provide principals with ample resources and supporting documents to share with staff members to assist in ICT integration.

Once a school staff is familiar with the ISTE standards, recommendations for closing the digital-use divide, and the TPACK and SAMR models, a data collection tool can be designed. The purpose of the data collection tool would be to identify current levels of ICT use, determine the quantity and quality of active learning, and shape decisions concerning professional development to support ICT integration for active learning.

This data collection tool should identify ISTE standards for teachers, students, administrators, and, if applicable, coaches. These standards are designed to work in concert so all participants in the school can focus on the same concept (ISTE, 2009). With focus standards identified, teachers, administrators, and coaches should observe classes to identify the teachers’ technological, pedagogical, and content level of
competency. Data from these observations will help shape professional development opportunities or coaching needs. Additionally, the data collection tool will identify the SAMR level of learning activities for students. This information will help shape targeted professional development opportunities to help teachers progress to using more redefinition activities identified in the SAMR model.

**Implication for Action 4**

Principals should establish all necessary supports to ensure virtual classrooms are created for all academic core classes. This initial step will allow for additional ICT and active learning activities to be integrated into the classroom with limited disruptions. Virtual classrooms will allow for students, teachers, administrators, and parents to easily access information, collaborate, and present authentic products and projects.

**Recommendations for Further Research**

There have been several studies on the integration of ICT, the effectiveness of active learning activities, and the influence of the school principal; however, few studies have focused on the integration of ICT to support active learning and ultimately address the digital-use divide. The researcher was unable to find any prior studies related to the perceptions of principals in regard to barriers to ICT for active learning. The current study specifically looked at the perceptions of middle school principals toward the barriers to ICT integration for active learning. It also analyzed principals’ strategies to reduce or eliminate these barriers and how they determined when or if active learning supported by ICT was happening. However, further studies in this area will help establish additional recommendations for closing the digital-use divide.

Recommendations for future studies on this topic are as follows:
1. The researcher recommends that similar studies to this one be conducted at the elementary and high school levels. Studies at these two levels will add to the research on principals’ perceptions toward integrating ICT for active learning.

2. Another area that should be studied is teachers’ perceptions of barriers to ICT integration for active learning. Data collected from this type of study juxtaposed with the findings from the study presented here would create a deeper understanding of the barriers to ICT integration and the digital-use divide.

3. Additionally, the researcher recommends a quasi-experimental study conducted with a control group of students participating in traditional active learning activities compared to students participating in ICT-supported active learning activities. This type of study would add quantitative data to determine the effectiveness of ICT-supported active learning activities versus non-ICT-supported active learning activities.

4. A mixed-method study can be conducted to measure the effectiveness of a data collection tool for assessing the quality and quantity of ICT used for active learning. This study would evaluate the effectiveness of the data collection tool for increasing ICT use for active learning.

5. Lastly, the researcher recommends a mixed-method study of teachers’ beliefs and students’ performance in classrooms that utilize ICT-supported active learning activities.

Any of these studies would add to the academic knowledge of ICT integration for active learning and ultimately provide additional recommendations for closing the digital-use divide.
Concluding Remarks and Reflections

The results of this study are important since they add to the small body of research on principals’ perceptions toward ICT integration for active learning. Also, this study is one of the first to look at the digital-use divide. Principals and district administrators in educational services or educational technology departments may benefit from the data presented in this study as they approach barriers to ICT integration for active learning.

The researcher has experience as a middle school teacher in Japan and Southern California as well as experience as an intermediate school assistant principal and principal. He has faced many of the barriers identified by the principals in this study, implemented many of the strategies used by the principals in this study, and observed some of the ICT-supported active learning activities. Five years ago, when the researcher was still an intermediate school principal, virtual classrooms were just being introduced at the middle school level, and their full potential is still to be realized. Seeing the changes over the past half decade has highlighted the ever-changing landscape of ICT in the educational setting and the fact that all of us, to some extent, will be perpetual novices in this arena.

This study reaffirmed the significant influence the middle school principal has on the learning environment for adolescents. The principals who agreed to participate in this study demonstrated the dedication they bring to the school site to ensure students are provided with optimal learning conditions. The researcher could feel their frustration about teachers with traditional teaching styles who prevent students from accessing ICT for active learning but could also see their clear joy when describing the amazing teachers
who can seamlessly integrate ICT into a lesson that has students actively exploring, creating, collaborating, and presenting their projects.

Papert (1980) correctly predicted that microcomputers would become small enough to fit in our pockets. The researcher of this study predicts that Chromebooks, laptops, and iPads will become everyday tools for learning as the pencil and paper have been for centuries. With overwhelming research that supports the use of ICT and active learning for improving student achievement, the question that still remains is, When will barriers to ICT-supported active learning finally be eliminated?
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APPENDIX B

IRB Approval

BRANDMAN UNIVERSITY INSTITUTIONAL REVIEW BOARD
IRB Application Action – Approval

Date: 10/30/2016

Name of Investigator/Researcher: Bob Presby

Faculty or Student ID Number: B00468562

Title of Research Project:
Barriers to Reducing the Digital-Use Divide as Perceived by Middle School Principals

Project Type: ✔ New    ☐ Continuation    ☐ Resubmission

Category that applies to your research:
✔ Doctoral Dissertation EdD
☐ DNP Clinical Project
☐ Masters’ Thesis
☐ Course Project
☐ Faculty Professional/Academic Research
☐ Other:

Funded: ✔ No    ☐ Yes

Project Duration (cannot exceed 1 year): 4 months

Principal Investigator’s Address: 28731 Hedgerow Mission viejo, CA 92692

Email Address: bpresby@mail.brandman.edu  Telephone Number: (949) 500-4727

Faculty Advisor/Sponsor/Chair Name: Dr. DeVore

Email Address: ddevore@mail.brandman.edu  Telephone Number: 623-293-2421

Category of Review:
✔ Expedited Review    ☐ Exempt Review    ☐ Standard Review

I have completed the NIH Certification and included a copy with this proposal

NIH Certificate currently on file in the office of the IRB Chair or Department Office

Signature of Principal Investigator: Robert Presby
Date: 10/30/2016

Signature of Faculty Advisor/ Sponsor/Dissertation Chair: Douglas DeVore
Date: 10/30/2016
BRANDMAN UNIVERSITY INSTITUTIONAL REVIEW BOARD
IRB APPLICATION ACTION – APPROVAL
COMPLETED BY BUIRB

IRB ACTION/APPROVAL

☐ Returned without review. Insufficient detail to adequately assess risks, protections and benefits.

☐ Approved/Certified as Exempt form IRB Review.

✔ Approved as submitted.

☐ Approved, contingent on minor revisions (see attached)

☐ Requires significant modifications of the protocol before approval. Research must resubmit with modifications (see attached)

☐ Researcher must contact IRB member and discuss revisions to research proposal and protocol.

Level of Risk: ☐ No Risk  ✔ Minimal Risk ☐ More than Minimal Risk

IRB Comments:

________________________________________________________________________

Digitally signed by David Long
DH: cn=David Long, or=Brandman University, ou=, email=dlong@brandman.edu, c=US
Date: 2016.11.17 14:53:57 -08'00'

IRB Reviewer:

Telephone: __________________________ Email: __________________________

BUIRB Chair: __________________________ Date: November 17, 2016

REVISED IRB Application  ☐ Approved  ☐ Returned

Name: __________________________

Telephone: __________________________ Email: __________________________ Date: __________________________

BUIRB Chair: __________________________

APPENDIX C

Informed Consent Form

INFORMATION ABOUT: Barriers to Reducing the Digital Use Divide as Perceived by Middle School Principals.

RESPONSIBLE INVESTIGATOR: Bob Presby

PURPOSE OF STUDY: You are being asked to participate in a research study conducted by Bob Presby, a doctoral student and Brandman University who is conducting a study on Barriers to reducing the digital-use divide as perceived by middle school principals. Additionally, this study will look at steps principals have taken to reduce barriers to ICT integration for active learning and how these steps may have helped close the digital-use divide.

This study is designed to help fill in the gap in research regarding principals perceptions of barriers towards Information and Communication Technology (ICT) integration for supporting active learning. The results of this study may assist districts in identifying and developing strategies that will support principals with the process of ICT integration for active learning and help to close the digital-use divide.

By participating in this study I agree to participate in a one-hour interview and will be conducted in person. In addition, participants will complete a brief background informational questionnaire using Survey Monkey. The survey will take approximately 10 minutes to complete.

I understand that:

a) There are minimal risks associated with participating in this research. I understand that the Investigator will protect my confidentiality by keeping the identifying codes and research materials in a locked file drawer that is available only to the researcher.

b) The possible benefit of this study to me is that my input may help add to the research regarding principals’ perceptions towards barriers for integrating ICT to support active learning and close the digital-use divide. The findings will be available to me at the conclusion of the study and will provide new insights about principals’ perceptions in which I participated. I understand that I will not be compensated for my participation.

c) If you have any questions or concerns about the research, please feel free to contact Bob Presby at 949-500-4727 or rpresby@mail.brandman.edu; or Dr. Doug Devore (Advisor) at ddevore@brandman.edu.

d) My participation in this research study is voluntary. I may decide to not participate in the study and I can withdraw at any time. I can also decide not to answer particular questions during the interview if I so choose. I understand that I may refuse to participate or may withdraw from this study at any time without any negative consequences. Also, the Investigator may stop the study at any time.
e) No information that identifies me will be released without my separate consent and that all identifiable information will be protected to the limits allowed by law. If the study design or the use of the data is to be changed, I will be so informed and my consent re-obtained. I understand that if I have any questions, comments, or concerns about the study or the informed consent process, I may write or call the Office of the Vice Chancellor of Academic Affairs, Brandman University, at 16355 Laguna Canyon Road, Irvine, CA 92618, (949) 341-7641.

I acknowledge that I have received a copy of this form and the “Research Participant’s Bill of Rights.” I have read the above and understand it and hereby consent to the procedure(s) set forth.

Signature of Participant or Responsible Party

____________________________________

Signature of Principal Investigator

____________________________________

Date

____________________________________
APPENDIX D

Interview Protocol

Introduction

I am Bob Presby and I am a research student from Brandman University. I have been in education for the past 22 years and currently am studying middle school principals and their perceptions towards Information and Communication Technology (ICT) integration.

This current study is designed to analyze the perceptions of middle school principals towards ICT integration for active use technology. There is emerging research on the “digital-use divide” or the growing separation between teacher/passive use of technology and student/active use of technology. My research is designed to better understand how principals perceive barriers to both ICT integration and active use of technology.

Informed Consent and Recording

Before I start the interview, I would like to make sure you understand what will happen during and after the interviewing process. Thank you for reading and signing the Informed Consent and the Brandman Bill Of Rights. Do you have any questions or need clarification about either document?

I will be recording during the entire interview; in fact, I have already turned on the recorder and I am recording as I speak. If at any point during the interview, you wish to have the recorder turned off, please request me to do so. Because I am recording this interview, I will take fewer notes so that I can obtain a better understanding of the
experiences you tell me during the interview, and this will ensure that all information you provide is accurate and precise. However, I will take some notes during the interview to make certain I have obtained all the important facts and pertinent information needed to answer the questions.

The interview is designed in a semi-structured way around the central theme of the study. Open-ended questions were developed to guide the interview but allow you the freedom to fully answer a question or explain a concept.

I will be transcribing interview within the next day or two. May I contact you to clarify any responses? Do you have any questions?

First, thank you for filling out the demographic information in the questionnaire I sent you;

**Interview Questions:**

Q1. What do you believe are barriers to integration Information Communication Technology (ICT) or technology into the classroom?

Probe: Why do you believe ________ is a barrier or can you give some examples?

Q2. How is ICT used at your school and in the classroom?

Probe: Can you give some examples or situations of ICT use in your core classes?

Q3. What types of active learning activities are used in your core classes?
Probe: Does that happen often? How often? Which Subjects? What does it look like in the classroom?

Q4. In thinking about your answers to ICT integration and active learning, what do you believe are barriers to ICT integration into the classroom specifically for active use technology?

Probe: Why do you believe ________ is a barrier or can you give some examples?

Q5. Have you found any particular strategies helpful in reducing these barriers?

Probe: Tell me more about that strategy?

Probe: Are there strategies you have found to be helpful for increasing tech access?

Q6. What are some of the most effective strategies for reducing barriers to ICT integration and/or increasing active learning?

Probe: Why do you think these strategies were effective?

Q7. Have you been involved in professional development on the integration of ICT?

If yes, please describe what it looked like?

If no, can you tell me what you believe would be important to include in professional development on the integration of ICT?

Probe: How would you describe yourself as a ‘user’ of technology in your personal and professional life?
Conclusion

Thank you for your time today. Please accept this Starbucks gift card as a thank you gift. As I mentioned, I will transcribe the audio recording from our conversation within the next few days. Please feel free to reach out to me if you would like to add any additional information or comments you feel will add to this study.

Research Questions

   Central Question: What are the barriers middle schools principals perceive affect the integration of the active use of technology for student learning?

   Sub-Question 1: How do middle school site principals reduce or eliminate barriers to effectively integrate the active use of technology in the classroom for student learning?

   Sub-Question 2: How do middle school site principals determine if the active use of technology is effectively integrated in the classroom to increase student learning?
Survey Monkey Questionnaire

What is your age?

( ) 20-29 ( ) 30-39 ( ) 40-49 ( ) 50-59 ( ) 60-65 ( ) 65+

What is your gender? ( ) Male ( ) Female

What is your educational background/experience starting with high school?

Were you a classroom teacher, if so how many years?______ Grade levels? Subjects?

Which administration positions have you held and for how long?