SUPPORTING TEACHERS’ TECHNOLOGY IMPLEMENTATION PRACTICES
THROUGH PEER-TO-PEER COACHING: A MIXED METHODS STUDY

by
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A dissertation submitted to Johns Hopkins University in conformity with the requirements for the degree of Doctor of Education

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Abstract

The promise of technology integration to increase student learning and acquisition of academic skills is far from realized, as teacher instructional practices do not reflect meaningful learning with technology. Informed by sociocultural and situated learning theories, a mixed methods study was designed for eight general education and two special education middle school teachers with 6 to 25 years of teaching experience. Two teachers represented each of the following disciplines: English language arts, history, mathematics, science, and special education \((N = 10)\). The 8-month study used surveys, teacher reflections, and a focus group to determine whether participation in a peer-to-peer coaching intervention changed teacher self-efficacy, technology perceptions, and technology knowledge and skills. A Wilcoxon signed rank test did not find statistically significant changes in teacher self-efficacy or perceived ease of use, but a statistically significant change was found for perceived usefulness of technology. Qualitative data from teacher reflections and a focus group revealed that technology knowledge and skills improved, which may be attributed to teachers engaging in conversations with peers from other content areas. Participation in a community of learners supported risk-taking and openness to integrating technology into instructional practices. An implication for practice is that teachers should collaborate in interdisciplinary teams to increase understanding of how technology can support student learning. Teachers need time to develop collegial relationships as well as explore, plan, and play with technology. Future studies should consider examining formal and informal peer support structures and their role in providing real-time assistance to teachers.
Keywords: technology integration, meaningful learning with technology, technology self-efficacy, peer coaching, technology knowledge and skills

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Dedication

This dissertation is dedicated to my family:

To the memory of my dad, Stephenson C. Cabiness, whose love and support I will always cherish, until we meet again in heaven. xo

To my mom, Shigeko Y. Cabiness, who is my biggest cheerleader. It is from you that I draw my strength and perseverance.

To my baby brother, Stephenson C. Cabiness, Jr., who makes me want to be a better version of myself.

And finally, to my husband, Patrick S. Atkinson, whose support, love, and encouragement have provided a safe harbor from life’s many storms and swells.

Thank you for helping me to achieve my Big Five for Life. xo
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the areas of contemporary approaches to educational problems, instructional design
theories and models, and research on effective professional development.

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Executive Summary

The introduction of technology (e.g., computers, mobile devices) as the panacea to increase student learning and acquisition of academic skills continues to remain unmet (Voogt, Erstad, Dede, & Mishra, 2013). In fact, technology integration will continue to have little effect on student learning if tasks and activities are not aligned to sound pedagogical approaches (Cuban, 2013). As teacher instructional practices directly influence what occurs in the classroom (Cuban, 2013; Garet, Porter, Desimone, Birman, & Yoon, 2001), the goal remains of how to help teachers design meaningful learning opportunities for students. Teachers need to take advantage of the benefits of technology to provide students with the necessary skills and dispositions to be productive members of this global society (Kale & Goh, 2014; Shapley, Sheehan, Maloney, & Caranikas-Walker, 2011; Stefl-Mabry, Radlick, & Doane, 2010). Jonassen, Howland, Marra, and Crismond’s (2008) research about meaningful learning with technology suggests that technology can support the learning process if the tasks reflect active, constructive, intentional, authentic, and collaborative learning. However, changing teacher instructional practices does not come without challenges. Barriers to technology integration include low self-efficacy (Ertmer, 1999; Ertmer & Ottenbreit-Leftwich, 2013), attitudes and beliefs about the value of technology for student learning (Ertmer, Ottenbreit-Leftwich, Sadik, Sendurur, & Sendurur, 2012; Shifflet & Weilbacher, 2015), lack of technology knowledge and skills (Koehler, Mishra, Kereluik, Shin, & Graham, 2014), and poorly designed professional development (PD; Cifuentes, Maxwell, & Bulu, 2011).
Problem of Practice

The promise of technology integration to increase student learning and acquisition of academic skills is far from realized (Voogt et al., 2013). The constraints of standardized testing and accountability measures have put schools on a trajectory that focuses on the narrow acquisition of content instead of the general knowledge and applicable skills needed in this global economy (Embse, Schoemann, Kilgus, Wicoff, & Bowler, 2017). Employers lament the lack of critical thinking, problem solving, and adaptability skills of recent college graduates and young adults (Gates, 2013; Lowther, Inan, Daniel Strahl, & Ross, 2008). Students are graduating without being exposed to experiences and skills to prepare them to be successful in this global society (Gates, 2013; Partnership for 21st Century Skills, 2016). Although there may be “pockets of innovation” (Couros, 2015, p. 135), technology implementation is inconsistent across teachers and schools, regardless of whether the setting is rural, urban, public, private, elementary, or secondary (Stefl-Mabry et al., 2010). Even when technology is being accessed, its use in classrooms is largely far from authentic (Ertmer & Ottenbreit-Leftwich, 2013). The context under study possessed ample technology resources but provided minimal support in helping teachers develop instructional practices that target opportunities for meaningful learning with technology.

Professional Context

The context for the study was a junior high (i.e., Grades 7 and 8) school located in a large, urban K12 unified district in California. School personnel consisted of two administrators (i.e., principal, assistant principal), one counselor, and 29 faculty. All teachers held a California teaching credential and are considered highly qualified as
defined under the No Child Left Behind Act (e.g., bachelor’s degree, valid teaching credential, demonstrate mastery of the content; U.S. Department of Education, 2001). The district and school both qualified for Title I funding. Approximately 76% of students came from socioeconomic disadvantaged households, and 54% of the student population were English language learners. During the 2015-2016 school year, Title I funding facilitated the purchase of technology for the school, including MacBooks, iPads, and Chromebooks. All teachers had a MacBook, and the core academic classes had a 1:1 student-to-device ratio.

A needs assessment was conducted during the spring of 2017 to identify current technology use as well as the opportunities and barriers to technology integration. The needs assessment focused on several constructs: self-efficacy, collective efficacy, current use, and opportunities and barriers. Teachers and administrators (N = 21; 70% of the faculty) provided quantitative data from the efficacy survey for analysis, with six of those teachers, representative of the four academic disciplines (i.e., English language arts, history, mathematics, and science), providing qualitative data from classroom observations and semi-structured interviews for analysis.

Self-efficacy data from the survey was inconclusive as teacher responses to some questions seemed to contradict one another. For example, the majority of teachers disagreed with the statement that outside factors had a larger influence on student learning, but then agreed that their efforts would have little influence on student progress. Field notes from the classroom observations and semi-structured interviews suggested that teachers were confident in their ability to use technology. Findings for collective efficacy revealed that teachers held peers in high regard in terms of pedagogical
knowledge but harbored low expectations in their collective efforts to support student learning. Data from the field observations indicated a wide-range of technology use among teachers. Responses from the semi-structured interviews revealed that teacher perception of technology use and integration spanned the continuum from technology as a supplemental tool to a means for providing student learning opportunities for choice and creativity. Barriers to technology integration included lack of time to explore, plan, and collaborate with colleagues; lack of knowledge about how technology tools could support student learning outcomes; and lack of perceived administrative support and leadership. However, a promising revelation from the interview data was the existence of an informal network of peers who provided technology support.

**Theoretical Frameworks**

The theoretical frameworks that informed the research design are sociocultural and situated learning theories. Sociocultural learning theory addresses the social aspect of learning that occurs at the intersection between relationships, language, and environment (Vygotsky, 1978). Situated learning theory focuses on the idea that learners best acquire knowledge and skills through the exploration and application of learning within the same or similar social context in which it was learned (Lave, 2005).

Learning is a social process that occurs with and through the help of others (Vygotsky 1978). A salient component of sociocultural learning resides with Vygotsky’s (1978) concept of the zone of proximal development—defined as the relationship between what a learner can do with and without assistance (i.e., scaffolding). Peers, coaches, or experts in the field can provide the necessary support structure for learning and skills acquisition (Vygotsky, 1978). As context is an important aspect of situated
learning (Bransford, Brown, & Cocking, 2000), shared experiences in authentic tasks can promote the transfer of knowledge to new settings (Brown, Collins, & Duguid, 1989).

Related to sociocultural learning is the notion of collaborative learning through communities of practice (Lave, 1996). Collaborative learning stems from increased knowledge and skills through conversation and academic discourse. According to Lave (2005), novice learners may benefit from peripheral participation within a learning community as they engage in the social construction of knowledge. The social negotiation of knowledge between the novice and expert is the crux of sociocultural learning theory and serves as the basis for the apprenticeship or coaching model (Bransford et al., 2000).

**Synthesis of Relevant Research Literature**

Traditional PD typically situates teachers as passive recipients of knowledge with little to no time for collaboration, application, or feedback (Desimone & Garet, 2015). As such, “many PD initiatives appear ineffective in supporting changes in teacher practices and student learning” (Darling-Hammond, Hyler, & Gardner, 2017, p. v). Existing research suggests that effective PD for teachers needs to address the disconnect between theory and practice.

Content-based PD supports authentic learning experiences that are applicable to the classroom (Darling-Hammond et al., 2017; Desimone & Garet, 2015; Doering, Koseoglu, Scharber, Henrickson, & Lanegran, 2014). PD that is of sustained duration leads to a higher likelihood of implementation (Borko, 2004; Darling-Hammond et al., 2017; Desimone & Garet, 2015; Garet et al., 2001; Penuel, Sun, Frank, & Gallagher, 2012). Active learning (Desimone & Garet, 2015; Garet et al., 2001; Penuel et al., 2012;
Sun, Penuel, Frank, Gallagher, & Youngs, 2013) supports teacher agency (Calvert, 2016) and empowers teachers in the learning process.

Oftentimes, multiple and conflicting initiatives confound teachers’ ability to implement new learning with fidelity (Darling-Hammond et al., 2017; Fullan, 2007). Providing PD that aligns to current school goals and initiatives supports the notion of coherence (Borko, 2004; Desimone & Garet, 2015; Penuel et al., 2012) and increases the likelihood of implementation (Fishman et al., 2013; Moon, Passmore, Reiser, & Michaels, 2014).

Collaboration and collective participation (Desimone & Garet, 2015; Kopcha, 2012) are built on the foundation of sociocultural learning theory (Vygotsky, 1978) and communities of practice (Lave & Wenger, 1991). Teachers benefit from coaching and expert real-time and follow-up support (Cifuentes et al., 2011; Collet, 2012; Fairman & Mackenzie, 2015). To that end, effective PD must be grounded in evidence-based pedagogical practices (Darling-Hammond et al., 2017; Learning Forward, 2011; Moon et al., 2014).

**Research Purpose and Objective**

The purpose of the study was to investigate the influence of peer-to-peer coaching on teacher technology implementation practices. The study objective was to reduce barriers to technology implementation by addressing teacher self-efficacy, technology acceptance (i.e., perceived ease of use, perceived usefulness), and technology skills and knowledge. This research study included process and outcome evaluation research questions.

Process Research Questions (RQ):
RQ1. To what extent are participants satisfied with the peer-to-peer coaching support opportunities specifically regarding perceived level of support, frequency, and regularity?

RQ2. To what extent do the coaches facilitate activities conducted during the release day that reflect the five components of meaningful learning with technology?

Outcome Evaluation Questions:

RQ3. To what extent does participation in peer-to-peer coaching influence teacher self-efficacy?

RQ4. To what extent does participation in peer-to-peer coaching contribute to technology acceptance (i.e., perceived ease of use, perceived usefulness) and increased technology skills and knowledge?

Research Design

A mixed methods convergent parallel design study (Creswell & Plano Clark, 2011) was used to collect quantitative and qualitative data to address the research questions. Quantitative and qualitative data were collected throughout the 8-month intervention, independently analyzed by instrument, and combined during the interpretation phase (Creswell & Plano Clark, 2011). Quantitative data included attendance records, satisfaction ratings from the 3-2-1 Reflection, and pre- and postintervention teacher efficacy (Teachers’ Sense of Efficacy Scale; Tschannen-Moran & Woolfolk Hoy, 2001) and perception survey (Technology Acceptance Model survey; Venkatesh, 2000) results. Qualitative data included open-ended responses from the 3-2-1 Reflection and a focus group. The combination of data from both strands contributed to a
better understanding of how peer-to-peer coaching influenced teacher technology implementation practices.

**Intervention**

Eight general education (i.e., English language arts, history, mathematics, and science) and two special education teachers participated in the study. The intervention occurred over an 8-month period in which participants met for a full-day session three times during the 2018-2019 school year, with optional afterschool follow-up sessions. The focus of the full-day sessions was to introduce and immerse teachers in the five components of meaningful learning with technology (i.e., active, authentic, intentional, cooperative, and constructive; Jonassen et al., 2008) as well as give them time to explore, plan, collaborate, and reflect with colleagues. During the unstructured work time, teachers met in small groups or dyads, oftentimes moving between groups or peers depending on their interest or need. Two peer technology coaches, also participants in the study, provided informal assistance during the full-day sessions.

**Data Collection and Analysis**

Quantitative data collection included: attendance records, participant satisfaction ratings, and pre- and postintervention surveys. Quantitative data analysis included descriptive statistics and a Wilcoxon signed rank test for the pre- and postintervention survey results. Qualitative data collection occurred through the 3-2-1 Reflection and a focus group. Seven of the 10 participants participated in the focus group. Thematic analysis was employed to analyze data using semantic and latent coding (Braun & Clarke, 2012). During the interpretation phase, quantitative and qualitative data were combined to substantiate the findings.
Findings

According to quantitative data from the 3-2-1 Reflection, nine of the 10 participants felt that they received the *perfect amount* of support during the full-day sessions. Descriptive statistics showed an increase in the pre- and postintervention means for Self-Efficacy, Perceived Ease of Use, and Perceived Usefulness. However, a Wilcoxon signed rank test did not reveal statistically significant results in changes for teacher self-efficacy or perceived ease of use, but a significant change was found for perceived usefulness.

Qualitative data from the 3-2-1 Reflection revealed that participants intended to use the strategies and technologies shared during the full-day day sessions. In answer to the question regarding application to practice, participants explicitly mentioned how they planned to integrate aspects of meaningful learning with technology into their instructional practices. Focus group data indicated that participant confidence and use of technology were bolstered by the existence of real-time peer support. An increase in technology knowledge and skills emerged during the focus group as teachers acknowledged changes to their instructional practices that incorporated technology to support student learning outcomes. A noteworthy finding is that teachers, both technology novices and experts, found value working with an interdisciplinary group of colleagues as they were exposed to different perceptions and uses of technology for learning.
Chapter 1
Technology and Teacher Practices

The introduction of the microcomputer and increased availability to the Internet in the 1980s ushered in an optimistic time for those fortunate enough to have access (Tyack & Cuban, 1995). Although quickly adopted by society, technology tools such as desktop computers followed by mobile devices, have continued to steadily make an appearance in classrooms (Ertmer, Ottenbreit-Leftwich, Sadik, Sendurur, & Sendurur, 2012; Zhao & Frank, 2003). Moreover, the unanswered promise of technology to substantially improve teaching practices, and thus student learning, makes clear the complexity of meaningful technology integration into classrooms as the adoption of devices has not equated to meaningful use (Cuban, 2013; Ertmer, 1999). Technology use is defined as low-level tasks such as email and word processing (Ertmer, 2005). Conversely, technology integration is defined as the use of mobile devices to provide learning opportunities that focus on skills such as communication, collaboration, critical thinking, and creativity (Ertmer, 1999). However, technology integration alone does not equate to the pedagogical approaches to technology integration, such as meaningful learning (Jonassen, Howland, Marra, & Crismond, 2008). Meaningful learning is defined as activities that foster communication, collaboration, critical thinking, and creativity (Partnership for 21st Century Skills, 2008). For meaningful learning to occur, student use of technology needs to move from “technology-as-teacher to technology-as-partner in the learning process” (Jonassen et al., 2008, p. 7). Meaningful learning with technology may also address the digital use divide, which refers to the gap pertaining to how students use technology to learn (Office of Educational Technology, 2016).
Cuban (2013) writes “the what [emphasis in original] of teaching has, indeed changed, but when it comes to the how [emphasis in original]—the pedagogy—few major changes have occurred” (p. 7). Writing about computer use in schools during the 1980s, Becker (1984) stated that the decision by public schools to purchase technology was not necessarily based on improving instruction but rather a means to satisfy parents and the community that students would graduate with employable computer-based skills (e.g., information curation and retrieval, computer programming). The desire to increase student motivation and engagement further influenced and continues to influence the push for increased access to technology (Becker, 1984; U.S. Department of Education, 2016). Even so, the cost of Internet connectivity and microcomputers inhibits widespread adoption (Delgado, Wardlow, & O’Malley, 2015; Wachira & Keengwe, 2011). The eRate application process, which helps schools in impoverished areas attain affordable access to telecommunications services such as the Internet (Federal Communications Commission, 2018), has proved cumbersome and resulted in long delays and, in some cases, denial of funding for affordable Internet access (Noonoo, 2018).

The next trend of technology tools occurred within the past decade and includes the adoption of mobile devices in larger numbers (Project Tomorrow, 2013). With federal funding, Title I schools have the opportunity to purchase devices to offer a 1:1 ratio of student-to-device learning environments (Davies & West, 2013); schools with a large number of children from low-income households receive federal funding under Title I, Part A of the Elementary and Secondary Education Act (1965, 2002, 2015). The increasing affordability of mobile devices means that more students have access to technology (Zheng, Warschauer, Lin, & Chang, 2016).
Although issues with equity for and access to technology and high-speed Internet may inhibit widespread adoption, access to technology is no longer an insurmountable barrier (Cuban, Kirkpatrick, & Peck, 2001; Ertmer et al., 2012; Shapley, Sheehan, & Maloney, 2010). The recent adoption of computer-based testing and the belief that technology-based learning helps students acquire the necessary academic skills challenges schools to funnel more funds toward the purchase of technology (Donovan, Green, & Mason, 2014; Zheng et al., 2016). Schools are under pressure to purchase technology to satisfy the public so, more often than not, technology is purchased without having a clear plan in place (Shapley, Sheehan, Maloney, & Caranikas-Walker, 2011).

Increased access to technology has spawned a different set of challenges that focus on the digital use divide. For instance, are students using technology to complete tasks that could otherwise be done with paper and pencil, or are students using technology to transform the learning process (Office of Educational Technology, 2016)? The digital use divide stems from the instructional practices and educational philosophies of teachers. For example, the philosophical struggle between teacher-directed and student-centered learning has emerged as a legitimate issue (Ottenbreit-Leftwich, Glazewski, Newby, & Ertmer, 2010). Teacher-directed learning is when teachers take a more active role in instruction, and students serve as passive recipients of information (Harris & Hofer, 2011). Student-centered learning occurs when the “control for the learning process shifts [from the teacher] to the student” (Drexler, 2014, p. 451). An example of teacher-directed use of technology would be a lecture presented vis-à-vis PowerPoint with minimal student-interaction or participation. Student-centered use of technology might entail using a weblog to publicly share their learning with a wider
audience. Therefore, the dichotomy of these two schools of thought differ not on the technology itself but the pedagogy behind instructional practices (Ertmer & Ottenbreit-Leftwich, 2013).

Changing teacher practices to include meaningful learning with technology is challenged by a number of factors including, but not limited to: traditional school structures, educational policies, school culture, and individual, daily decisions teachers make in their classrooms (Ertmer, 1999; Kale & Goh, 2014). It is noteworthy that conflicting reports of teacher perception regarding the quality of technology professional development exist (Ertmer et al., 2012; Gray, Thomas, & Lewis, 2010; Margolin, Pan, & Yang, 2019); no such conflicting reports exists regarding the quantity of technology professional development (Calvert, 2016; Darling-Hammond, Hyler, & Gardner, 2017; Jensen, Sonnemann, Roberts-Hull, & Hunter, 2016). The use of technology as an integral part of instructional practices requires a shift not only in practice but in pedagogy as well (Ertmer, 1999).

Researchers divide barriers to technology integration into two types: external and internal. External barriers include access to technology, infrastructure, and technology support (Ertmer & Ottenbreit-Leftwich, 2013; Wachira & Keengwe, 2011). Internal barriers include teacher efficacy, teacher beliefs, teacher perception, and the value of technology to improve student learning (Ertmer & Ottenbreit-Leftwich, 2013; Wachira & Keengwe, 2011). The integration of meaningful learning with technology into instructional practices requires the elimination or reduction of both external and internal barriers (Evans-Andris, 1995; Finley & Hartman, 2004; Howard, 2013).

*Figure 1.1* Meaningful Learning with Technology Diagram
Figure 1.1. Diagram indicating the interrelated task components that support meaningful learning with technology. Meaningful learning occurs when activities (a) actively engage learners in the process, (b) allow for the construction and reflection of learning, (c) include opportunities for collaboration and social negotiation of understanding, (d) reflect real-world or contextualized situations, and (e) incorporate the development of intentional goals and self-regulatory behaviors. From Meaningful Learning with Technology (3rd ed., p. 3), by D. H. Jonassen, J. L. Howland, R. M. Marra, and D. P. Crismond, 2008, New York, NY: Pearson Education. Copyright 2008 by Pearson Education. Reprinted with permission.

Access to technology does not equate to meaningful learning. Meaningful learning with technology—with a focus on active, constructive, cooperative, authentic, and intentional activities (see Figure 1.1; Jonassen et al., 2008)—can facilitate the skills that students need to be productive members of this global society (Kale & Goh, 2014; Shapley et al., 2010; Stefl-Mabry, Radlick, & Doane, 2010). The five components of meaningful learning, when incorporated into instructional practices, support opportunities
for students to use technology such that they “learn with the technology, not from it” (Jonassen et al., 2008, p. 5). However, a problem exists because, even with the introduction of technology, teaching practices have not significantly changed (Ertmer & Ottenbreit-Leftwich, 2010).

**Problem of Practice**

The promise of technology integration to increase student learning and acquisition of academic skills is far from realized (Voogt, Erstad, Dede, & Mishra, 2013). The constraints of standardized testing and accountability measures have put schools on a trajectory that focuses on the narrow acquisition of content instead of the general knowledge and applicable skills needed in this global economy (Embse, Schoemann, Kilgus, Wicoff, & Bowler, 2017). Employers lament the lack of critical thinking, problem solving, and adaptability skills of recent college graduates and young adults (Gates, 2013; Lowther, Inan, Daniel Strahl, & Ross, 2008). Students are graduating without being exposed to experiences and skills to prepare them to be successful in this global society (Partnership for 21st Century Skills, 2016; Gates, 2013). Although there may be “pockets of innovation” (Couros, 2015, p. 135), technology implementation is inconsistent across teachers and schools, regardless of whether the setting is rural, urban, public, private, elementary, or secondary (Stefl-Mabry et al., 2010). Even when technology is being accessed, its use in classrooms is largely far from authentic (Ertmer & Ottenbreit-Leftwich, 2013). The context under study possessed ample technology resources but provided minimal support in helping teachers develop instructional practices that target opportunities for meaningful learning with technology.
Theoretical Framework

The ecological systems theory (EST) provides the framework for this exploration of literature. Bronfenbrenner’s (1977) notion that researchers should investigate a phenomenon within its ecological context deviated from previous developmental psychologists who focused on isolated behaviors without consideration of reciprocal or outside influences. Bronfenbrenner’s nested ecological systems theory model situates the focal individual within concentric spheres of influence. The four main systems in this model are macrosystem, exosystem, mesosystem, and microsystem. External barriers to technology integration fall within all four systems—macrosystem, exosystem, mesosystem, and microsystem—whereas internal barriers reside within the mesosystem and microsystem. For the purposes of this study, only the macrosystem, exosystem, and microsystem are addressed. To situate the nested model within the context of the problem of practice, each system is aligned with the appropriate underlying factor from the problem of practice in Figure 1.2.

Figure 1.2 Nested Model of Ecological Systems

![Diagram](image)

Figure 1.2. Diagram is an adaptation of Bronfenbrenner's (1977) nested model of ecological systems as aligned to context of the problem of practice. The focal individual
is the teacher who exists within the microsystem of the school along with fellow teachers, administrators, and students. The exosystem contains the policies that influence what happens at the school, which ultimately affects the decisions, behaviors, and mindset of the focal individual. The macrosystem consists of societal influences such as values and beliefs about the role of technology in education. From “Nested or Networked? Future Directions for Ecological Systems Theory,” by J. W. Neal and Z. P. Neal, 2013, Social Development, 22, p. 725. Copyright 2013 by John Wiley & Sons. Adapted with permission.

Bronfenbrenner’s (1994) nested model recognizes the influence of a variety of factors on the various systems. In this approach, societal influences, cultural expectations, and the grammar of schooling (Tyack & Cuban, 1995) for education serve as the macrosystem. District policies inform the exosystem. The school serves as the microsystem with administrators, teachers, and students coexisting within the microsystem. The teacher, as the focal individual, serves as the main focus of the problem of practice.

According to Bronfenbrenner (1994), as the spheres of influence move further from the center, or focal individual, the influence of the proximal processes lessens. Proximal processes are defined as persistent influences that directly affect the immediate surroundings (Bronfenbrenner, 1994). For example, school culture and climate (i.e., microsystem) would have a more immediate impact on individual teacher practices as opposed to federal educational policies (i.e., exosystem), which are farther removed from what directly happens in the classroom. Likewise, social values and beliefs regarding the
role of educators (i.e., macrosystem) exert even less influence than federal educational policies on the classroom teacher.

**Underlying Factors of Technology Integration**

Using ecological systems theory to frame the complex nature of the problem of practice allows for the exploration of the influential underlying factors and causes. The nested model appropriately shows the relationships between settings and how educators, individually and collectively, respond to the complex endeavor of innovation. A myriad of factors directly and indirectly influence teacher propensity to integrate technology into classroom practices in meaningful ways. In the following sections, each of the influences will be introduced using Bronfenbrenner’s nested model, starting with the macrosystemic influences.

**The Role of Society and Culture**

Throughout history, schools have served as the answer to society’s ills (Tyack & Cuban, 1995). From taking on the task of character-building to instilling necessary skills for students to be employable, schools have attempted to address larger social and economic issues that have plagued American society (Tyack & Cuban, 1995). Historically based assumptions of what should occur in schools are known as the “grammar of schooling” (Tyack & Cuban, 1995, p. 9). The underlying notion of the grammar of schooling is that one knows how schools should be run because that is how it was done in the past (Tyack & Cuban, 1995). Powerful lobbyists pushed an agenda that included changes such as grade levels based on biological age, smaller class sizes, specialized courses (i.e., English language arts, history, mathematics, science) at the secondary level, and team-teaching (Tyack & Cuban, 1995). More recently, the push for
21st century skills have prompted researchers and educators to address the notion of what constitutes 21st century learning and the implications for classroom practice (Mishra & Mehta, 2016).

The role of technology in society has become so ubiquitous that it is seen as the panacea for addressing gaps in educational achievement (U.S. Department of Education, Office of Educational Technology, 2016). The increased numbers of science, technology, engineering, and mathematical jobs have influenced schools to focus their efforts in certain curricular areas (i.e., mathematics, science; Kivunja, 2014), sometimes at the expense of others (i.e., history, electives; Freeland Fisher & Arnett, 2017). Organizations such as the Partnership for 21st Century Skills (2016) and International Society for Technology in Education (2019) have introduced and promoted technology standards. Similarly, educational companies such as Project Lead the Way (2019) have developed curriculum to address the acquisition and practice of science-, technology-, engineering-, and mathematical-related skills. In answer to societal expectations, districts have shifted their curricular focus to prepare students with the skills to be college and career ready (Freeman, Adams Becker, Cummins, Davis, & Hall Giesinger, 2017).

The Role of Federal and District Policies

The pressure for public schools to perform has never been higher (Bryk, Gomez, Grunow, & LeMahieu, 2015). The No Child Left Behind Act of 2001 (U.S. Department of Education, 2001) put schools on a trajectory to increase student performance or risk financial sanctions and organizational restructuring (Mehta, 2013a, 2013b). Federal oversight of educational policies at the state and local levels forced schools to comply or, at the very least, shift instructional practices to align with strict standards-based reform.
measures (Fancera & Bliss, 2011). Standards-based reform measures were one attempt to “create systemic change [through] setting standards for what should students should be expected to do, establishing assessments to measure progress, and holding schools accountable for progress towards these goals” (Mehta, 2013a, p. 286).

The macrosystem of outside forces pressured states and thus districts to align practices and procedures to adhere to federal mandates. One example is the Race to the Top Fund (U.S. Department of Education, 2009) that awarded states with grants for adhering to standards-based reform measures that the federal government deemed necessary to drive school improvement and, thus, student achievement. Though high-stakes testing existed prior to Race to the Top, school success has been increasingly equated with students’ performance on standardized tests (Tanner, 2013). High-stakes testing refers to annual, standardized assessments conducted at schools and failure to raise student achievement in mathematics and English language arts across all student sub-groups (e.g., special education, English language learners) meant loss of funding (U.S. Department of Education, 2009).

With the passage of the Every Student Succeeds Act of 2015 (U.S. Department of Education, 2015), high-stakes testing persisted with continued focus by districts to close the achievement gap for traditionally underperforming groups. Therefore, the pressure for schools to perform remained a high priority. Individuals within the exosystem, such as state policy makers, established goals, allocated resources, and selected the measurement tools for student performance (Cuban, 2013). These policy decisions influence what occurs in the classrooms, with teacher input notably absent (Cuban, 2013).
High-stakes testing and accountability measures influenced teacher instructional practices and school climate (Embse et al., 2017). The pressure to raise student achievement for traditionally lower-performing subgroups and avoid sanctions contributed to teacher stress, increased job dissatisfaction, and complacency (Embse et al., 2017). To examine how teacher stress influenced instructional practices, Embse et al. (2017) administered an online survey that measured teacher test stress and fear appeals (e.g., threat-based directives toward students who typically underperform on tests) to 7,281 teachers in North Carolina. Using a moderated mediation model—in which a variable was examined to see if it impacted the relationship between two other variables—Embse et al. found that teacher stress influenced the connection between instructional practices and job satisfaction. Teachers with low job satisfaction and high-perceived value of test scores engaged in counterproductive instructional practices (e.g., teaching to the test; Embse et al., 2017). Because teaching is a complex endeavor, exosystemic policy decisions may have unequal effects in individual classroom practices (Diamond, 2012).

Differences in educational resources, school climate, and levels of collective efficacy meant that the implementation of educational policies varied from district to district and school to school (Diamond, 2012). Collective efficacy is defined as the shared belief in a group’s ability to effect change (Bandura, 2000). High-stakes testing and accountability measures influenced instructional decisions differently depending on the content area. Diamond (2012) conducted 105 classroom observations and interviewed 47 K-5 and K-8 teachers in Chicago. The researcher asserted that the pressure to align teaching with test-based accountability measures led to fragmented
instructional practices as opposed to a holistic or interdisciplinary approach to learning. The demands of raising student achievement outweighed the desire to use sound pedagogical practices (Diamond, 2012; Embse et al., 2017). Thus, changes in teacher instructional practices to align with test-based skills did not necessarily mean that meaningful changes in pedagogy occurred.

Test scores as a measurement of school effectiveness put undue pressure on schools and teachers to teach to the test (Ravitch, 2010). Because the federal government set the goal that all students would be proficient in mathematics and English language arts by 2014 (U.S. Department of Education, 2001), mathematics and English language arts scores carried a considerable weight when determining a school’s measure of success (Freeland Fisher & Arnett, 2017). Mathematics and English language arts teachers prioritized their instructional practices to adhere to test-based skills and content knowledge (Freeland Fisher & Arnett, 2017). The decision to change instructional practices to focus on tested skills may have resulted in an increase in student performance, but that did not equate to meaningful learning opportunities (Ravitch, 2010) as state leaders may have not fully understood “how existing organizational structures favor or hinder certain forms of innovation” (Freeland Fisher & Arnett, 2017, p. 4).

School boards have an important job in selecting and retaining high quality leadership (Zavadsky, 2016). In centralized school districts, the school boards and superintendents provided direction and support for fulfilling district goals, and then principals set the goals and direction for the school (Zavadsky, 2016). Policies and practices set forth by district personnel have the potential to either change teacher instructional practices or have no sustainable effect on what happens in the individual
classrooms (Firestone & Martinez, 2007). These district-level policies and practices stemmed from mandates enforced by federal funding requirements and legislation (Cuban, 2013).

One barrier to systemic adoption of innovative initiatives may occur at the district level. Innovative initiatives are defined as new ideas (Sebastian & Allensworth, 2012) or a “chance to ‘do schools differently’” (Hamilton & Mackinnon, 2013, p. 4). Administrators and school boards charged with determining curricular decisions and textbook adoption may thwart efforts for innovative change by choosing to maintain the status quo (Learning Forward, 2015). Similarly, decision makers at this level may not see the compatibility or relative advantage of adopting a particular innovation (Rogers, 2003), and thus little forward progress occurs (Fullan, 2007). Competing district initiatives and programs serve as an additional barrier to change (Darling-Hammond et al., 2017; Fullan, 2007). Districts may adopt vision statements or slogans with the intent to create positive change; however, conformity to federal or state mandates to retain funding may stifle efforts to implement change with fidelity (Everhart & Doyle, 1980; O'Connell, Hickerson, & Pillutla, 2011).

Though state departments of education create content standards and curricula, districts determine the resources and support allocated to teaching those standards (Firestone & Martinez, 2007). Decisions by districts may constrain or support teacher autonomy. Policies by instructional technology departments determine availability to outside websites and tools, thus impacting curricular objectives and instructional practices (Minshew & Anderson, 2015). Likewise, mandates to strictly adhere to the textbooks as well as a narrow focus on improving performance on state tests influence
teacher perception, beliefs, and value toward student learning (Firestone & Martinez, 2007). Districts also determine the types of technology to purchase (Minshew & Anderson, 2015; Zavadsky, 2016), length of the school day (California Department of Education, 2018), strategies to implement (Firestone & Martinez, 2007; Zavadsky, 2016), and the personnel hired in the classrooms (Zavadsky, 2016). As a result, district policies and procedures influence what happens at the school.

Another underlying factor to technology integration centers on the funding of support structures that schools have in place. Support structures include personnel to troubleshoot technology, access, and infrastructure issues as well as coaches or mentors to provide instructional support (Wachira & Keengwe, 2011). Lack of a strong infrastructure that includes access to technology tools, websites, and technical support increases frustration for teachers with low self-efficacy when it comes to technology (Besnoy, Dantzler, & Siders, 2012; Ertmer et al., 2012).

The lack of time to explore and experiment with technology is driven by school structure and accountability policies. Wachira and Keengwe (2011) conducted a mixed methods study of 20 teachers enrolled in a graduate course at a university in the Midwest. Their findings confirmed that teacher perception regarding lack of time for learning and exploring technology coupled with time constraints due to preparation for state-mandated tests posed multiple barriers to technology integration (Wachira & Keengwe, 2011). Similarly, a PEW Research study of 2,462 Advanced Placement and National Writing Project teachers conducted by Purcell, Heaps, Buchanan, and Friedrich (2013) in 2012 found that time constraints and pressures to teach test-based skills continued to pose barriers to technology integration in classroom practices. The combination of the lack of
time to plan, play, and explore with technology in conjunction with low self-efficacy for technology use and a narrow focus on covering curriculum prevents teachers from exploring opportunities to integrate technology into classroom practices (Kale & Goh, 2014; Purcell et al., 2013; Wachira & Keengwe, 2011).

The Role of the School Culture and Climate

The organizational structure of schools impacts the diffusion of innovation (Frank, Zhao, Penuel, Ellefson, & Porter, 2011). The rate of adoption of innovation correlates to the beliefs, values, and cultural norms of stakeholders within a social system—such as a school (Rogers, 2003). The environment, as opposed to technology, plays a key role in creating opportunities for 21st century learning, which is “as much or more about how [emphasis in original] to learn and think as it is about what [emphasis in original] students learn and think about” (Donovan et al., 2014, p. 15). As such, school culture influences the extent of collaboration and collegiality among teachers (Goddard, Goddard, Kim, & Miller, 2015; Levin & Wadmany, 2008).

School culture is defined as the norms and practices that govern teacher behavior (Ertmer & Ottenbreit-Leftwich, 2010). Shared beliefs in the organization’s openness to innovation and change comprise another element of school culture (Tschannen-Moran, Woolfolk Hoy, & Hoy, 1998). School culture is influenced by school climate, and school climate is a byproduct of school culture. School climate, defined as the nuances, attitudes, and morale of teachers and administrators, exists within the school culture (Gruenert, 2008) and contributes to the development of collegiality and support (Besnoy et al., 2012). The social relationships among teachers and administrators influence, and is influenced by, school culture and climate.
School culture includes the beliefs and practices that constitute the organizational structure of the school, such as the propensity for change and risk-taking (Tschannen-Moran et al., 1998). Demoralized school cultures disempower teachers, focus on siloed decision-making, and contribute to a weak support structure (Payne, 2008). The integration of technology into classroom practices rise and fall depending on the culture of the school (Msila, 2011). Likewise, school culture impacts the effectiveness of teacher leaders in their efforts to influence change in classroom practices (Payne, 2008; Gialamas, Pelonis, & Medeiros, 2014).

Dysfunctional school cultures prevent innovative instructional practices to thrive within and across the classrooms (Payne, 2008). School culture influences teacher collaboration and informal learning opportunities, two areas that teachers cite as important conditions for technology integration (Jurasaitė-Harbison & Rex, 2010). Therefore, a school’s culture could either foster or hinder shared decision-making and collaboration, which contribute to collegiality and trust (Gray, Kruse, & Tarter, 2015). However, school culture is not solely determined by past practices or norms; leadership also sets the tone.

School climate is a byproduct of the relationships between teachers and administrators (Cuban, 2013). In fact, school climate influences the likelihood of technology integration into classroom practices (Shapley et al., 2010). Moreover, the perception of school climate by both teachers and administrators is a key predictor of continued implementation of technology (Overbaugh, Lu, & Diacopoulos, 2015). The efforts of principals in cultivating a positive school climate can manifest in the degree of collective efficacy and collegiality (Gray et al., 2015). Weak leadership, along with poor
communication, lack of shared decision-making, and an absence of a school vision all contribute to teacher perceptions of an unsupportive or negative school climate (Howard, 2013; Preus, 2012; Wong, Li, Choi, & Lee, 2008).

Lack of or miscommunication of a schoolwide vision for change impedes the adoption of innovation (Fullan, 2007). As instructional leaders, principals have the potential to exert a strong influence over the change process. However, the absence of communication and clarity about what changes need to occur serve as a point of frustration for teachers (Fullan, 2007). Moreover, lack of a vision for schoolwide technology integration in conjunction with weak leadership contribute to a school climate that avoids risk-taking and collaboration (Preus, 2012).

An additional aspect of school climate that influences the likelihood of technology integration is the vision for student learning. Teacher-centered versus student-centered practices dictate how teachers approach instruction. Though teacher espoused beliefs do not necessarily translate into enacted behaviors (Ertmer et al., 2012; Judson, 2006), the philosophical views of teachers dictate how they approach instruction and student learning (Ertmer et al., 2012). The value of technology on student learning is influenced by school climate. Schools whose focus remain tied to student performance on standardized tests may bypass innovative ways technology can aid student learning and achievement (Embse et al., 2017). However, schools willing to deviate from the status quo may find that technology integration not only supports meaningful learning but also contributes to increased student learning outcomes (Ottenbreit-Leftwich et al., 2010). Changes to the traditional structure of schools can only occur through the efforts of visionary principals and teachers.
The Role of School Leadership

Leadership without a vision for schoolwide technology integration contributes to a school culture that fears risk-taking and collaboration (Preus, 2012). Horton and Martin (2013) studied the influence of superintendents on change initiatives and the development of professional learning communities in three school districts in Missouri. A professional learning community is defined as a group of educators with a common purpose who collaborates on ways to better support student learning (Horton & Martin, 2013). The findings revealed that superintendents who lacked a sense of urgency for change were impediments for building leadership capacity (Horton & Martin, 2013). Direction from leadership influences the level of collaboration and trust by subordinates (e.g., principals, teachers).

School principals’ instructional leadership strongly correlates to the degree of teacher collaboration to improve instruction (Goddard et al., 2015; Gray et al., 2015). In situations that challenge teachers’ sense of efficacy, the level of collegiality and administrative support is a major factor in the persistence of teachers to meet that challenge (Bryk et al., 2015; Payne, 2008). Specifically, principals, perhaps inadvertently, demonstrate their support for collaboration—or not—through their allocation of time for collaboration (Goddard et al., 2015). As knowledgeable and skilled instructional leaders, principals can promote or hinder a strong focus towards improving student learning outcomes through their actions (Goddard et al., 2015; Minckler, 2013).

Leadership effectiveness and acceptance is influenced by organizational structure and society culture, norms, and practices (House, Javidan, Hanges, & Dorfman, 2002; Leithwood, Harris, & Strauss, 2010). To be effective, leaders need to demonstrate
competence in their ability to motivate and develop a shared vision for group success (Onorato, 2013). Cultural differences and misunderstandings may impede leadership’s ability to effect change, and thus, people in positions of leadership need to consider the multiple influences that determine follower propensity for change and risk-taking as this may impact teacher decisions to experiment with technology (Gialamas et al., 2014).

A phenomenological study of 42 principals from four districts located in northern California revealed that 98% of principals valued technology integration for student learning (Machado & Chung, 2015). Principal perception of barriers to technology integration for teachers included “teacher willingness” closely followed by the need for professional development (PD) and time for planning (Machado & Chung, 2015, p. 43). However, the same barriers to technology integration for teachers were similar to principals who serve as instructional leaders (Fullan, 2007; Machado & Chung, 2015).

In addition to principals, teacher leaders play an important role in the support of technology integration and the development of collegiality among faculty (Raffanti, 2008). Collegiality is defined as the “social influence of particular colleagues on one another’s practice” (Penuel, Sun, Frank, & Gallagher, 2012, p. 105). The effectiveness of teacher leaders is dependent upon the relationships cultivated amongst the staff. Ineffective teacher leaders are those whose focus is on power and self-promotion as opposed to relationship-building to develop mutual trust and respect (Bradley-Levine, 2011). As such, weak leadership and collegiality among faculty hinder efforts to change (Payne, 2008).

Although teacher leaders may serve as additional support to technology integration, not all schools openly welcome teacher leaders. Because teacher leaders are
peers, a power struggle may prevent a working relationship from developing (Raffanti, 2008). Low efficacy and personality differences contribute to mistrust among colleagues (Rock & Cox, 2012). The fear of evaluation or lack of trust inhibits the ability to foster collegiality, and thus limits the support teacher leaders can offer. Raffanti (2008) conducted a phenomenological study of formal and informal teacher leaders that brought to light the tenuous relationships that exist among peers. Teachers may perceive the efforts by teacher leaders who ignore the need to establish a sense of trust and community among the faculty as intrusive (Bradley-Levine, 2011; Lee, Leary, Sellers, & Recker, 2013; Raffanti, 2008).

The Role of Teachers

Policy makers, educational reformers, and parents acknowledge that teachers play an important role in student learning (Cuban, 2013). Though teachers do not necessarily have the freedom to choose the content, they do have autonomy over the delivery of content in the classroom (Cuban, 2013; Tyack & Cuban, 1995). Instructional decisions by teachers arise from a myriad of factors such as efficacy, beliefs, perception, knowledge, and value for student learning (Ertmer et al., 2012; Frank et al., 2011; Shifflet & Weibacher, 2015; Wachira & Keengwe, 2011).

Teacher efficacy is defined as the belief in one’s ability to effect change (Bandura, 1977, 1993). The decision to integrate technology into instructional practices adds a layer of complexity to the decision-making process (Overbaugh et al., 2015; Shifflet & Weibacher, 2015). Low-level technology use (e.g., attendance, email) does not put as much stress on the cognitive load of teachers, whereas the notion of integrating technology into student-centered practices in meaningful ways considerably increases the
cognitive load (Ertmer, 1999). As a result, technology integration typically falls within traditional practices (e.g., word-processing, research) as opposed to transforming the learning environment (Levin & Wadmany, 2008). Low efficacy stems from lack of knowledge, skills, and pedagogy related to how to integrate technology into classroom practices.

For meaningful learning with technology integration to occur, teachers need to understand the pedagogy behind effective instructional practices. Besnoy et al. (2012) surveyed 255 teachers of gifted learners and identified student-centered pedagogy as a key component of a classroom-based digital ecosystem. A classroom-based digital ecosystem is defined as a “combination of equipment and experiences” that allow for the redefinition or transformation of learning tasks within a classroom environment (Besnoy et al., 201, p. 306). The researchers found that access to technology tools did not automatically translate into meaningful instructional practices, but, rather, personal use of technology by teachers influenced attitudes toward technology use in the classroom.

Similarly, Kale and Goh (2014) conducted a quantitative study of 161 teachers in West Virginia that found positive correlation between teaching style and technology integration. Data from the study revealed that teachers “claimed to mainly prefer ‘shared control’ with students” (Kale & Goh, 2014, p. 56). However, espoused beliefs do not necessarily translate into practices (Ertmer et al., 2012). A mixed methods study of 32 classroom teachers also in West Virginia indicated that teachers held constructivist learning philosophies, but classroom observations illustrated otherwise (Judson, 2006). According to Judson (2006), constructivist learning is defined as “constructing personal meaning, learning from one another, learning from experts, and creating unique
interpretations” (p. 592). The mixed results of teacher-espoused beliefs versus enacted instructional practices suggest a need for PD to incorporate authentic and constructivist learning opportunities as opposed to simply a focus on technology.

An oft-cited barrier to technology integration is lack of time to explore, plan, and play with technology (Preus, 2012; Wong et al., 2008). Data from a mixed methods study conducted in a middle school in the southwest revealed that teacher (N = 17) concerns centered on how technology impacted their “time, planning, and instructional practices” (Donovan, Hartley, & Strudler, 2007, p. 274). If teachers do not have time to explore with technology, the likelihood of integration, especially meaningful integration, into classroom practices diminishes.

A contributing factor to teacher efficacy is technology knowledge. Technology knowledge determines how technology is integrated into classroom practices (Koehler, Mishra, Kereluik, Shin, & Graham, 2014). Technology knowledge is defined as what teachers know about technology (e.g., device management, software, apps, troubleshooting; Albion, Jamieson-Proctor, & Finger, 2010). Classroom and device management can prove daunting for preservice, novice, and even experienced teachers (Shifflet & Weilbacher, 2015; Wachira & Keengwe, 2011). A survey of 2,462 Advanced Placement and National Writing Project teachers conducted by Purcell et al. (2013) revealed that 30% considered lack of a technical support structure (e.g., set-up, troubleshooting, repair) as a major challenge with 47% citing it as a minor challenge. Teachers who perceive a lack of support for technology integration are less likely to adopt technology into instructional practices (Ertmer, 1999; Grant et al., 2015; Purcell et al., 2013). As such, an important aspect of preservice and inservice teacher education
needs to include knowledge of device management along with the pedagogy behind designing learning experiences that support meaningful learning with technology.

The purpose of preservice teacher education programs is to prepare teachers with the pedagogy and skills to be effective educators for youth (Council for the Accreditation of Educator Preparation, 2013). As such, universities and colleges who do not properly prepare preservice teachers with the necessary technology skills will ultimately jeopardize the future of students in K12 education. Recognizably, not all university preservice teacher programs are equal. Oliver, Osa, and Walker (2012) examined a teacher preparation program in which 29% of the faculty admitted not using or modeling any type of technology in their courses. The faculty who modeled the use of technology typically used videos, PowerPoint, and a learning management system. To be clear, the low-level use of technology (e.g., PowerPoint, videos) by faculty in preservice education courses does not necessarily equate to low-level integration if the learning is situated within an authentic context (Bell, Maeng, & Binns, 2013). Nevertheless, the lack of preparation by preservice teacher education programs puts undue pressure on schools to close the gap between technology knowledge and use by relying already overextended resources found within the school.

The Role of Students

Though teacher instructional practices determine what occurs in the classroom, students also necessarily contribute to the learning process. As with teachers, student attitudes (Han & Carpenter, 2014; Kaiser & Wisniewski, 2012); engagement (Shapley et al., 2011); and skills, knowledge, and value (Gu, Zhu, & Guo, 2013) of technology to support their learning determines their level of use.
Physical access to technology in the classroom can pose a barrier to student use but even when technology is available, other barriers remain impediments (Ertmer, 1999). Thus, the following two studies focus on schools with high access to technology to determine other obstacles that impede technology use. To ascertain student perceptions of technology use for learning, Stefl-Mabry et al. (2010) conducted an exploratory case study of middle and high school students from a rural district in the northeastern United States. Results from a district-wide survey revealed that “students perceive teachers as making minimal use of ICT [information and communications technologies] in classrooms” (Stefl-Mabry et al., 2010, p. 67). The researchers next used a focus group to delve deeper into the student ICT experience in the classroom. Information from 26 middle school and 22 high school students relayed their dissatisfaction with the level of ICT use by teachers. Students attributed the lack of technology skills and knowledge by teachers as one of the main reasons for low ICT use. Students were forthcoming about the role of ICT in their learning process as focus group data suggested that students desired a customized and personalized learning path in which they felt empowered by technology and operated as content creators.

A similar finding stemmed from a quantitative study by Gu et al. (2013) who examined the perceptions of 90 elementary, middle, and high school students living in Shanghai, a leader in ICT integration, with “100% of the schools connected to the Internet” and a 3:1 student-to-device ratio (p. 394). Survey items focused on constructs such as outcome expectancy (i.e., perceived ease of use, perceived usefulness), task technology fit (i.e., relativeness to job performance), social influence (i.e., peer pressure), and personal factors (i.e., computer self-efficacy, openness to change) for students versus
teachers. Findings from the student survey suggest that the highest in-class ICT use occurred at the high school followed by the middle and then elementary schools. All students harbored a high expectancy of in-class ICT usage, with elementary students having the highest expectancy of ICT use but the lowest actual use. Students, whom the researchers referred to as “digital natives,” had a higher percent of early adoption of ICT over their teachers, with greater access to ICT outside versus inside of school.

Interestingly, although K12 students had greater ICT access at home, the frequency and duration of ICT use was greater within the classroom (Gu et al., 2013), which was in contrast to the findings from Stefl-Mabry et al. (2010) whose study revealed that students used “more ICT for academic work out of school than in school” (p. 75).

Ubiquitous student access to technology at school was the focus of a longitudinal study conducted by Shapley et al. (2011). This study concentrated on the Year 3 findings of a technology immersion initiative across two cohorts of low-income Grades 6-8 treatment and control schools in Texas. The researchers used a control group delayed intervention model (Shapley et al., 2011) in which Cohort 2 received the treatment one year after Cohort 1. The treatment given to the schools included devices, resources, technology support, and PD for teachers. Analysis of student survey data across treatment groups in both cohorts showed “statistically significant and positive growth trends for classroom activities, small-group work, and technology proficiency” (Shapley et al., 2011, pp. 305-206) along with a decrease in disciplinary issues, which was attributed to higher student engagement during class time. Though the study did not explicitly examine student perceptions of ICT usage, the findings suggest that technology rich environments in impoverished schools can contribute to greater student engagement.
and active learning. The findings of Shapley et al. juxtapose those of Stefl-Mabry et al. (2010) in which technology-affluent middle and high school students relayed disappointment at the low-level of access, integration, and use of technology at school. As Gu et al. (2013) suggest, students hold high expectations for technology use; however, it appears that teacher instructional practices play a larger role in determining to what extent students can interact with technology for meaningful learning.

**Summary**

Bronfenbrenner’s (1977) nested approach frames the influences among the various systems of ecological systems theory. The macrosystem of societal and cultural beliefs regarding the purpose of education set the stage for the development of federal and state educational policies (Fancera & Bliss, 2011; Mehta, 2013a, 2013b). Moreover, the current job market stipulated the need for a labor force skilled in the areas of problem-solving, adaptability, and flexibility (Gates, 2013; Kivunja, 2014; Lowther et al., 2008; Trilling & Fadel, 2009).

In turn, the exosystem of federal and state educational policies, though far removed from individual teacher classrooms, nevertheless exerts influence through its ability to shape district policies and practices (Diamond, 2012; Embse et al., 2017; Fancera & Bliss, 2011). Legislation such as the Every Student Succeeds Act of 2015 (U.S. Department of Education, 2015) establishes accountability policies for districts that trickle down to schools in the form of standards and expectations for student performance. Furthermore, district policies and procedures are determined by the top-down organization of leaders from superintendents to principals (Zavadsky, 2016). Leadership at this level not only dictates the curriculum and school structures that
determine the effectiveness of teachers at the schools but also establishes the vision and focus for student learning (Horton & Martin, 2013; Zavadsky, 2016).

District policies directly affect the microsystem of teachers (Diamond, 2012; Minshew & Anderson, 2015). Federal and state accountability measures, a narrow focus on district-based assessments, and school structures influence teacher autonomy (Firestone & Martinez, 2007). However, as Cuban (2013) notes, teachers respond differently to district mandates and school policies. Teacher efficacy can either flourish or diminish according to factors such as technology knowledge, skills, and pedagogy (Besnoy et al., 2012; Koehler et al., 2014; Shifflet & Weibacher, 2015; Wachira & Keengwe, 2011). Likewise, support structure and time constraints mitigate the teachers’ ability to integrate technology into classroom practices (Donovan et al., 2007; Ertmer, 1999; Preus, 2012; Shapley et al., 2010; Stanhope & Corn, 2014; Wong et al., 2008).

Perhaps the largest influence on teacher instructional practices occurs at the convergence of school culture, school climate, and the relationships between students, teachers, and principals (Donovan et al., 2014; Goddard et al., 2015; Levin & Wadmany, 2008). Students desire the use of technology for learning. Even from the elementary level (Gu et al., 2013), students see technology as a means to empower them in the learning process (Shapley et al., 2011; Stefl-Mabry et al., 2010). However, school structures can and do hinder technology use (Stefl-Mabry et al., 2010). School culture dictates the norms and practices that influence school climate. In turn, a positive school climate fosters collaboration and collegiality (Gray et al., 2015; Jurasaitė-Harbison & Rex, 2010). Additionally, collective efficacy is built on the relationships between teachers and the support of strong leadership (Bryk et al., 2015; Goddard et al., 2015;
Gray et al., 2015). Collective efficacy is a key predictor of changing teacher practices (Fancera & Bliss, 2011; Takahashi, 2011).

Numerous factors and causes contribute to the problem of practice from federal legislation down to individual teacher decisions to integrate technology. To better understand the factors in the current context, a needs assessment was conducted to inform the state of teachers’ technology use as well as to identify the barriers and opportunities that promote or inhibit meaningful technology integration.
Chapter 2
Teacher Technology Practices: Needs Assessment

Federal funding provided Title I schools with the ability to purchase devices to accommodate a 1:1 student-to-device ratio (Davies & West, 2013). Additionally, the decreasing cost of technology means that schools can purchase more devices for student and teacher use (Zheng et al., 2016). The acquisition of mobile devices to accommodate computer-based standardized testing means students and teachers now have more access to technology (Wachira & Keengwe, 2011). However, the presence of computers and Internet on school campuses does not necessarily translate into instructional practices that focus on meaningful learning with technology (Cuban et al., 2001), which would seem to hold true for mobile devices present in today’s schools. In many cases, there is little difference between student use of mobile devices and their use of paper and pencil (Cuban et al., 2001; Ertmer & Ottenbreit-Leftwich, 2013; Jackson, Helms, Jackson, & Gum, 2011). For instructional practices to include the meaningful use of technology by students, teachers need to know what meaningful learning with technology looks like in the classroom (Ertmer & Ottenbreit-Leftwich, 2013). Moreover, teachers need knowledge of how to integrate skills such as communication, collaboration, critical thinking, and creativity into lesson design (Cuban, 2013; Partnership for 21st Century Skills, 2008). To ascertain the opportunities for and barriers to meaningful learning with technology in the current context, I conducted a needs assessment that employed a mixed methods approach.

Teacher self-efficacy and collective efficacy are underlying factors that influence the propensity for meaningful technology integration into classroom practices (Horton &
Martin, 2013; Levin & Wadmany, 2008; Overbaugh et al., 2015). Teacher-self efficacy is defined as the individual belief in one’s ability to perform certain tasks (Bandura, 1977). Collective efficacy is defined as the social negotiation of a group’s ability to accomplish particular tasks (Bandura, 1993). Collective efficacy influences school climate, which determines teacher propensity to change instructional practices (Tschannen-Moran et al., 1998). School culture is affected by school climate, and school climate is one measurement of school culture. As such, school climate survey results may reveal the school’s ability to support and foster any change initiative.

**Context of the Study**

The setting and context for the study is a junior high (i.e., Grades 7 and 8) school located in a large, urban K12 unified district in California. I am a full-time history teacher and social science department chair. I have worked at the school for 19 years and have 24 years of teaching experience in the district. The district and school both qualify for Title I funding. During the 2015-2016 school year, this funding facilitated the purchase of technology for the school, including MacBooks, iPads, and Chromebooks. All teachers have a MacBook, and the core academic classes have a 1:1 student-to-device ratio.

In 2015, the school hired outside consultants to help the faculty develop a technology plan. The consultants introduced teachers to the substitution, augmentation, modification, and redefinition (SAMR) model by Puentedura (2014). After gathering information from the teachers regarding their perceptions about opportunities and barriers to technology use, the consultants put together a draft of the school technology plan using SAMR as the theoretical framework for technology integration. However, because the
school and outside consultants parted ways before the 3-year contract concluded, no other trainings regarding technology or the SAMR model were offered to the teachers. Consequently, the school has a draft of a technology plan that has yet to be approved by the faculty.

Technology PD offered to teachers during the 2016-2017 school year focused on the use of short-throw projectors—a projector that displays images from a short distance. Prior to 2015, PD opportunities included workshops on how to use various technology sites, tools, and apps such as Edmodo, Google Apps for Education, PowerSchool (formally Haiku Learning), and Weebly.

At the time the needs assessment was conducted, the English language arts teachers were participating in the second year of a 3-year research study conducted by the University of California–Irvine. The study focused on the impact of Live Ink, a technology-based program, on student reading comprehension and writing skills. English language arts teachers participating in the study received an iPad cart for their classroom. In addition, the mathematics, English language development, and special education teachers were in the first year of a new textbook adoption with technology playing a significant role in required and ancillary materials. These competing district initiatives could have impacted and could continue to impact the current study.

**Statement of Purpose**

The needs assessment aimed to identify current technology use as well as the opportunities and barriers to technology integration. The research questions that guided this study are:

RQ1. How do teachers interpret meaningful use of technology?
RQ2. What are the opportunities and barriers to integrating technology in meaningful ways?

Method

The needs assessment used a convergent mixed method design (Creswell & Plano Clark, 2011). In a convergent mixed methods design, collection of quantitative and qualitative data occurs independently with the triangulation of data to occur during analysis (Creswell & Plano Clark, 2011). For example, quantitative and qualitative results can “confirm, disconfirm, or expand each other” and are represented in side-by-side comparisons or combined into one database (Creswell & Plano Clark, 2011, p. 222).

Participants

The target population for this study included a nonrandomized, purposeful sample (O’Leary, 2014; Patton, 2015) of 29 teachers and two administrators with teaching experience ranging from 2 to more than 25 years. All teachers were highly qualified as defined under No Child Left Behind (e.g., bachelor’s degree, valid teaching credential, demonstrate mastery of the content; U.S. Department of Education, 2001). Teachers of the four core academic disciplines (i.e., English language arts, history, mathematics, science) have 1:1 student-to-device ratio in their classrooms.

While working with the outside consultants, the teachers participated in an informal exercise to elicit their knowledge of technology integration, as aligned to the SAMR spectrum, by placing themselves as a physical point on that spectrum (Puentedura, 2014; see Table 2.1). The consultants informally assessed the teachers’ technology expertise as spanning from novice to expert, with the majority of teachers in the novice range.
To solicit participation for the current study, I emailed the faculty (i.e., administration, teachers) to explain the purpose of the study, data collection procedures, estimated time commitment, and the Informed Consent (see Appendices A & B). I placed a hard copy of the Informed Consent form in the teachers’ and administrators’ boxes for their signature.

Table 2.1

<table>
<thead>
<tr>
<th>Category</th>
<th>Definition (Puentedura, 2014)</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Redefinition</td>
<td>Technology allows for the creation of new tasks, previously inconceivable</td>
<td>Students record a vlog and publish it on YouTube</td>
</tr>
<tr>
<td>Modification</td>
<td>Technology allows for significant task redesign</td>
<td>Students write a blog post and post comments to peers</td>
</tr>
<tr>
<td>Augmentation</td>
<td>Technology acts as a direct tool substitute, with functional improvement</td>
<td>Students collaboratively write an essay in Google Docs</td>
</tr>
<tr>
<td>Substitution</td>
<td>Technology acts as a direct tool substitute with not functional change</td>
<td>Students use Google Docs to type an essay</td>
</tr>
</tbody>
</table>

Due to spring break, open house, and end-of-quarter grade reporting, one week was the expected turn-around time for teacher signatures to participate in the study. The teachers who signed the informed consent received an email confirming their participation in the study as well as the links to next steps in the process (see Appendix C). The sample population included 21 teachers who opted to complete the efficacy survey and six teachers who volunteered to open their classrooms for observations and a
follow-up interview. A demographic breakdown of teachers whose classrooms were observed is provided (see Table 2.2).

Table 2.2

**Demographic Breakdown of Participants Whose Classrooms Were Observed**

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Male (n = 2)</th>
<th>Female (n = 4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade Level</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Seventh Grade</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>Eighth Grade</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Mixed Grade</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Content Area</td>
<td></td>
<td></td>
</tr>
<tr>
<td>English Language Arts</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>History</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Mathematics</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Science</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Ethnicity/Race</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asian</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Caucasian</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Hispanic</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Years Teaching</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-5 Years</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>6-10 Years</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>11-15 Years</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>16-20 Years</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>&gt;20 Years</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

**Measures and Instrumentation**

The selection of appropriate instruments for data collection depends on the problem of practice and research questions (Creswell & Plano Clark, 2011). The instruments used for this needs assessment took into consideration school culture, district policies and procedures, cost, and feasibility (Soriano, 2013; see Table 2.3).
Table 2.3

*Instrument and Research Question Alignment*

<table>
<thead>
<tr>
<th>Instrument</th>
<th>Research Question 1</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>How do teachers interpret meaningful use of technology?</td>
</tr>
<tr>
<td>Efficacy Survey</td>
<td>X</td>
</tr>
<tr>
<td>Classroom Observation</td>
<td>X</td>
</tr>
<tr>
<td>Semi-structured Interview</td>
<td>X</td>
</tr>
<tr>
<td>School Climate Survey</td>
<td>X</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Research Question 2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>What are the opportunities and barriers to integrating technology in meaningful ways?</td>
</tr>
<tr>
<td>Efficacy Survey</td>
<td>X</td>
</tr>
<tr>
<td>Classroom Observation</td>
<td>X</td>
</tr>
<tr>
<td>Semi-structured Interview</td>
<td>X</td>
</tr>
<tr>
<td>School Climate Survey</td>
<td>X</td>
</tr>
</tbody>
</table>

**Efficacy survey.** The survey instrument was comprised of two efficacy surveys: Patterns of Adaptive Learning Scales teacher subscale (Midgley, Maehr, Hruda, & Anderman, 2000; see Appendix D) and the collective efficacy survey (Goddard, Hoy, & Woolfolk Hoy, 2000; see Appendix E). The survey addressed the second research question, which focused on potential barriers for teachers when integrating technology in meaningful ways.

**Patterns of Adaptive Learning Scales.** The Patterns of Adaptive Learning Scales (Midgley et al., 2000) teacher subscale measured self-efficacy regarding teachers’ perceived role in instructional design decisions. The five subscales of the teacher version of Patterns of Adaptive Learning Scales are: Mastery Goal Structure for Students ($\alpha = .81$), Performance Goal Structure for Students ($\alpha = .70$), Mastery Approaches ($\alpha = .69$), Performance Approaches ($\alpha = .69$), and Personal Teaching Efficacy ($\alpha = .74$). The varied alpha coefficients for each of the subscales indicated an internal consistency range from questionable to good.

The Patterns of Adaptive Learning Scales teacher subscale consisted of 29 items measured on a 5-point Likert scale with 1 representing *strongly disagree* and 5
representing strongly agree. The items directed teachers to rank their agreement with statements concerning beliefs in their ability to influence student motivation, achievement, and effort. Subscale descriptions and sample items are presented in Table 2.4.

Table 2.4

Patterns of Adaptive Learning Scales Teacher Subscales, Definitions, and Sample Questions (Midgley et al., 2000)

<table>
<thead>
<tr>
<th>Subscale</th>
<th>Description</th>
<th>Sample Questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mastery Goal</td>
<td>Teacher perception of student awareness that the school promotes student engagement in academic tasks to improve competency skills</td>
<td>The importance of trying hard is really stressed to students</td>
</tr>
<tr>
<td>Structure</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Performance Goal</td>
<td>Teacher perception of student awareness that the school promotes student engagement in academic tasks to demonstrate competency skills</td>
<td>It’s easy to tell which students get the highest grades and which students get the lowest grades</td>
</tr>
<tr>
<td>Structure</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mastery</td>
<td>Instructional strategies that promote student engagement in academic tasks that improve competency skills</td>
<td>I give a wide range of assignments, matched to students’ needs and skill level</td>
</tr>
<tr>
<td>Approaches</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Performance</td>
<td>Instructional strategies that promote student engagement in academic tasks that demonstrate competency skills</td>
<td>I encourage students to compete with each other</td>
</tr>
<tr>
<td>Approaches</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Personal</td>
<td>Teacher beliefs in their ability to improve student learning and academic achievement</td>
<td>If I try really hard, I can get through to even the most difficult student</td>
</tr>
<tr>
<td>Teaching Efficacy</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Collective efficacy survey. To measure collective efficacy, teachers completed a collective efficacy scale created by Goddard et al. (2000). The collective efficacy survey consisted of 21 questions measured on a 6-point Likert-type scale with 1 representing strongly disagree and 6 representing strongly agree. The questions directed teachers to rank responses to statements according to their perception of collective teacher efforts to
foster student learning and achievement. The alpha coefficient for this scale was .96, which indicates a high reliability. Sample items included “Teachers here don’t have the skills needed to produce meaningful student learning” and “Teachers in this school have what it takes to get the children to learn.”

Observations. Classroom observations were conducted to inform both research questions, which sought to determine teacher interpretation of meaningful learning with technology in the classroom and the opportunities and barriers to integrating technology in meaningful ways. As teacher espoused beliefs do not necessarily translate into enacted practices (Judson, 2006), rich data from observations provided an additional source of information about teacher instructional practices (O’Leary, 2014). Observations, therefore, collected information about the reality of technology integration and use (see Appendix F).

The quantitative portion of the matrix consisted of four major skills deemed important for students such as communication, collaboration, critical thinking, and creativity (Partnership for 21st Century Skills, 2008). The qualitative portion included an area for comments regarding notable student and teacher interactions with technology. Data from the matrix informed possible follow-up questions for the semi-structured interviews (Patton, 2015). Classroom observations occurred during one 45-minute class period per teacher.

Semi-structured interviews. Similar to observations, interviews with participants may reveal rich descriptions of instructional decision-making (O’Leary, 2014). Schutt (2015) posits that “social reality is socially constructed” (p. 20). Though the use of open-ended questions may influence teachers to give socially desirable responses, the ability to
gather personal and descriptive reflection of the lesson outweighed the potential for bias (Soriano, 2013).

The interviews sought to determine teacher interpretation of meaningful learning with technology in the classroom and the opportunities and barriers to integrating technology in meaningful ways. The questions focused on topics such as the perceived role of technology, available support, and barriers to technology use. The semi-structured interview consisted of six questions with possible follow-up questions depending on the data from the classroom observations (see Appendix G).

**California school climate survey.** Each year, teachers in California voluntarily participate in a school climate survey, which is part of a larger survey that includes student and parent respondents. The 2016 and 2017 staff surveys consisted of 43 questions and the 2018 staff survey consisted of 46 questions measured on a 4-point Likert-type scale with A representing strongly agree and D representing strongly disagree. The school climate survey measured staff and faculty perception of school norms, communication, collegiality, school supports, school improvement efforts, facility maintenance, safety as well as the teaching and working environment.

**Procedure**

I conducted the needs assessment during spring 2017. Teachers ($N = 21$) completed the efficacy survey prior to my conducting classroom observations and subsequent follow-up semi-structured interviews ($n = 6$). I carried out the semi-structured interviews within 24 hours of the classroom observations.

For the classroom observations, I recruited teachers from the four core disciplines (i.e., English language arts, history, mathematics, science) to participate. I selected two
high, two medium, and two low users of technology, in accordance with the Technology Integration Matrix (Florida Center for Instructional Technology, n.d.). The teachers did not formally assess themselves using the Technology Integration Matrix, but rather I used my prior knowledge of their instructional practices to determine individual technology use. For the purposes of this study, high users were teachers whose instructional practices were categorized as adaptation, infusion, and transformation, whereas low users were teachers whose instructional practices aligned with entry level use, and medium users fell within the adoption category (see Table 2.5).

Table 2.5

*Characteristics of the Five Levels of the Technology Integration Matrix (Florida Center for Instructional Technology, n.d.)*

<table>
<thead>
<tr>
<th>Level</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Entry</td>
<td>The teacher begins to use technology tools to deliver curriculum content to students.</td>
</tr>
<tr>
<td>Adoption</td>
<td>The teacher directs students in the conventional and procedural use of technology.</td>
</tr>
<tr>
<td>Adaptation</td>
<td>The teacher facilitates students in exploring and independently using technology.</td>
</tr>
<tr>
<td>Infusion</td>
<td>The teacher provides the learning context and the students choose the technology.</td>
</tr>
<tr>
<td>Transformation</td>
<td>The teacher encourages the innovative use of technology tools. Technology tools are used to facilitate higher order learning activities that may not have been possible without the use of technology.</td>
</tr>
</tbody>
</table>

Teachers who agreed to participate in the classroom observations received a second Informed Consent (see Appendix H). I either emailed or spoke to teachers to schedule dates for the observations. The schedule included one classroom observation per teacher.
**Data Collection.** Data from the efficacy survey, observations, and interviews were collected during the spring of 2017.

**Efficacy survey.** Efficacy survey data were collected via Qualtrics, a web-based dissemination and collection tool, during a 2-week window in April 2017. The efficacy survey was shared with participants via email (see Appendix C). The email included an expected time frame for completion of the survey. Teachers who did not complete the survey by the requested date received a reminder email via Qualtrics.

**Observations.** During 45-minute classroom observations, I took field notes and used a matrix to facilitate the coding process. I employed a participant observer approach (Schutt, 2015) while gathering quantitative (i.e., matrix) and qualitative data (i.e., field notes; Patton, 2015). For each observation, I arrived before the start of class and selected a seat in the back of the room. Using the matrix, I noted teacher and student use of technology. Additional field notes were added that included specific phrases or actions from both the teacher and students that related to the constructs under study (e.g., communication, collaboration, critical thinking, creativity). Field notes also included a sketch of the room layout. As I was the technology coordinator, the teacher and students occasionally interacted with me by asking clarifying questions.

**Semi-structured interviews.** Within 24 hours of the classroom observations, I conducted a semi-structured interview with participating teachers. The interviews were conducted after school in my classroom or the classroom of the participating teachers. I kept hand-written field notes of their responses.

**California school climate survey.** Data collected by the state of California at the conclusion of each school year informs teacher perception of school climate. All
members of the faculty received the results of the California school climate survey prior to the start of the new school year.

**Data Analysis.** During the analysis phase, I initially examined quantitative and qualitative data separately. Analysis continued with data aggregated per research question. For the second research question, I combined both strands for the purpose of triangulation.

**Quantitative data sources.** The efficacy survey was analyzed using Excel and Statistical Package for the Social Sciences (SPSS). I used descriptive statistics to identify the mode and mean as well as examine individual scores from the participants using a frequency table (O’Leary, 2014). The self- and collective efficacy scales contained five and 10 items, respectively that were reverse coded (e.g., “Teachers here don’t have the skills needed to produce meaningful student learning”). Therefore, before indexing the items into two variables—self-efficacy and collective efficacy—I transformed 15 of the reverse coded question items to ensure a common direction for the response set.

For the school climate surveys covering the years 2016 – 2018, I focused on statements that pertained directly to teacher perception of school staff climate and district climate (e.g., school promotes trust and collegiality among staff, school is supportive and inviting, district promotes trust and collegiality among staff). Items that showed an annual decline were flagged for further analysis. The resulting data were triangulated with data from the efficacy survey, classroom observations, and semi-structured interviews to inform the opportunities and barriers for teachers to integrate technology in meaningful ways.
**Qualitative data sources.** Data from field notes of classroom observations and semi-structured interviews were initially examined using a deductive approach (O’Leary, 2014) and thematic analysis (Braun & Clarke, 2012). Thematic analysis is a six-step process: gain familiarity with the data through recursive readings, develop initial codes, scan for themes, review and revise themes, collapse and expand themes, and report the data (Braun & Clarke, 2012). The primary objective targeted the development of “descriptive or semantic codes [which] typically stay close to the content of the data and to the participants’ meanings” (Braun & Clarke, 2012, p. 61). However, in some cases, I used latent or interpretative coding based on what I knew about the school and participants.

The main purpose for gathering data using observations and interviews was to determine the current use of technology and to identify potential barriers to technology integration. To prevent obscuring potentially important data from the original field notes, copies were made for mark-up. During the initial examination, I looked for words or phrases that appeared in more than one set of field notes and that matched the research questions. Words or phrases were highlighted, circled, marked, and color-coded according to frequency and common themes (Braun & Clarke, 2012). I established a key for the highlights and mark-ups.

For the second read, I employed descriptive or semantic coding (Braun & Clarke, 2012). I created a Google Spreadsheet and listed participants by code. The column headers were named according to common themes that emerged from the initial examination of data. Words and phrases from the semi-structured interviews were added first in black. Next, I examined field notes from the classroom observations and added
that data to the Google Spreadsheet in pink. The notes in the Google Spreadsheet were color-coded to reflect the ones that came from the semi-structured interviews versus classroom observations. Additional notes and questions for further examination and introspection were added in red, a third color. Some of the questions and notes reflected my interpretation of what teachers explicitly revealed during the interviews and what I saw during the classroom observations. In some cases, I based my interpretation of the data on what I knew about the faculty from personal experience. For example, I knew that there were teachers on campus who did not want to change their instructional practices at all—even if technology could be used to make their work responsibilities more efficient—so I posed the question “why?” with the thought that perhaps I could delve deeper into that at a future date. The most frequent themes were quantitatively identified. Several months after conducting the needs assessment, I added in blue text additional thoughts as I reviewed the data based on my further knowledge of teacher technology use. For credibility purposes, peer debriefing offered additional insight as well as helped clarify and confirm emerging themes (Patton, 2015). Field notes from the observations were triangulated with data from the semi-structured interviews and efficacy survey.

**Findings**

The needs assessment occurred at a school with wide disparity in teacher and student technology use. The acquisition of a large number of mobile devices (e.g., iPads, Chromebooks) called for the need to explore the current use of technology in light of the large expenditure. Currently, only the core academic disciplines had 1:1 access to devices. Moreover, the level of technology use by teachers and its integration into
instructional practices for student use was dependent on teacher technology knowledge, skills, and efficacy.

Findings from the classroom observations, semi-structured interviews, and surveys are shared below. Major themes that emerged from the analyses included technology integration, efficacy, and meaningful use. Within technology integration and efficacy, several sub-themes were addressed.

**Current Practice**

Preliminary findings from field observations indicated a wide-range of technology use. Student use of a district-mandated computer-based curriculum for the English language development class did not include any instances of communication, collaboration, critical thinking, or creativity. The teacher used a station rotation model—four stations—in which some students worked on iPads, while other students participated in small group work with the teacher or instructional aide. In this class, the teacher did not have any control over the design of the computer-based curriculum.

In the science class, students completed an assessment in PowerSchool that required use of recall as well as critical thinking skills. Subsequent use of technology by students after completing the exam did not reflect use of skills such as communication, collaboration, critical thinking, or creativity. Students independently worked on assignments from other classes both with the Chromebooks (e.g., studying in Quizlet, completing an Anne Frank assignment in Google Docs, Internet research on bottle rockets) and without until the last five minutes of class when the teacher showed the class a video clip about Black Holes.
In both mathematics classes, students completed a teacher-created quiz in Socrative using the previous night’s homework for help. The main lesson focused on various activities found in the Khan Academy website. When a technical glitch occurred that prevented students from logging in to Khan Academy using their Google Apps for Education account, one mathematics teacher solicited students to help resolve the issue. Once a solution was discovered, the teacher walked over to the adjoining mathematics class—these teachers share a door between their rooms—to explain how to troubleshoot the glitch. In both classes, students readily helped peers who struggled with technology issues such as logging in to Khan Academy and finding the correct place for independent practice (see Figure 2.1).

*Figure 2.1 Student Collaboration on a Chromebook*

*Figure 2.1.* Students in one of the mathematics classes used a Chromebook to collaborate on a frequency table in Khan Academy.
In the English language arts and U.S. History classes, the students engaged in independent work. In both classes, student use of technology included a creative component. Students in the Advanced U.S. History class used the largest variety of technology tools to complete higher level cognitive activities. For example, students used BaiBoard, a collaborative app, to create report cards of the various Reconstruction plans using GATE Thinking Tools (California Department of Education & California Association of the Gifted, 1994), which was part of their digital notebook assignments housed in Google Slides. Students collaborated with peers in BaiBoard but worked independently on their digital notebook assignments in Google Slides (see Figure 2.2).

*Figure 2.2 Independent Student Work on an iPad*

*Figure 2.2. Student in the U.S. History class worked on a digital notebook assignment on an iPad using Google Slides and PowerSchool.*

The history teacher regularly posted blogs in PowerSchool for his students. When reviewing for the summative assessment, the teacher remarked that the short-essay questions “should be easy [if you’ve] read the blogs” (Participant 1, Classroom
Observation). At the end of class, students prepared for the summative assessment using Quizlet Live—a gamified version for review of major concepts.

In the English language arts class, students used BaiBoard to create multiple pages comparing and contrasting experiences from two people affected by the Holocaust. The teacher used a MacBook, short-throw projector, and software (i.e., Reflector) to mirror a student’s iPad for modeling purposes. This assignment introduced students to digital storytelling by giving them the opportunity to retell the experience of the Holocaust from the perspective of survivors. During the lesson, some students experienced issues with not being able to change the order of the pages in BaiBoard. The English language arts teacher explained to me that this was a known issue and that she discussed this problem with another teacher who is also a frequent user of BaiBoard, with no solution reached. All classes used technology to assess student learning. Some classes used actual tests or checks for understanding, whereas other classes were more product- or project-based. In all classes, except the English language development class, teacher instructional practices determined the level and extent of technology use by students.

The level of collaboration among the teachers was dependent upon their personalities, relationships with department members, and number of sections taught. For example, the English language development teacher was the only one of two teachers who taught a particular English language development course. Therefore, though the teacher collaborated with members of the English language arts department, when it came to the English language development class, the teacher explicitly mentioned that she was an “island” (Participant 5, Interview). On the other hand, the English language
arts department included seven teachers, but the English language arts teacher remarked that she found it difficult to collaborate with others due to the “lack of reciprocity” (Participant 6, Interview). The science teacher likewise mentioned his preference to work alone as he liked to do “my own thing . . . [I have a] specific way to do things” (Participant 2, Interview).

However, even though these three teachers seemingly worked independently, when asking them who they contacted for support, all three mentioned that they relied on colleagues from their respective departments or the history department for help. The English language development teacher stated that she relied on the English language arts teacher, a participant in this study and a former technology teacher on special assignment, for support, but that she typically “doesn’t know what to ask for” (Participant 5, Interview). The science teacher remarked that if he had questions he would “email [the history teachers]” or ask questions “in passing in the teacher’s lounge” (Participant 2, Interview). Some teachers mentioned that proximity played a role when it came to who they asked for help because classroom proximity offered a quick and efficient way to get answers when technology issues emerged. For example, the English language arts teacher stated that she would typically walk across the quad during or in-between classes because “[the history teacher] doesn’t mind the interruptions” (Participant 6, Interview).

Perception

Teacher responses from the semi-structured interviews revealed that the purpose for integrating technology into their classroom practices spanned the spectrum from a supplemental tool to a means for providing opportunities for choice and creativity. All teachers used technology to assess student learning. However, the English language
development and mathematics teachers used technology to guide students through a step-by-step process to learn specific concepts, whereas the English language arts and history teachers allowed student autonomy in technology use to demonstrate their learning.

The mathematics and English language development teachers specifically mentioned how technology was used to close the achievement gap for lower-performing students. The mathematics department put together an afterschool intervention program that used Khan Academy videos to help students master the prerequisite skills for algebra. One mathematics teacher remarked that she used Khan Academy to support “intervention students [as a] skill builder” (Participant 4, Interview). The other mathematics teacher stated that technology use “align[ed] to take the SBAC [standardized test]” was helpful since “paper and pencil [tasks] is different than digital in math[ematics]” (Participant 3, Interview). The required curriculum for the English language development class included the use System 44, an Internet-based application, as an integral part of the language-building process. Students enrolled in this class performed at several grades below grade level due to their language deficit. Although the English language development program allowed students to choose the type and order of the tasks, the purpose of the technology-based program was to help students with writing, reading, listening, and speaking skills.

For the history teacher, the use of technology served several purposes including organizing the presentation of content and information for students as well as “guiding [students] through lessons [to] grasp content better” (Participant 1, Interview). The history teacher remarked that “everything is technology now” and that he used technology to give students the option of many tools and choices to demonstrate their
learning (Participant 1, Interview). The history teacher admitted that professionally technology is very integrated in what his department does. However, he intimated that he was slower to adopt technology on a personal level outside of school.

**Barriers**

Data from the semi-structured interviews and classroom observations revealed that access to technology was no longer a barrier to technology use as all of the core academic classes have a 1:1 student-to-device ratio of Chromebooks or iPads. Modernization resolved accessibility issues with the infrastructure and connectivity to the Wi-Fi network.

Another emerging theme from the interviews illuminated that the lack of time for exploration, planning, and collaboration posed a key barrier to technology integration. One mathematics teacher stated the need “to be trained and educated [in] how and what to use” (Participant 4, Interview). For the science teacher the barrier to technology integration resided in “finding time to learn [and the need for] time to formally practice” (Participant 2, Interview). The remarks of the participants suggest an openness to learning about technology if the issue of time could be resolved.

The lack of knowledge about the technology tools (i.e., Chromebooks versus iPads) and how using it would benefit student learning was a point of frustration for teachers. Several teachers brought up that technology PD tended to focus on the *what* as opposed to the *how*, which they felt did not give them enough knowledge on how to design instruction that focused on meaningful learning with technology. The science teacher remarked that “a lot [is] out there [but] no time to find quality time” for exploration (Participant 2, Interview). Teachers seemed overwhelmed with the numerous
possibilities of technology but acknowledged that time to explore the tools would help to alleviate this concern.

Teachers revealed that they needed time to explore and plan with colleagues beyond the current bi-monthly collaboration schedule. Data from the semi-structured interviews conveyed that teachers preferred release time to meet within and across departments, but they were willing to meet after school if that was the only option. The English language development teacher echoed the sentiments of several other participants when she stated that the “challenge with children” served as a barrier to collaborating or meeting with others after school (Participant 5, Interview). One of the mathematics teachers remarked that being released to work with peers “once a quarter . . . not an issue to be out of the classroom” (Participant 3, Interview). The history teacher stated his preference for a release day for “collaboration . . . [and to] connect with teachers reduces barriers” instead of meeting after school where time would be limited to an hour or two (Participant 1, Interview).

The idea of observing expert teachers using technology with students also emerged from the interview data. Teachers indicated that they preferred to choose the time and content for PD. The English language development teacher expressed her desire “to see a literature based lesson . . . [as well as] seeing technology in [an] AVID classroom done well” (Participant 5, Interview). Similarly, one of the mathematics teachers suggested a two-part release day to “observe [classrooms] and [be] trained” with fellow mathematics teachers would be informative (Participant 3, Interview). Two teachers specifically used the term “as needed” when asked about their preference for the frequency of technology professional development (Participant 2 & Participant 4,
Interview). Personal preferences for professional development specific to their respective content areas emerged as a clear theme.

The issue of the lack of administrative support and leadership emerged from the semi-structured interviews. The principal’s inconsistent support of technology integration has contributed to frustration for some faculty members. In some cases, teachers asked for and received funds to purchase licenses as well as procure substitutes so they could be released from class to collaborate, whereas others have felt as if their department needs have been constantly overlooked. The mathematics department, in particular, has had several of their technology requests denied under the guise of cost. Participant 3 shared “[He needs to] pay better attention to the [needs of the] team . . . instead of the negative things” (Interview). Similarly, Participant 4 stated that the principal “didn’t address [our request for technology PD] in a timely manner” (Interview). The concern related to the perception that other departments received release days to work on technology, but not the mathematics department. In spite of the frustration relayed by the two mathematics teachers during the interview, both seemed willing and open to learning how technology could support student learning outcomes in their classes.

The school has continued to operate under a draft of a technology plan as no formal process of adoption has occurred. The latest school climate survey results from 2018 revealed that faculty responses for disagree and strongly disagree increased from 23% to 29% in the area of site leadership support for professional development. Moreover, faculty responses increased by 20% for those who disagreed or strongly disagreed with the statement regarding school site promotion of trust and collegiality.
Opportunities

Semi-structured interview data revealed that teachers perceived varying levels of support at the school and district level. Regarding teacher awareness of support, the majority of teachers interviewed did not know the names of the district technology teachers on special assignment. When prompted to clarify the hesitation to reach out to the district office for help, one teacher stated, “[I] don’t know what to ask for” (Participant 5, Interview). Participant 3 and Participant 4 brought up frustrations with the lack of support for technology by the administration, with Participant 3 specifically stating the “[principal] doesn't know that we all need support” (Interview).

In addition to teacher awareness of support, proximity emerged as a key component from the interviews. All of the teachers mentioned that they felt they could rely on the history department—the first department to pilot 1:1 technology integration—for technology support not just for planning but also for troubleshooting issues. Most teachers mentioned that they liked that they could walk over in-between or during classes to ask colleagues for help—this practice was observed during several of the classroom observations, specifically with the mathematics and science teachers who shared a common doorway between their rooms. Classroom and interview data suggested that most of the support occurred in informal settings through casual conversations.

Efficacy

Consistent with the research, data from the needs assessment revealed that teacher self- and collective efficacy both played a key role in teacher instructional practices to include meaningful learning with technology (Horton & Martin, 2013; Levin &
Wadmany, 2008; Overbaugh et al., 2015). The following section includes an analysis of data from the efficacy surveys, classroom observations, and semi-structured interviews.

**Self-efficacy.** To begin, I created an aggregate index for both self-efficacy and collective efficacy scores for the teachers. The self-efficacy index consisted of items from the Patterns of Adaptive Learning Scales (Midgley et al., 2000), and the collective efficacy index comprised items from the collective efficacy survey (Goddard et al., 2000). Participant scores for items from each subscale were combined into one average score to represent the variables of interest, self-efficacy and collective efficacy, respectively. Descriptive statistics for the 29-item Patterns of Adaptive Learning Scales teacher subscale is displayed in Table 2.6. A mean score of 3.18 indicated that participants had a higher than average or stronger sense of self-efficacy.

Table 2.6

<table>
<thead>
<tr>
<th>Descriptive Statistics</th>
<th>N</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>self</td>
<td>21</td>
<td>3.18</td>
<td>.36</td>
<td>2.66</td>
<td>4.17</td>
</tr>
</tbody>
</table>

The histogram (see Figure 2.3) showed the range of participant scores ($SD = .36$). There appeared to be one extreme score, which was the maximum of 4.17. Descriptive statistics revealed a median score of 3.14 and a mode of 3. The histogram for self-efficacy represented a positively skewed distribution.

*Figure 2.3* Histogram of Participant Responses from the Patterns of Adaptive Learning Scales
Participant responses ranged from a mean of 2.66 to 4.17 out of a total possible of 5 (see Appendix I). The data from the histogram indicated some variability in self-efficacy scores among teachers, with scores almost evenly distributed above and below the mean. Item 12 ($M = 2.33$) stood out in particular with teacher responses yielding a mode of 1 and a median score of 2 which aligns with the answer choices *strongly disagree* and *disagree*, respectively. For this item, the majority of teachers disagreed with the statement “Factors beyond my control have a greater influence on my students' achievement than I do” (Midgley et al., 2000). The results from this statement indicated a higher sense of self-efficacy meaning that teachers believed their efforts have some type of influence on student achievement. On the other hand, responses for Item 24 ($M = 3.57$) produced modes of 3 and 5 which meant that the majority of teachers *somewhat agreed* and *strongly agreed*, respectively, with the statement that “Some students are not going to make a lot of progress this year, no matter what I do.” Evidently, the self-
efficacy data proved to be inconclusive, which may be attributed to participant confusion with the wording of the questions or perhaps this was the result of a mismatch between the chosen instrument and the construct of interest.

My classroom observations suggested that teachers were comfortable with the technologies used in their classroom. When questions arose in the mathematics and English language arts classes, students typically relied on peers for help before consulting with the teacher. The tenacity observed by the two mathematics teachers and the English language arts teacher indicated a strong propensity for troubleshooting. Because of my role as a participant observer, the teachers did not hesitate to include me in problem-solving technology issues while I was in their classrooms. Despite the results from the descriptive statistical analysis of the Patterns of Adaptive Learning Scales survey data, which indicated lower self-efficacy in general, when considering technology, teachers showed persistence in trouble-shooting issues. The seemingly inconsistent results when comparing the quantitative and qualitative data may have been due to a mismatch in operationalizing the construct of self-efficacy. The Patterns of Adaptive Learning Scales measured personal self-efficacy along with mastery and performance approaches to school goal structures and goal-related approaches to instruction (Midgley et al., 2000), whereas when I conducted the classroom observations, I focused on technology self-efficacy instead of general or personal self-efficacy.

The semi-structured interview data further contradicted the survey results. One teacher indicated a large learning curve when first introduced to using technology, but the proximity of peers who could help troubleshoot issues helped him to realize that the “key [is that I am] not a loser” (Participant 1, Interview). Other teachers also indicated a large
learning curve with technology but cited the support from colleagues who were technology experts as instrumental to their learning.

Collective efficacy. An emerging theme from the data revealed the extent to which teachers relied on peers for technology support. Teachers typically collaborated within their respective departments for curricular issues, but in terms of technology support, teachers crossed departmental lines. Existence of an informal support network surfaced from the semi-structured interview data.

The descriptive statistics for the 21-item collective efficacy survey are displayed in Table 2.7, which shows the minimum and maximum scores from the participants as well as the mean and standard deviation. A mean score of 4.32 indicated that participants had higher than average or stronger sense of collective efficacy.

Table 2.7

<table>
<thead>
<tr>
<th>Descriptive Statistics</th>
<th>N</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>collective</td>
<td>21</td>
<td>4.32</td>
<td>0.55</td>
<td>3.43</td>
<td>5.24</td>
</tr>
</tbody>
</table>

The histogram showed the distribution of scores ($SD = .55$; see Figure 2.4) which represented a normal distribution. Participant responses ranged from a mean of 3.43 to 5.24 out of a possible 6 (see Appendix J).

Responses to several statements from the survey suggested an incongruence with the cumulative score of the collective efficacy survey. For example, teacher responses to Item 39 ($M = 5.29$) resulted in both a median and mode of 6 which indicated strongly agree in response to the statement that asked teachers about the group’s inability to promote meaningful learning among students. On the other hand, teacher responses to
Item 41 ($M = 5.24$) resulted in both a median and mode of 6 which indicated *strongly agree* in response to the statement that teachers believed their colleagues were well-versed in multiple types of teaching strategies. These results suggest that perhaps teachers held their colleagues in high regard in terms of pedagogical knowledge but harbored a low opinion of their collective or collaborative efforts when it came to student learning. Further examination is needed in the areas of teacher perception of collective efficacy and instructional practices.

*Figure 2.4 Histogram of Participant Responses from the Collective Efficacy Scale*

![Histogram](image)

*Figure 2.4. Histogram of participant responses from the Collective Efficacy Scale.*

Data from the classroom observations and semi-structured interviews revealed that teachers relied on peers both within and outside of their departments for instructional support, and that suggests teachers believe in the ability of their peers to positively affect student learning outcomes. Field notes from observations of the two mathematics teachers indicated a highly level of collaboration as well as a healthy respect for each other’s knowledge of mathematics and technology. Likewise, data from the interviews highlighted the fact that the history teachers are a cohesive and collaborative group.
Discussion

The results of the needs analysis not only revealed the current use of technology (Research Question 1) but also informed opportunities and barriers to meaningful learning with technology (Research Question 2). Using a mixed methods approach allowed for a rich revelation of data regarding the current state of technology and teacher practices. Triangulation of data from the qualitative and quantitative measures confirmed the data and emergent themes that addressed the role of self- and collective efficacy in teacher decisions to use technology for meaningful learning. The following section addresses emergent themes and how those themes informed possible interventions.

Meaningful Learning with Technology (Research Question 1)

Classroom observations and semi-structured interview data revealed a range of technology use for meaningful learning. The majority of observed teacher instructional practices included one of five characteristics of meaningful learning: active, constructive, cooperative, authentic, and intentional (Jonassen et al., 2008). Cooperative (i.e., collaborative and conversational) learning was evident in several of the classrooms observed. Some teachers intentionally designed lessons that required group or partner work, whereas other teachers let students decide if they wanted or needed to work with peers.

Several teachers used the power of technology for collaborative or conversational purposes. In classes where students used technology for constructive purposes, the extent of student-centered learning could improve with more time to plan and collaborate with colleagues. In this case, constructive refers to tasks in which students applied knowledge in a new or different way (Jonassen et al., 2008). The lack of authentic, intentional, or
active learning components implied room for improvement in teacher instructional practices. Collaboration and targeted PD may address gaps between technology integration and meaningful learning with technology. Furthermore, the existence of an informal support network suggested the benefit of communities of practice as another avenue to help and empower teachers to design instructional practices that support meaningful learning with technology.

**Opportunities and Barriers (Research Question 2)**

Barriers to technology integration are two-fold: external and internal. External barriers consist of issues with technology access, technical support, and infrastructure (Ertmer & Ottenbreit-Leftwich, 2013; Wachira & Keengwe, 2011). Internal barriers consist of issues such as efficacy, beliefs, perception, knowledge, and value of technology to support student learning (Ertmer & Ottenbreit-Leftwich, 2013; Wachira & Keengwe, 2011). For instructional practices to include the meaningful integration of technology, the reduction or elimination of external and internal barriers is paramount (Evans-Andris, 1995; Finley & Hartman, 2004; Howard, 2013).

Data from the needs assessment revealed that, at the target school, access to technology was no longer a key issue, as the core academic classes have a 1:1 student-to-device ratio. Technical support was provided by a part-time technology assistant. With the completion of modernization, issues with infrastructure were addressed with an updated local area network. To date, most of the external barriers to technology integration have been resolved.

On the other hand, internal barriers remained a key impediment to meaningful learning with technology. The design of the needs assessment included several
components to determine the level of efficacy, knowledge, skills, and value of technology to support meaningful learning by students at the target school. Research indicates that efficacy is a key factor in teacher decisions to integrate technology into instructional practices (Ertmer, 1999; Overbaugh et al., 2015; Shifflet & Weilbacher, 2015). Data from the survey showed promise in that the self-efficacy and collective efficacy levels of teachers were in a range whereby participant in an intervention may reveal marked improvement. Even with several outliers, evidence from the data analysis suggested that teachers at the target school shared similar perceptions about their individual ability to affect change.

Data from the semi-structured interviews revealed that teachers relied on (Participant 5 & Participant 6) and desired to work with peers (Participant 1, Participant 3, & Participant 4). As such, Goddard and Goddard's (2001) statement that when "teachers tend to think highly of the collective capability of the faculty" they may feel encouraged to rise to the expectations of their peers, seems a promising aspect for the target school (p. 815). Therefore, preliminary analysis from the efficacy surveys revealed that the potential exists to include meaningful integration of technology into instructional practices through support and encouragement from peers (McConnell, Parker, Eberhardt, Koehler, & Lundeberg, 2012; Pella, 2011). An increase in the amount of collaboration time may address this opportunity to benefit from the current level of collective efficacy among the teachers.

Two of the semi-structured interview questions purposely focused on level of support and collaboration. Teacher responses indicated a desire to learn how technology could be used in their respective content areas:
• “looking for . . . free tools for marking text and collaboration” (Participant 6)
• “would like to see tech in the AVID classroom done well” (Participant 5)
• “want to know tech can help students [to] create more things (Participant 3)
• “been asking all year [for PD] for Haiku [PowerSchool] Learning” (Participant 4)

When prompted about PD opportunities, all teachers chose release time over meeting after school. The assumption was that being released from class all day would allow ample time to explore and learn how to use technology to support meaningful learning, whereas if teachers choose to meet after school, they would likely spend no more than two hours together.

How teachers wanted to spend their release time varied. Several teachers indicated a desire to observe a demonstration lesson by an expert teacher in technology integration. One teacher commented that “if someone showed it, [they’d] do it” (Participant 4, Interview). The revelations indicate the potential of a coaching model had a positive effect on teacher efficacy and instructional practices.

Cognitive apprenticeship (Brown, Collins, & Duguid, 1989) is another potential intervention. Current school culture and practices do not support teachers learning and working together. Establishing a relationship between expert and novice teachers as well as providing release time may provide opportunities for teachers to learn how to design meaningful learning opportunities with technology through enculturation.

All teachers stated that collegial support served as a key component to their technology use. The revelation of an informal support network within and across departments was promising in that it indicated that teachers were willing to reach out to
peers for help. The implications of this finding suggested the existence of communities of practice at the school. One teacher remarked that “we’re bringing in our friends” and that “schoolwide adoption depends heavily on relationships” (Participant 1, Interview).

These findings aligned with Hall and Hord’s (2015) notion of a gentle breeze in that the diffusion of technology integration into classroom practices seemed to have disseminated across a network of teachers from different departments who had an established relationship based upon friendship and mutual respect. The expansion of communities of practice to include other teachers may occur through increased collaboration and release time within and across departments. The newly restructured local control funding formula provides for increased PD for teachers who serve traditionally underperforming subgroups (e.g., English language learners, special education; Wolf & Sands, 2016), which comprised the majority of students at the school. Therefore, Title I and local control funding should provide the means to pay for release time or stipends for teachers who engage in collaboration or PD both within and outside the regular school day.

However, school climate survey data from 2016 to 2018 showed a steady decline in teachers’ perception of a positive school climate. Areas such as inclusion of staff input, follow-through, fostering professional growth, and communication dropped by five to sometimes as much as 20 points over the past three years with more faculty selecting disagree or strongly disagree. The decline in the school climate survey results suggested a cautionary approach when expanding technology integration among other teachers at the school, as strong leadership and a positive school climate contribute to pedagogical changes in instructional practices (Besnoy et al., 2012; Goddard et al., 2015; Jurasaitė-Harbison & Rex, 2010). The implications of this finding mean that any forward
movement with technology integration needed to address teacher concerns about leadership support.

**Conclusion**

The needs assessment revealed the current use of technology as well as opportunities and barriers to technology integration. The emergence of an informal support network suggested that teachers relied on colleagues for guidance in how to integrate technology to support the learning goals for their students. Therefore, the next step was to determine potential interventions that take advantage of the pre-existing informal support network. However, because of the declining trend in the school climate survey data, I would be remiss to ignore a driver to the problem of practice that resided in the leadership—or perception of the lack thereof—that existed at the school. As a result, when determining avenues for intervention, addressing the role of leadership needed to take precedence.
Chapter 3

Literature Review of Professional Development Models and Formats

Teacher instructional practices have a direct effect on student learning outcomes (Cuban, 2013; Garet, Porter, Desimone, Birman, & Yoon, 2001). As such, to improve student learning outcomes as mandated under federal and state legislation, educators and researchers have looked to PD as an impetus to enact change (Borko, 2004; Dagen & Bean, 2014). In addition, university programs for both preservice and inservice teachers have attempted to address the gap between theory and practice with the intent to increase student achievement.

Professional development serves as the traditional means to provide teachers with training that focuses on topics, such as strategy attainment, pedagogical knowledge acquisition, and skills practice (Hochberg & Desimone, 2010; McConnell et al., 2012). Learning outcomes of typical forms of PD equate to mere attendance, with little input from teachers as to the topics and pace of instruction (Matherson & Windle, 2017). Moreover, most PD models lack sustainability or long-term engagement (Darling-Hammond & McLaughlin, 1995; Darling-Hammond et al., 2017; Dede, Ketelhut, Whitehouse, Breit, & McCloskey, 2008; Garet et al., 2001). In fact, most PD falls into the category of one-shot learning in a physical context that does not resemble the learning environment of the classroom (Dede et al., 2008). In other words, learning is not situated within an optimal environment for retention or transfer of knowledge (Bell et al., 2013). As a result, the time teachers spend in PD does not equate to authentic learning as the learning occurred outside of the classroom context (Desimone, 2009; Matherson & Windle, 2017).
A mixed methods needs assessment conducted in spring 2017 explored the current use of technology as well as teacher self-efficacy and collective efficacy beliefs. The purpose of the needs assessment derived from the problem of practice that teacher instructional practices do not reflect meaningful learning with technology for students. Meaningful learning is defined as encompassing five components: active, constructive, cooperative, intentional, and authentic (Jonassen et al., 2008; see Figure 1.1). For student use of technology to reflect meaningful learning, teacher instructional practices need to shift from teacher-directed to student-centered learning—a change from passive to active learning (Cuban, 2013; Jonassen et al., 2008). The instruments used in the needs assessment included an online survey, classroom observations, preexisting school climate data, and semi-structured interviews.

An online survey measuring self-efficacy and collective efficacy beliefs administered to the faculty \((N = 20)\) revealed that teachers scored higher on self-efficacy compared to collective efficacy measures. Descriptive statistics analysis revealed a normal distribution of data with no outliers to skew the results. However, the results from the survey indicated that self-efficacy and collective efficacy need further exploration to determine the influence on teacher propensity to integrate technology into instructional practices to support student learning outcomes.

Classroom observations revealed the current use of technology in the classrooms \((n = 8)\) from the four core academic areas—English language arts, history, mathematics, and science. Field notes from the observations highlighted a wide range of technology use by students and teachers. In some classes, students used technology to support low-level tasks, such as research or word-processing, whereas in other classes students used
technology to create projects that demonstrated higher-order thinking or simulated real-world phenomena. Teacher use of technology typically focused on modeling for students but also included tasks directly related to their professional responsibilities (e.g., taking attendance, corresponding with colleagues).

Preexisting school climate data informed my understanding of current teacher perceptions regarding administrative support, collegiality amongst staff, and communication from the leadership. For the past four years, results from the survey showed a decline in teacher perception of administrative support. Likewise, teachers perceived a lack of communication from the administration as well as a lack of trust, in general. Strong leadership is key to enacting change (Besnoy et al., 2012; Goddard et al., 2015). However, data from the school climate survey revealed that leadership is area of weakness and, thus, a potential barrier to change.

Semi-structured interviews ($n = 5$) allowed for the collection of rich data used for the purposes of triangulation. Field notes from interviews highlighted teacher interest in learning how technology could support student learning outcomes in their respective content areas. Likewise, teacher concerns focused on the need for support in acquiring the knowledge and skills of how to integrate technology into their instructional practices. When prompted, teachers shared their preference for release days over afterschool sessions for the purposes of PD. A surprising outcome from the needs assessment revealed the existence of an informal support network of teachers who provided peer-to-peer support. The findings from the needs assessment suggested that teacher professional learning may be one avenue to address teacher concerns. The next section discusses the
theoretical frameworks that build upon the informal support network already in existence at the target school.

**Theoretical Frameworks**

Teachers no longer can afford to teach in isolation and those who do so will be left behind (Bouwmans, Runhaar, Wesselink, & Mulder, 2017; Cuban, 2013). Because the needs assessment revealed an informal network of peer-to-peer support, the theoretical frameworks that guide this literature review are sociocultural and situated learning theories. Sociocultural learning theory is based on the social aspect of learning through the convergence of relationships, language, and environment (Vygotsky, 1978). Situated learning theory is based on the idea that learners best acquire knowledge and skills by applying their learning within the same or within a similar social context in which it was learned (Lave, 2005).

The notion behind sociocultural learning centers on learning that takes place with and through the help of others—whether it is by peers, instructors, or experts in the field. Vygotsky’s (1978) concept of the zone of proximal development (ZPD) illustrates the symbiotic relationship well by delineating the difference between what a learner can do without assistance and what a learner can do with assistance (i.e., scaffolding). Scaffolding is defined as providing the necessary support structure for learning (Vygotsky, 1978). Another related aspect of sociocultural learning centers on the notion of collaborative learning through communities of practice (Lave, 1996). Collaborative learning focuses on the increase of understanding or skills through conversation and academic discourse with others. The notion of communities of practice is a product of situated learning theory and stems from the work by Lave and Wenger (1991).
Learners working together to solve a common problem is an example of collaborative learning. Apprenticeship is connected to both situated and sociocultural learning through the idea of a novice learning under the tutelage of an expert (Brown et al., 1989; Lave, 1996). Formal learning—schooling—is commonly associated with instruction that includes abstract concept attainment and application outside of authentic experiences, whereas informal learning is traditionally aligned to real-world experiences in which learning is contextualized (Lave, 1996). For example, current models of PD occur in workshops far removed from what typically occurs in a classroom environment. Situated learning theory touts the “importance of social interaction [and] joint construction of meaning” (Lave & Wenger, 1991, p. 79), two aspects that also align with sociocultural learning theory.

Peripheral participation within a learning community may serve as a stepping stone for novice learners as they engage in the social construction of knowledge (Lave, 2005). In this case, learning may occur both in the physical and cognitive realm. For example, learning experiences within an authentic and appropriate context (e.g., coteaching) have the potential to not only provide contextualized learning but could also influence teacher self-efficacy and collective efficacy (Rohlwing & Spelman, 2014). The social engagement as well as negotiation of skills and knowledge acquisition between the novice and expert serves as the basis for the apprenticeship or coaching model (Bransford, Brown, & Cocking, 2000).

Though Vygotsky’s (1978) concept of ZPD focused primarily on the mental developmental of children as learners, ZPD can and does play a key role in situations involving adult learners as well. Researchers working in both education and leadership
development acknowledge how aspects of social learning influence the learning outcomes of adults (Polly, 2012; Polly & Hannafin, 2011; Zaccaro & Banks, 2004). The following section is an examination of literature that highlights a variety of methods for teacher professional learning.

**Synthesis of Intervention Literature**

A salient theme that emerged from the needs assessment illuminated the existence of an informal network of peers who provided support for each other for technology integration and pedagogical knowledge acquisition. Using that theme as a guide, literature focusing on tenets of meaningful learning (Jonassen et al., 2008) forms the basis of this review. Likewise, a case is presented for a peer-to-peer coaching intervention based on a personalized professional development model. The literature review begins with an examination of the dichotomy of designs for PD that highlights the current forms of teacher professional learning as generally applied across schools and other contexts.

**Traditional Versus Online Formats**

Traditional PD typically occurs in a face-to-face format at workshops (Desimone, 2009; Garet et al., 2001). Teachers gather at a predetermined meeting place where the topic or content is presented to them. In the majority of these cases, teachers are passive recipients of information with little to no time to collaborate or plan (Appova & Arbaugh, 2017; Macià & García, 2016). Facilitators include outside experts, district personnel, and school-site peers.

Oftentimes, topics for PD focus on district initiatives that support expected student learning outcomes as mandated by federal and state legislation. A major criticism
of traditional face-to-face workshops target the ineffectiveness of the learning experience (Dede et al., 2008; Garet et al., 2001; Matherson & Windle, 2017). As passive learners in this model of PD, teachers do not actively engage in the learning process (Desimone, 2009). Information is presented, but teachers lack time for exploration and application (Resources for Learning, 2017). Often, the information and strategies presented occur outside of the classroom environment; thus, the learning is not contextually situated (Desimone, 2009; Dexter, Anderson, & Becker, 1999; Duffy & Cunningham, 1996; Rohlwing & Spelman, 2014). Lack of time is another oft-cited concern for teachers as they balance multiple responsibilities both professionally and personally (McConnell et al., 2012). As such, attending traditional PD further taxes the already over-burdened resources of teachers (McConnell et al., 2012).

An alternative to traditional PD occurs in the online realm (Dede et al., 2008). Teachers can meet and collaborate via a variety of Web 2.0 tools, such as web conferencing, discussion boards, blogs, wikis, and social media (Cifuentes, Maxwell, & Bulu, 2011; Duncan-Howell, 2010). The flexibility between synchronous and asynchronous learning environments supports choice in the learning process (Dede et al., 2008). Synchronous learning occurs when multiple participants learn in real-time, whereas asynchronous learning does not (Jonassen et al., 2008). Asynchronous learning environments allow for more flexibility than synchronous events because teachers do not have a set time to meet—learning truly occurs on the learner’s own terms (Matherson & Windle, 2017). However, synchronous environments support teachers who prefer whole group, real-time learning, and collaboration but perhaps from the comfort of their own home (Dede et al., 2008). Whatever the case, teacher professional learning that occurs
online means that teachers do not have to drive somewhere to meet at a physical location, which reduces some of the burden for teachers (Dede et al., 2008; Fishman et al., 2013).

Two longitudinal studies examined the effects of online PD on teacher professional learning over a period of three years (Ching & Hursh, 2014; Pape et al., 2015). Ching and Hursh (2014) focused on the experience of three cohorts of K12 teachers ($N = 69$) as they learned how to develop an interactive web-based application (e.g., wiki, blog, website, simulation) that could be implemented into their own classrooms. The researchers discovered the role of peer modeling through the development of communities of practice that motivated teachers to change instructional practices. Using a social constructivist theoretical framework, the authors found that peer collaboration contributed to a learning culture of collaborative inquiry (Ching & Hursh, 2014). Though the study occurred over a 3-year period, the online courses were offered over four consecutive weeks in the summers. As such, the researchers, who also served as the instructors of the online courses, tracked change over time as they used an archive of exemplary projects to help guide and motivate successive cohorts (Ching & Hursh, 2014). Year 1 teachers did not have the advantage of the exemplary projects archive, so those who attempted to use a novel technology tool (i.e., learning management system) were perceived by peers in their cohort as brave and innovative. Year 2 and 3 participants benefitted from the archive of projects as they viewed evidence of the application of certain technologies into classroom practices. Successive cohorts used the exemplary projects archive to determine the applicability and relevance of the technologies for their respective students; thus, the benefit of peers extended beyond cohorts.
Similarly, Pape et al. (2015) examined the effects of an online PD program but on the acquisition of mathematical content and pedagogical knowledge. Twenty-three Grades 3-5 elementary mathematics teachers engaged in activities that focused on mathematical thinking and inquiry. The 35-module PD program allowed participants to engage in critical inquiry around pedagogy and mathematical content. Findings from the study revealed that the design of the PD program as well as the level of engagement and support by the instructor contributed to a social learning experience for participants that supported “deep and meaningful learning” (Pape et al., 2015, p. 19). A promising result from the study attributed that both teacher content and conceptual knowledge of mathematics likely increased due to participation in the online PD program which included inquiry-based learning and application to practice. Moreover, the social learning aspect of the online PD program indicated that instructor support and engagement served as key components to influencing changes to teacher instructional practices.

Both studies used a mixed methods approach to examine the effects of an online PD program on the acquisition of teacher technology skills and knowledge as well as content and pedagogical knowledge. The purpose of the studies focused on ways to design learning opportunities for teachers so that they could engage in meaningful learning with technology (Ching & Hursh, 2014; Pape et al., 2015). An interesting outcome from both studies illuminated the key role of instructional design in online PD to support collaboration as well as the development of communities of practice (Ching & Hursh, 2014; Pape et al., 2015)—both of which will be further addressed in subsequent sections.
Researchers have assessed the viability of face-to-face versus online PD (e.g., Fishman et al., 2013; McConnell et al., 2012; Moon, Passmore, Reiser, & Michaels, 2014; Powell, Diamond, Burchinal, & Koehler, 2010). In addition, the Western Interstate Commission for Higher Education Cooperative for Educational Technologies (2010) has curated research regarding face-to-face versus technology-supported learning and whether a significant difference exists for student learning outcomes. The comparison of face-to-face versus online PD may illuminate factors that districts and professional developers will need to keep in mind when designing professional learning opportunities for teachers.

The paucity of current empirical studies of face-to-face versus online PD on teacher and student learning outcomes served as the impetus for two different researchers to employ a randomized experiment or quasi-experimental design. Fishman et al. (2013) used a two-level model to study teachers as a cluster and students as nested within teachers. The independent variables measured in the study included environmental science content knowledge, teacher efficacy, and teacher beliefs about the pedagogy behind science instruction. The researchers not only found significant gains in teacher and student learning outcomes after the treatment but also no significant differences between whether the PD occurred in a face-to-face or online format (Fishman et al., 2013; see also Anderson & May, 2010; Gagne & Shepherd, 2001; Johnson, Aragon, Shaik, & Palma-Rivas, 2000; Silver & Nickel, 2005). Similarly, Powell et al. (2010) sought to identify whether a difference existed between onsite versus online coaching interventions. Employing controlled randomized methods, teachers were divided among several conditions—control versus treatment and onsite versus online. The treatment
coaching group outperformed the control group for student learning outcomes; however, inconsistencies emerged when looking at teacher versus student learning outcomes both for onsite and online conditions.

The onsite and online treatment participants in Powell et al.’s (2010) study both received approximately one semester of coaching support, whereas participants in Fishman et al.’s (2013) study received a varied amount of PD as the flexibility and frequency for coaching support rested with the participants. Participants from the face-to-face treatment group in Fishman et al.’s study received the same amount of instructional support—48 hours over the span of six days—whereas the online participants engaged in online PD that varied from 3 to 52 hours. Findings from Fishman et al. confirmed results from Powell et al.’s study in that the modality of the learning did not serve as the catalyst for change, but rather the difference in learning outcomes resulted from the design and fidelity of the implementation of the treatment.

**Design Considerations**

The affordances for face-to-face versus online PD have implications for learners. Technology-mediated PD provides an easily accessible way to communicate between learners and coaches that is not bound by a classroom schedule or physical space (Powell et al., 2010; McConnell et al., 2012). A response to the study by Fishman et al. (2013) focused on the affordances of online learning for teachers and educational organizations who are looking for affordable ways to broaden the reach and scale of PD (Moon et al., 2014). Although the findings of face-to-face versus online PD produced similar increases in teacher learning outcomes, attention needs to concentrate on the principles of
instructional design as opposed to targeted content and strategy acquisition (Fishman et al., 2013; Moon et al., 2014).

Traditional PD typically focuses on delivering content with teacher learning determined by attendance (Webster-Wright, 2009). One-shot PD sessions with little to no follow-up support serve as a barrier for transfer of knowledge. Likewise, learning outside the context and content of a classroom environment leaves teachers without a means to see the strategies or content applied in an authentic manner (Bell et al., 2013; Kopcha, 2012). Lack of time during PD to digest the information, discuss the implications for classroom practice, or co-plan with colleagues likely exacerbates the gap between theory and practice.

Effectively designed PD needs to follow sound design principles (Moon et al., 2014). As such, instructional designers, facilitators, and coaches need to employ practices that allow for thoughtful design of learning experiences (Bruner, 1960; Richey, Klein, & Tracey, 2011). One method to address the gap between theory and practice is to employ authentic learning experiences for learners (Reiser & Dempsey, 2018; Zaccaro & Banks, 2004). Authentic learning is not a new concept. In fact, Jonassen et al. (2008) stipulate that an important component of meaningful learning needs to include authentic learning experiences—similar to the theory of situated learning (Lave, 1996). In efforts to define components of effective PD, researchers have singled out several key features: active learning, duration, content-based, coherence, and collective participation (Borko, 2004; Desimone, 2009; Garet et al., 2001; Penuel et al., 2012). The following section highlights several key features of effective PD.
**Active learning.** Active learning that occurs during collaboration, planning, or practice supports authentic learning experiences (Garet et al., 2001; Jonassen et al., 2008). Active learning, synonymous to student-centered learning, is when the learner takes on a more active as opposed to passive role in the learning process. Learning situations for teachers should not differ from that which is best for their students (Matherson & Windle, 2017). Teachers who are afforded opportunities to actively engage in the learning process become vested in their learning outcomes (Penuel et al., 2012; Sun, Penuel, Frank, Gallagher, & Youngs, 2013). For example, informal learning—quick conversations in the hallways, dropping by a colleague’s classroom—provide opportunities that can foster engagement and motivation (Besnoy et al., 2012; Donovan & Green, 2014; Garet et al., 2001; Zhao & Frank, 2003).

The coplan/coteach model also supports authentic learning. The type of support provided within the coplan/coteach model may include an expert assisting a novice to teach a lesson or a novice teacher observing an expert teach a model lesson. Model lessons and coteaching opportunities allow teachers to engage in contextualized learning experiences which further reinforces the theory of situated learning and its effectiveness for change (Lave, 1996). Moreover, the notion of cognitive apprenticeship is facilitated by the coplan/coteach model as the expert teacher—in this case, the coach—serves as a mentor for the novice teacher (Brown et al., 1989; Reiser & Dempsey, 2018). However, the type and level of support for the coplan/coteach model depends on the stakeholders involved, acceptance by the staff, and funding.

A qualitative study that focused on the influence of an 8-month PD project between the PD project staff and teachers revealed that coplanning lessons supported a
higher likelihood of successful implementation of learner-centered instructional practices (Polly & Hannafin, 2011). The type of scaffolding used—modeling, coplanning, coaching—aligned to Vygotsky’s (1978) notion of ZPD in that the instructional practices of participants changed as a result of support as provided by the PD project staff (Polly & Hannafin, 2011). Though the PD project staff provided model lessons wherein the teachers participated as students, the absence of coteaching a lesson in a classroom setting was a notable gap in the authentic learning experience.

Findings from an experimental study that examined a two-week PD program through both a neuro- and cognitive science lens revealed that teacher efficacy beliefs increased as a result of mastery experiences (JohnBull, Hardiman, Maria, & Rinne, 2013). Mastery experience is defined as an activity in which a teacher’s sense of self-efficacy increases as a result of practice and real-world experience with the support of peers or experts (Bandura, 1977). Teachers in this study engaged in collaboration, coplanning, reflection, and academic discourse with peers and instructors, all of which will inform the design of the peer-to-peer coaching intervention to address the problem of practice. Pre- and postsurvey results revealed an increase in teacher belief and changes in attitude as a result of participation in the PD (JohnBull et al., 2013). The experiences of participants in this study as compared to a matched control group (i.e., ethnicity, gender, ethnicity, grade level, and years of teaching) that included 600 teachers from a neighboring state demonstrate that design components of PD along with proper scaffolds can help teachers change instructional practices that will support increased student learning outcomes.
**Duration.** Lack of time is an oft-cited concern for why teachers find PD opportunities to be ineffective and is also a confounding factor in the transfer of knowledge and skills to classroom instructional practices (Resources for Learning, 2017). The one-day or passive model of PD does not allow teachers time to engage in academic discourse, collaborate with peers, or reflect on what they learned (Devine, Houssemand, & Meyers, 2013; Rohlwing & Spelman, 2014). Sustainable PD ensures that teachers will have time to absorb the learning, apply the concepts into their classroom practices, and reflect on the overall experience (Biancarosa, Bryk, & Dexter, 2010; Cifuentes et al., 2011; Lee, 2005).

Although a one-time workshop may be ineffective to fostering teacher change, what needs to also be considered is how much time an individual teacher needs for professional growth. The affordances of asynchronous online learning may allow teachers to choose the pace as well as duration of PD (Fishman et al., 2013). In a study that compared the influence of face-to-face versus online PD on increasing student learning outcomes, Fishman et al. (2013) found no significant differences in learning outcomes between teachers who completed the online modules within three hours or 52 hours. The conclusion by the researchers focused on the affordances that technology-mediated PD had on personalizing the PD process for teachers. Whether conducted face-to-face or virtually, duration plays a key role in changing teacher beliefs and practices (Darling-Hammond & McLaughlin, 1995; Dede et al., 2008; Lee, 2005; Powell et al., 2010).

An important distinction when considering duration of PD and the impact on changes in teacher instructional practices and student learning outcomes is whether one
categorizes time as duration (i.e., how many hours, time spent) or span (i.e., how many weeks, across time; Lauer, Christopher, Firpo-Triplett, & Buchting, 2014). A review of literature conducted by Lauer et al. (2014) focused on “effective short-term face-to-face professional development . . . with durations of 30 hours or less” (p. 207). Findings from the literature review revealed that the number of PD hours was unrelated to student learning and that the number of hours spent in PD was less important than what teachers did during that time. As such, the PD design features (e.g., use of learning objectives, modeling, practice, active learning, learner-centered, follow-up support, aligned to needs) mattered more than time spent in PD (Lauer et al., 2014). The findings from the literature review further support the necessity of effective PD design (Fishman et al., 2013; Moon et al., 2014).

A comparison of two studies which fall under the description of short-term PD focused on Grade 6 mathematics teachers \((N = 106)\) and Grade 8 science teachers \((N = 23)\). With regards to duration, an efficacy study of mathematics teachers included 14 hours of PD (Ross, Hogaboam-Gray, & Bruce, 2006), whereas the other study focused on the implementation of a reformed science curriculum that included 20 hours of PD (Doppelt et al., 2009). Both studies examined the effects of PD on student learning outcomes. Results from the 10-week efficacy study of mathematics teachers did not reveal an increase in student achievement, which Ross et al. (2006) attributed to several potential causes: lack of qualitative data, premature evaluation of treatment effects, and insufficient follow-up support. On the other hand, the 2-year PD program conducted by Doppelt et al. (2009) provided follow-up support to science teachers whose students
demonstrated gains in science achievement over peers whose teachers did not participate in the PD.

In both these studies, teachers engaged in situated learning opportunities, which included active learning, academic discourse, collaboration, and reflection (Doppelt et al., 2009; Ross et al., 2006). Though classified as short-term PD by the definition used by Lauer et al. (2014), in this case, duration and span of PD both seemed to play a role in student learning outcomes. Results from the 2-year study of science teachers included 20 hours of PD, which was correlated to an increase in student achievement (Doppelt et al., 2009), whereas results from a 10-week study of mathematics teachers with 14 hours of PD did not reveal an improvement in student mathematics achievement (Ross et al., 2006). As such, though components of PD design play a role in teacher learning, apparently duration and span are also contributing factors.

**Content-based.** Workshops play an important role in disseminating information to teachers whether the topics include strategies, pedagogies, or content. A multi-phase mixed methods study conducted to determine changes to teacher technology, pedagogy, and content knowledge found an increase in teacher propensity for technology integration within their respective content area—geography—as a result of authentic learning experiences, scaffolded learning, and ongoing instructional support (Doering, Koseoglu, Scharber, Henrickson, & Lanegran, 2014). The week-long workshop for inservice middle and high school teachers ($N = 8$) included an online component where teachers could engage in discussions with peers as well as receive instructional support from the workshop facilitators. Doering et al. (2014) conducted the final phase four months after the week-long workshop. Qualitative data analysis revealed that the apparent transfer of
knowledge and skills into classroom practices resulted from a workshop that included several elements of effective PD: active learning, collective participation, and a focus on the content (Doering et al., 2014).

Likewise, two longitudinal studies of participating schools in the National Writing Project examined the transfer of knowledge between teachers (Penuel et al., 2012; Sun et al., 2013). The researchers sought to determine the relationship between direct participation in content-focused PD, interactions among colleagues, collegial ties, and changes to instructional practices. Sun et al. (2013) employed a randomized experimental design with a treatment \((n = 20)\) and delayed treatment \((n = 19)\) group of participants. Teachers, from various subject areas, in the treatment group received direct exposure to PD. The delayed treatment teachers refrained from additional PD related to writing to determine the extent of the spillover effects on teachers who were not directly part of the PD. Penuel et al. (2012), however, focused on the treatment group \((n = 20)\), teachers in direct partnership with peers within the National Writing Project, as the sample came from a larger study that included a control group \((n = 19)\). Findings from teacher self-reports revealed a significant and positive correlation between changes to teacher instructional practices after direct participation in PD (Penuel et al., 2012). Indirect effects of content-based PD were also evident in changes to instructional practices by teachers who did not directly participate in the PD but shared a strong collegial bond with colleagues who directly participated in the PD—essentially a spillover effect and further evidence to support the presence and benefit of sociocultural learning practices (Penuel et al., 2012; Sun et al., 2013).
Penuel et al. (2012) noted that sustained, content-based PD is imperative if the goal is to change teacher instructional practices, but that the indirect effects of PD—through collaboration and strong collegial ties—must not be ignored and that the social aspect of peer-to-peer professional learning is an area for further exploration. Although Sun et al. (2013) admit issues with fidelity as teachers in the delayed treatment group likely could not refrain from any additional PD within Year 2 and Year 3 of the intervention, the benefit of the spill-over effect through peer-to-peer interaction remains a valuable concept for further examination. Another area admitted for future investigation is the reciprocal spill-over effect whereby teachers who did not directly participate in PD still had an influence on peers (Sun et al., 2013).

A focus on content plays a key role in why educators value PD (Duncan-Howell, 2010; Harris & Hofer, 2011). A comparison between two online PD opportunities offers a juxtaposition in methodology, but the findings remain the same—teachers seek practical and relevant strategies for their content area. The proliferation of social media as a viable platform for PD prompted Duncan-Howell (2010) to study three online professional communities. Researchers solicited participants ($N = 98$) to complete an online survey with open and closed-ended questions regarding the advantages and disadvantages of online communities as a means for professional learning. Oft-cited reasons for membership in online communities included opportunities to learn from peers, receive emotional support, develop and hone professional skills, and stay up-to-date with the latest trends in technology. However, a key reason for maintaining membership in an online community was the ability to seek relevant subjects and content targeted to individual needs (Duncan-Howell, 2010). In this case, online professional
communities supported real-time, teacher-driven PD that was content-based and applicable.

Harris and Hofer (2011) conducted a qualitative study that examined the experience of social science teachers ($N = 6$) who participated in an online component of a university-funded initiative that focused on content, technology, and pedagogical-based PD. This five-month study solicited teacher input regarding instructional planning needs based on the technological pedagogical content model (Shulman, 1987; see Koehler & Mishra, 2009). Data from interviews and document analyses (e.g., reflections, unit/lesson plans) provided insight into what teachers found valuable from the PD. Similar to the study on online communities for PD, findings from the technological pedagogical content model study indicate that teachers seek learning opportunities that are content-based and relevant to their professional practice (Duncan-Howell, 2010; Harris & Hofer, 2011)—but perhaps more importantly, teachers are benefitting from the sociocultural aspects of online learning.

**Collective participation.** Teachers can no longer choose to teach in isolation. The revolution of social media and the networking opportunities it affords ushered in a new era for professional growth—collective participation. Building social capital and empowering teachers influence teacher motivation for change. Though the literature touts leadership as playing a key role in changing instructional practices (Goddard et al., 2015; Gray et al., 2015; Minckler, 2013; Preus, 2012), a phenomenological study of secondary teachers ($N = 10$) by Meister (2010) revealed that collegial ties between veteran teachers (i.e., experienced teachers with more than 20 years in the classroom) served as the main impetus for continued professional growth as opposed to a strong
leadership leading the change. Characterized as highly motivated by their administrators and colleagues, these veteran teachers formed an informal support network of peers built on trust and collegiality which increased the likelihood for effecting change (Meister, 2010; Penuel et al., 2012; Sun et al., 2013). In this example, the collective participation of veteran teachers demonstrates the benefits of sociocultural learning in changing teacher instructional practices.

Other examples of teachers engaging in collective participation in professional growth are found in communities of practice and professional learning communities (Bransford et al., 2000; Matherson & Windle, 2017). Communities of practice are defined as groups of people who “share a set of practices, often carried out collaboratively, related to carrying out a common endeavor” (Gee, 2008, p. 91). Professional learning communities share similarities with communities of practice. A formal definition of a professional learning community includes “shared values . . . intentional collective learning . . . shared leadership . . . and peer-to-peer support” (Hall & Hord, 2015, p. 164). Regardless of the differences between communities of practice and professional learning communities, the foundation for changes to instructional practice still rests within the notion of peer-to-peer support as evident in the following two studies.

Researchers examined the influence of communities of practice (Kopcha, 2012) and professional learning communities in a 2-year longitudinal study (Cifuentes et al., 2011). Kopcha (2012) investigated teacher-led communities of practice in Year 2 after teachers participated in mentor-led PD in Year 1. The support provided by the mentor, also a participant-observer, sought to instill in teachers the skills and knowledge needed
to continue to support peers in their endeavor to integrate technology into instructional practices (Kopcha, 2012). The intent of the study was to demonstrate that scaffolded support by a mentor well-versed in technology integration and PD would provide teachers with the means to continue peer-to-peer support after removal of the scaffolds. Likewise, Cifuentes et al. (2011) studied the long-term effects of mentoring and professional learning communities as one of the researchers—with the help of university faculty and school-based technology coaches—sought to instill in teachers the skills and knowledge needed to continue providing support to peers at the conclusion of the intervention. Teachers within the professional learning communities remained enthusiastic with technology integration but expressed a desire to work with peers from their own school who taught the same grade level or content (Cifuentes et al., 2011). The desire to collaborate among within-school peers as a component for professional learning is an area that will be addressed in subsequent sections.

One main difference between these two studies existed in the make-up of the peer-to-peer support. The study conducted by Kopcha (2012) focused on the development of communities of practice with elementary teachers ($N = 30$) from the same school, whereas the study by Cifuentes et al. (2011) focused on the development of a professional learning community across five schools in three different districts. At the conclusion of the intervention, teachers within the professional learning community that spanned several schools and districts voiced their desire to work with peers due to shared school contexts, curriculum, and students (Cifuentes et al., 2011). Interestingly, because teachers within the communities of practice study came from the same school, collaboration as well as efforts to find additional ways to integrate technology into
classroom practices persisted despite increasing frustration with technology issues, which the researcher attributed to “teachers’ limited use of the communities of practice” (Kopcha, 2012, p. 1118). Researchers attributed changes to teacher instructional practices to include technology integration as a result of effectively designed PD, which included active learning, situated contexts, scaffolded support, sustainability, and increased knowledge of pedagogy behind effective instruction (Cifuentes et al., 2011; Kopcha, 2012). The following section addresses the influence of team learning on changing teacher instructional practices.

**Team Learning**

Collaboration among adults does not simply occur by putting people in the same group. Determinants of successful team learning include components such as task interdependence, shared cognition, and identification as a team (Van den Bossche, Gijselaers, Segers, & Kirschner, 2006; Wijnia, Kunst, van Woerkom, & Poell, 2016). “Mutually shared cognition” (Van den Bossche et al., 2006, p. 506), the coconstruction of knowledge that occurs within a collaborative learning environment, is a social process and as such, team members not only need to find common ground but also need to actively cultivate relationships among members (Wijnia et al., 2016). A quantitative study by Van den Bossche et al. (2006) examined first-year business students enrolled in an international degree program located in the Netherlands. The researchers sought to investigate factors for successful team learning. Findings from the study revealed that, within the teams \( N = 75 \), mutually shared cognition mediated the relationship between “team learning behaviors and team effectiveness” (Van den Bossche et al., 2006, p. 513).
Similarly, a quantitative study by Wijnia et al. (2016) examined teams of vocational education teachers \((N = 104)\) to determine factors that contributed to implementation of “competence-based education” (p. 115). Results from the study highlighted the importance of interactions among team members as a determining factor in changing instructional practices. Task interdependence, team identification, and trust all served to foster team learning practices—another tie to sociocultural learning (Van den Bossche et al., 2006; Wijnia et al., 2016).

A qualitative case study by Fairman and Mackenzie (2015) examined the role of teacher leaders \((N = 40)\) and peer influence in seven schools in Maine. Findings from the study revealed the importance of relationship-building in the development of trust and collegiality. The researchers asserted that the role of teacher leaders in enacting change and influence among their colleagues stemmed from the following: motivation for change, desire for increased student achievement, and employment of support strategies (e.g., modeling, coaching, collaboration). One deciding factor that kept teachers open to change was the fact that the teacher leaders were peers from the same school (see also Cifuentes et al., 2011; Fairman & Mackenzie, 2015). The notion of within-school leaders supporting peers—team learning—may serve as the foundation for the development of a coaching culture. A literature review by Gormley and van Nieuwerburgh (2014) defined coaching as an “intervention that can help people to achieve their goals or improve performance through structured conversations” (p. 91). Studies included in the literature review—both from industry and education—reveal that peer coaching may help to build capacity for individual as well as organizational change (Gormley & van Nieuwerburgh, 2014).
Two additional models that align with the idea of team learning include peer development and Japanese lesson study design (Byrne, Brown, & Challen, 2010; Doig & Groves, 2011). One option for improving professional practice may occur through peer observations—mastery experiences (Bandura, 1977; JohnBull et al., 2013). However, in higher education institutions, peer observations typically serve as a means for accountability with little incentive for meaningful dialogue around pedagogy and effective teaching practices (Byrne et al., 2010). One solution to increase accountability and incentive among faculty that also supports the development of critical discourse and collegiality may rest with the idea of peer development. Byrne et al. (2010) examined the notion of peer development within one department at a university in the southern part of England. Faculty were given the option to participate in a peer development review process or continue with peer observations. The two-phase study included questionnaires and interviews with full and part-time faculty \( (N = 36, n = 10; N = 18, n = 5) \). Findings from the study revealed that a participant-driven approach to PD led to the development of collegiality, increased trust, critical conversations around pedagogy, but more importantly, improvement in teacher instructional practices (Byrne et al., 2010). The researchers found that teacher agency served to increase motivation and commitment, three important factors of a participant-driven approach to PD.

Similarly, Japanese lesson study design offers an opportunity for teachers to become reflective practitioners (Doig & Groves, 2011). Based on the notion of improvement science and communities of inquiry (Lewis, 2015), Japanese lesson study design takes participants through a four-step process for professional growth: goal setting and planning, teaching and peer observations, post-lesson debriefing, and revision of
practice through critical discourse and reflection. Changing teacher instructional practices through active learning, discourse, and reflection is one avenue of PD (Doig & Groves, 2011). The Japanese lesson study draws an important benefit from the notion of communities of inquiry. By working together on the shared goal of improving instructional practices, teachers take an active role in their learning—a nod to constructivist as well as sociocultural learning theories (von Glasersfeld, 2005; Vygotsky, 1978). Using the format of the Japanese lesson study will lead to sustainable PD through practices such as participation in a community of inquiry, teacher empowerment over their learning, creation of common goals, as well as a shared sense of responsibility for peers and students (Doig & Groves, 2011; Lewis, 2015). Working closely with colleagues in this type of PD model is indicative of what makes teachers a team as opposed to a loosely-knit group. The notion of team learning exists within a coaching culture, which will be further addressed in the following section.

**Coaching Model**

The occurrence of coaching has increased in frequency within schools and districts to address the gaps in various PD models and improvements to teacher instructional practices (Dagen & Bean, 2014; Denton & Hasbrouck, 2009). Though instructional coaching has served and continues to serve as a form of PD, a definition of the theoretical and operational models of an instructional coach is lacking. The popular definition of an instructional coach is someone who provides support and guidance to teachers to improve the quality of teaching (Denton & Hasbrouck, 2009). In fact, coaches play a key role in implementing district initiatives as well as providing job-embedded support. Disagreement exists among the responsibilities of coaches. Do
coaches best serve as data-based, student-oriented, managerial, or teacher-oriented support? Denton and Hasbrouck (2009) provide an overview of seven types of coaches: technical, problem-solving, reflective practice, reform-minded, instructional consultation, collaborative consultation, and team-building. The notion of coaches serving in a team-building or collaboration consultation capacity will be the focus for the rest of this section.

The positive perception of coaching support rests on the type of relationship fostered between the coach or teacher leader and teachers (Collet, 2012; Polly, 2012; Raffanti, 2008; Scott, Cortina, & Carlisle, 2012). A mixed methods study by Collet (2012), grounded within a sociocultural framework, examined how the coaching process influenced teacher propensity to make changes to their instructional practices—a gradual increase of responsibility. Three coaches, professors and doctoral students from a local university, worked with preservice and inservice teachers ($N = 46$) enrolled in a graduate program focused on literacy education. The coaches provided scaffolded support that changed over time. Initially, coaches focused on modeling and making recommendations to teachers. However, as teacher efficacy increased, coaches offered suggestions for a deeper analysis into literacy practices as well as provided affirmation for teacher efforts (Collet, 2012). The researchers noted that the scaffolded support of the coaches eventually led to more collaboration among both participating teachers and coaches. Through these “collegial conversations,” the relationships and peer supports between participating teachers continued outside of the formal intervention process (Collet, 2012, p. 41).
Similarly, an inductive qualitative study by Polly (2012) focused on the changing role of coaches as teacher efficacy increased over time. The researcher, who also served as the coach, worked with four elementary teachers in the area of mathematics literacy skills. Grounded in the notion of ZPD, the coach provided supportive strategies, such as coplanning, coteaching, and modeling of lessons based on teacher needs and interests (Polly, 2012). The researcher noted that an informal group of grade-level teachers—not part of the study—formed a team to provide support for a first-year teacher who was a participant in the study. The collaboration among the grade-level peers helped the novice teacher with planning, classroom management, and curricular support. Findings from the study revealed that novice teachers sought more support in the areas of classroom management and curricular resources, whereas experienced teachers sought guidance in the form of feedback and affirmation (Polly, 2012). Conclusions from this study suggest that teacher needs are varied and, when given the opportunity, they will self-select their pathway for learning.

A different mixed methods study by Scott et al. (2012) examined the perception of coaching from the perspective of coaches and teachers. Literacy coaches ($N = 105$) provided a range of scaffolded support dependent on teacher needs and interests. Coaches reported more instances of modeling reading literacy skills in classrooms of novice teachers, whereas with experienced teachers the coaches reported more opportunities to discuss and share research-based strategies (Scott et al., 2012). Results from a questionnaire revealed that teacher perception of coaches increased with the amount of time the coaches spent with teachers, which speaks to the need for sustainable PD (Desimone, 2009; Garet et al., 2001). Likewise, teachers appreciated the support of
coaches when aligned with active learning practices (Desimone, 2009; Garet et al., 2001). As such, the results from this study aligned with elements of effective PD (Desimone, 2009; Desimone & Garet, 2015; Doering et al., 2014; Garet et al., 2001).

Coaching support can come in the form of partnerships with local universities or through teacher credential programs. A longitudinal study conducted by Musanti and Pence (2010) explored the experience of elementary inservice teachers ($N = 14$)—serving as co-facilitators—as they provided support to peers who taught English language learners. The researchers used qualitative measures to track the development of learning communities in six schools across a 3-year span. Grounded in situated and constructivist learning principles, co-facilitators were expected to open their classrooms for observations by peers as well as coteach lessons. Findings from field notes, interviews, and focus group revealed that collaboration among peers did not occur naturally (Musanti & Pence, 2010). Though co-facilitators engaged in the active co-construction of knowledge within their cohort and peers at their schools, data from interviews exposed a dark-side to coaching and collaboration—anxiety for co-facilitators, lack of time for reflection, and the need to develop trusting relationships among peers. The experience of coaching draws its strength from collaboration and situated learning experiences, but the learning does not come without some resistance (Musanti & Pence, 2010). The experience of coaches from this study illuminate the need for time to develop trust between peers in order for the benefits of co-construction of knowledge and collaboration to occur.

A different longitudinal study focused on the experience of preservice teachers from a dual credential master’s program (Bell et al., 2013). Similarly grounded in
situated learning theory, this study also examined the effects of cognitive apprenticeship on teacher instructional practices. Bell et al., (2013) gathered qualitative data across a span of two years from student teachers ($N = 26$) whose participation in the program focused on technology integration. Field notes, lesson plans, and interviews revealed a substantial increase in innovative technology integration into instructional practices. Classroom observations and subsequent interview data found a correlation between the modeling that occurred in the credential program courses and preservice teacher instructional practices in the classroom. Researchers saw evidence of application, transfer, and adaptation of technology practices into classroom practices (Bell et al., 2013). Participants cited the benefits of modelling, context-specific collaboration, feedback, and reflection opportunities as the impetus for change (Bell et al., 2013). The design of the courses within the dual credential master’s program aligned not only to tenants of sound pedagogical practices, but courses also mimicked the type of support coaching can provide. As such, though this particular study did not focus specifically on coaching, the interactions between the course instructors and preservice teachers share similarities between an expert-novice coaching relationship. The following section addresses the proposed intervention for the problem of practice in light of the literature presented.

**Summary and Overview of Proposed Intervention**

Teacher professional learning can occur through a variety of means: formal versus informal, face-to-face versus online, independent versus collaborative, and mentor or coach versus peers. Studies that compared face-to-face versus online PD found that, though teachers may have a particular preference for meeting face-to-face or virtually due
to issues with time or learning preferences, the modality of the learning did not serve as the catalyst for change; rather, the difference in learning outcomes resulted from the design and fidelity of the implementation of the treatment (Fishman et al., 2013; McConnell et al., 2012; Moon et al., 2014; Powell et al., 2010). In other words, the design of the PD, not the modality, served as the key component for change, as can be further supported by the plethora of No Significant Difference Phenomenon research (Anderson & May, 2010; Gagne & Shepherd, 2001; Johnson et al., 2000; Silver & Nickel, 2005).

Common elements of effective PD that supported transfer of knowledge as well as changes to attitudes, beliefs, efficacy, and ultimately teacher instructional practices included: active learning, duration, content-based, coherence, and collective participation (Borko, 2004; Ching & Hursh, 2014; Desimone, 2009; Fairman & Mackenzie, 2015; Garet et al., 2001; Lauer et al., 2014; Pape et al., 2015; Penuel et al., 2012). Professional learning opportunities that included more than one of these elements exhibited a higher likelihood of changes to teacher instructional practices (Dagen & Bean, 2014; Doppelt et al., 2009). Therefore, a case is made for personalized professional learning via peer-to-peer coaching that not only considers findings from the needs assessment but also elements of effective PD.

The needs assessment revealed that teachers relied on colleagues to troubleshoot technology issues, brainstorm ideas for lessons, and share best practices for technology integration. As such, collaborative learning via a sociocultural and situated learning lens serves as the focal point for the intervention. Collaborative learning can come in many forms, such as mentorship, coaching, or team learning (Brown et al., 1989; Cifuentes et
al., 2011; Collet, 2012; Dagen & Bean, 2014; Kopcha, 2012; McConnell et al., 2012; Polly, 2012; Powell et al., 2010; Reiser & Dempsey, 2018; Scott et al., 2012; Van den Bossche et al., 2006; Wijnia et al., 2016)—the importance being that teachers have a choice in the learning process. The influence of collaboration on changing teacher practices is dependent upon relationships and trust—among which diverging viewpoints can serve as a mechanism to strengthen collective team identification (Dagen & Bean, 2014; Musanti & Pence, 2010; Wijnia et al., 2016).

Within the proposed intervention, teachers will engage in authentic and situated learning opportunities through activities such as coplanning, coteaching, or observing model lessons. Numerous studies highlight the importance of authentic learning experiences (Borko, 2004; Desimone, 2009; Garet et al., 2001; Jonassen et al., 2008; Penuel et al., 2012; Reiser & Dempsey, 2018; Zaccaro & Banks, 2004). In addition, to address the dual issues of duration (i.e., how many hours) and span (i.e., how many weeks; Biancarosa et al., 2010; Cifuentes et al., 2011; Doppelt et al., 2009; Lauer et al., 2014; Lee, 2005; Ross et al., 2006), formal collaborative opportunities will occur over four full-day sessions (i.e., release days) interspersed throughout the school year for teachers to coplan, coteach, or observe model lessons. The intervention will also include four to six afterschool sessions per quarter to serve as a follow-up to the full-day sessions for additional support. To address one barrier to change—lack of time—the intervention purposely allows for multiple opportunities throughout the school year (i.e., span) for teachers to receive peer-to-peer support. Though the amount of full-day sessions will be the same for all participants, the number of afterschool sessions (i.e., duration) is dependent upon personal preference.
The full-day and afterschool sessions will occur over the course of one school year to gather information about change over time as well as explore the process behind peer-to-peer coaching as teachers grow together professionally. The intervention design will align to the district goals and school action steps so that teachers do not feel as if their participation conflicts with other professional duties and responsibilities. The topics to be covered during the full-day sessions will include information about how to design instructional practices around meaningful learning with technology for students.

Teachers desire professional learning opportunities that are situated within their respective content areas (Doering et al., 2014; Penuel et al., 2012; Sun et al., 2013). Traditional PD that occurs out of context inhibits transfer of knowledge and skills (Bell et al., 2013; Dede et al., 2008; Desimone, 2009; Matherson & Windle, 2017). Modeling and coteaching opportunities provide teachers with the means to practice the skills and knowledge learned through peer-to-peer collaboration (Collet, 2012; Kopcha, 2012; Polly, 2012; Polly & Hannafin, 2011). With many working parts to the proposed intervention, thoughtful instructional design is imperative in order for teacher professional learning to be effective (Rohlwing & Spelman, 2014).
Chapter 4

Intervention Design and Methodologies

A problem of practice exists because even with the proliferation of technology devices within the context of a Grades 7 and 8 junior high school, the goal of meaningful learning with technology has not been realized. Due to a variety of factors, instructional decisions by teachers determine how students use technology for learning (Cuban, 2013; Garet et al., 2001). As such, one way to address the problem of practice is teacher professional learning (Borko, 2004).

Teacher professional learning comes in a variety of formats and modalities (e.g., formal versus informal, face-to-face versus online, independent versus collaborative, mentor or coach versus peers), most of which allow teachers some choice in the place, time, structure, and content for learning. However, not all PD is equal. Components of effective PD include active learning, duration, content-based, coherence, and collective participation (Borko, 2004; Desimone, 2009; Garet et al., 2001; Penuel et al., 2012).

A review of literature highlighted a variety of teacher professional learning opportunities framed within the sociocultural perspective (Vygotsky, 1978). Furthermore, an examination of empirical studies from K12 public schools, higher education, and private industries revealed a variety of professional learning opportunities, some of which have contributed to long-term success in changing attitudes, beliefs, and practices regarding technology integration (Cifuentes et al., 2011; Kopcha, 2012; Penuel et al., 2012; Polly, 2012; Sun et al., 2013). With the variety of PD available, a case is presented for personalized professional learning through a peer-to-peer coaching model.
Purpose of the Study

The purpose of the study was to determine whether a personalized PD model would address individual teacher needs respective to their levels of efficacy, technology knowledge and skills, content area, and goals for student learning outcomes (Darling-Hammond & McLaughlin, 1995; Dede et al., 2008; Ertmer & Ottenbreit-Leftwich, 2013; Matherson & Windle, 2017; Wachira & Keengwe, 2011). Specifically, the development of a peer-to-peer coaching model stemmed from an informal teacher support network that was already in place on campus. Based upon the findings from the needs assessment and literature review, I formulated research questions to explore the variables that influence teacher propensity to include technology into instructional practices: self-efficacy, collective efficacy, perceived usefulness of technology, and perceived ease of use of technology. The following process and outcome evaluation questions informed the research design:

Process Research Questions:

RQ1. To what extent are participants satisfied with the peer-to-peer coaching support opportunities specifically regarding perceived level of support, frequency, and regularity?

RQ2. To what extent do the coaches facilitate activities conducted during the full-day sessions that reflect the five components of meaningful learning with technology?

Outcome Evaluation Questions:

RQ3. To what extent does participation in peer-to-peer coaching influence teacher self-efficacy?
RQ4. To what extent does participation in peer-to-peer coaching contribute to technology acceptance (i.e., perceived ease of use, perceived usefulness) and increased technology skills and knowledge?

Research Design

A mixed methods convergent parallel design study was conducted during the 2018-2019 school year (Creswell & Plano Clark, 2011; Teddlie & Tashakkori, 2017). A convergent mixed methods approach occurs when quantitative and qualitative data are concurrently collected, independently analyzed, but mixed during the interpretation phase (Creswell & Plano Clark, 2011). The inclusion of both quantitative and qualitative methodologies served to add “breadth and depth of understanding and corroboration” to the research process (Creswell & Plano Clark, 2011, p. 3) as well as permitted the strengths of one strand to compensate for the weaknesses of the other (Johnson & Onwuegbuzie, 2004). Incorporating a mixed methods design offered the following benefits: answered research questions that one method on its own cannot, provided for the potential of stronger inferences during data analysis, and allowed for the inclusion of multiple and perhaps divergent points of view (Teddlie & Tashakkori, 2017). As such, a convergent design was employed in which I collected quantitative and qualitative data at various points throughout the 8-month intervention, independently analyzed the results by instrument, and combined the strands during the interpretation phase (Creswell & Plano Clark, 2011).

Process Evaluation

The effectiveness and sustainability of an intervention depends upon the ability of program implementers to identify key components, conditions, and target individuals of
the intervention (Linnan & Steckler, 2002). Key components for process evaluation include context, reach, dose delivered, dose received, fidelity, implementation, and recruitment (Linnan & Steckler, 2002) as well as adherence, dose, quality of delivery, participant responsiveness, and program differentiation (Dusenbury, Brannigan, Falco, & Hansen, 2003). Of these, reach and dose were used to help inform frequency and regularity of the peer-to-peer coaching intervention as one measure of participant satisfaction. Quality of delivery, dose, and quality of implementation (i.e., fidelity) were used to convey if the topics presented during the full-day sessions adhered to meaningful learning with technology.

Reach referred to the sample population—in this case, two general education teachers from each of the core disciplines (e.g., English language arts, history, mathematics, science) and two special education teachers—who participated in the intervention (Linnan & Steckler, 2002). Dose consisted of the program components such as peer-to-peer coaching over the course of four full-day sessions and approximately four to six afterschool sessions per quarter to occur at the target school. Dose also assessed what the program provided to participants—in this case, time to explore, inquire, and plan with technology. Quantitative data collection occurred through an examination of attendance records for the full-day sessions and afterschool sessions as “compared with the list of potential participants” (Saunders, Evans, & Joshi, 2005, p. 142). An additional indicator of participant satisfaction was the self-reported data from the closed-ended question of the 3-2-1 Reflection that asked participants to rate their satisfaction with their perceived level of support.
Dusenbury et al. (2003) purported that *quality of program delivery* depends on the program provider’s ability to facilitate tasks related to the intervention. The working definition for quality of program delivery focused on my ability to facilitate collaboration between teachers, address teacher needs regarding technology integration, and provide participants time to engage in learning opportunities that allowed for the practice of active, authentic, cooperative, constructive, and intentional activities. *Dose* was operationalized as the extent to which the peer technology coaches and I integrated the five components of meaningful learning with technology during each of the four full-day sessions (Linnan & Steckler, 2002).

*Quality of program implementation* refers to the extent that the intervention was implemented with fidelity. Qualitative measures to determine quality of program delivery included using a checklist to determine whether activities addressed during the full-day sessions aligned to the five components of meaningful learning with technology. The 3-2-1 Reflection served as both a qualitative and quantitative measure of dose and fidelity of program implementation. Teacher responses indicated to what extent the activities during the full-day sessions reflected meaningful technology integration.

**Outcome Evaluation**

An outcome evaluation plan “gauges the extent to which a program produces the intended improvements in the social conditions it addresses” (Rossi, Lipsey, & Freeman, 2004, p. 58). For this study, the outcome of the peer-to-peer coaching model on changes in beliefs, practices, and knowledge was assessed. As shown in the logic model, several proximal outcomes were measured: teacher self-efficacy, perceived ease of use of technology, perceived usefulness of technology, and technology skills and knowledge.
(see Figure 4.1). To measure the proximal outcomes, I employed a pre- and posttest survey to measure teacher self-efficacy and technology perception, administered the 3-2-1 Reflection at the close of each full-day session, and, at the conclusion of the intervention, conducted a focus group.

**Figure 4.1 Logic Model**

![Logic Model](image)

**Figure 4.1.** Logic model of the peer-to-peer coaching intervention including specific details for assumptions, inputs, activities, outputs, outcomes, and impact.

**Method**

Good research design begins with a plan for evaluation (Newcomer, Hatry, & Wholey, 2015). Data from four instruments were used to answer the research questions. The creation of summary matrices allowed me to display the alignment between the process and outcome evaluation research questions, measures, variables or indicators, data collection, and data analysis (see Appendix K). This section describes the participants, measures and instrumentation, and procedure.
Participants

The target population for this study included a purposeful, criterion sample (Patton, 2015) of 26 secondary teachers. Criteria included being highly qualified as defined under the No Child Left Behind Act (i.e., bachelor’s degree, valid teaching credential, demonstrate mastery of the content; U.S. Department of Education, 2001) and having an interest in furthering their skills and knowledge of technology. I also sought to have participants equally distributed among subject areas taught.

Eight general education (i.e., English language arts, history, mathematics, and science) and two special education teachers participated in the study. The two history teachers were known to be high users of technology and will, hence, be referred as “peer technology coaches” due to the role they frequently took as that of a mentor or resource both during and outside of the peer-to-peer coaching intervention. As this intervention is based on the idea of peer-to-peer coaching, it is expected that participants will take on the role of experts or novices depending on the strategies, content, or technology tools discussed. Experts are defined as those who are able to “fluently access relevant knowledge because their understanding of subject matter allows them to quickly identify what is relevant,” whereas novices have “informal ideas about the subject … and will vary in the amount of information” acquired (Bransford et al., 2000, p. 17).

Participants, equally divided between male and female, had between 6 to 25 years of teaching experience with six having more than 16 years of teaching experience. Half of the participants taught mixed-grades, while the other half taught one grade. The ethnic make-up comprised 50% Caucasian, 40% Asian, and 10% Hispanic. Additional demographic information for the participants is provided in Table 4.1.
At the beginning of the 2018-2019 school year, I engaged in face-to-face conversations to solicit teachers interested in participating in the 8-month intervention. Teachers who expressed interest were sent an email outlining the purpose of the study and an electronic form of the Letter of Consent (see Appendices L & M). A hard copy was also placed in teacher boxes for their signature.

Table 4.1

Demographic Breakdown of Participants

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>((n = 5))</td>
<td>((n = 5))</td>
</tr>
<tr>
<td>Grade Level</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Seventh Grade</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Eighth Grade</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Mixed Grade</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Content Area</td>
<td></td>
<td></td>
</tr>
<tr>
<td>English Language Arts</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>History</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Mathematics</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Science</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Special Education</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Ethnicity/Race</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asian</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Caucasian</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Hispanic</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Years Teaching</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-5 Years</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>6-10 Years</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>11-15 Years</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>16-20 Years</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>&gt;20 Years</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

Note. All teachers possessed a valid single-subject or multiple subject California credential.

At the conclusion of the intervention, all participants were invited to take part in a focus group (see Appendix N); seven agreed. Two males and five females represented all
content areas except for special education. All focus group members had over 11 years of teaching experience, with the majority (60%) having taught at the target school for their entire career.

**Measures and Instrumentation**

The selection of suitable instruments for data collection depends on the research questions and the expertise or experience of the researcher (Creswell & Plano Clark, 2011). When selecting instruments, I took into consideration district policies and procedures, school culture, cost, and feasibility (Soriano, 2013). Instruments for this study included a survey, reflections, and a focus group. Data from the teacher reflections informed the fidelity of the process evaluation indicators. Data collected from the survey and focus group informed the evaluation of the overall outcomes from the intervention.

**Survey.** The use of surveys for primary data collection considered costs, usability, and ease of use to quickly collect information for participants (O’Leary, 2014). The surveys used for this study gathered data to analyze change over time for the variables of interest. As such, I administered two different surveys—combined into one—as a pre- and posttest measure.

**Teachers’ Sense of Efficacy Scale.** Self-efficacy is defined as the belief in one’s ability to effect change (Bandura, 1977, 1993). To measure self-efficacy, teachers completed the Teachers’ Sense of Efficacy Scale (Tschannen-Moran & Woolfolk Hoy, 2001; see Appendix O). The alpha coefficient of this scale was .90, which indicates a high reliability. The teacher self-efficacy survey consists of 12 items measured on a 9-point Likert-type scale with 1 representing nothing and 9 representing a great deal. The teachers were directed to rank responses to statements according to their perception of
their ability to handle difficulties that might impede student learning outcomes. Sample items included: “How much can you do to motivate students who show low interest in school work?”, “How much can you do to get students value learning?”, and “How much can you use a variety of assessment strategies?” Data from this survey informed Research Question 3 that sought to determine the influence of participation in peer-to-peer coaching on teacher self-efficacy.

**Technology Acceptance Model survey.** Teacher perception of the value and usefulness of technology to support student learning outcomes served as the impetus for choosing the Technology Acceptance Model survey (Venkatesh, 2000). The value of technology for performance improvement is dependent upon the user’s willingness to adopt or use the available technology tool (Davis, 1989). Tests to determine the reliability of measures for perceived ease of use and usefulness revealed an aggregate score of .94 and .91, respectively, which indicates a high reliability (Venkatesh, 2000).

The Technology Acceptance Model survey (Venkatesh, 2000) administered for this study consisted of 31 items measured on a 7-point Likert scale with 1 representing strongly disagree and 7 representing strongly agree, 10 yes or no statements arranged on a Guttman scale, and 1 mark all that apply question (see Appendix P). A Guttman scale solicits yes or no answers to questions ordered such that if respondents agree with a question, they will also have “agree[d] with all previous questions” (O’Leary, 2014, p. 210). The items from the survey focused on nine subscales ascertaining teacher perceptions regarding the following: behavioral intention to use, perceived usefulness, perceived ease of use, computer self-efficacy, computer anxiety, computer playfulness, perceived enjoyment, and perceived voluntariness of use. Sample items asked
participants to rank their perceptions on a scale of 1 to 7 on the following: “Using new technology (devices or tools) enhances my effectiveness in my job”, “I find new technology (devices or tools) to be easy to use”, and “I find it easy to get new technology (devices or tools) to do what I want it to do.” Data from this survey informed Research Question 4 which sought to determine the extent of participation in the peer-to-peer coaching intervention on technology perception and increased technology skills and knowledge.

3-2-1 reflection. Teacher feedback and reflection of the peer-to-peer coaching experience was collected via a 3-2-1 Reflection (see Appendix Q). Questions were field tested to inform whether the wording was clear and whether the response choices aligned to the purpose of the question (Soriano, 2013). Open-ended questions generate a rich description of the peer-to-peer coaching experience without imposing constraints on teacher responses (Soriano, 2013). The three open-ended questions were:

- What are three things you learned?
- What are two questions you still have?
- What is one connection that you can make to your instructional practice?

Two additional fixed-choice, closed-ended questions asked teachers to rank their satisfaction with the level of support received as well as state how many follow-up sessions they needed to help support the integration of technologies and strategies learned during the full-day sessions. Data from the open-ended questions informed Research Question 2, which focused on determining whether the activities facilitated during the full-day sessions reflected the components of meaningful learning with technology. Data
from the closed-ended questions informed Research Question 1, which sought to
determine the level of satisfaction with the peer-to-peer coaching intervention.

**Focus group.** The purpose of conducting a focus group was to collect rich data
(Creswell & Plano Clark, 2011) about the participant experience of the peer-to-peer
coaching model. Focus groups also support the collection of thick descriptions “with
contextual details that captures and communicates someone else’s experience” in their
own words (Patton, 2015, p. 54). Additionally, the choice to use a focus group stemmed
from the desire to “elicit multiple meanings from the participants” (Creswell & Plano
Clark, 2011, p. 45). The focus group interview protocol used seven semi-structured
questions so as to provide flexibility to delve deeper into teacher responses by asking
follow-up questions (Schutt, 2015). Focus group questions included asking participants
about their overall experience with the peer-to-peer coaching model and whether they
believed it contributed to changes in their instructional practices (see Appendix R). Data
from the focus group informed Research Questions 3 and 4 which focused on whether
participation in the peer-to-peer coaching intervention influenced teacher self-efficacy,
technology perception, and technology skills and knowledge.

**Procedure**

Thoughtful research design takes into consideration the target population and
whether the results of the study may be generalizable or the procedure transferrable to
other contexts (Teddlie & Tashakkori, 2017). The following section outlines the peer-to-
peer coaching intervention as well as the procedures for data collection and data analysis.

**Intervention.** The original timeline for the intervention was scheduled to occur
from August 2018 to June 2019 with four full-day sessions, one per quarter, and 16 to 24
afterschool sessions per teacher. However, due to changes in priorities of the administration, the full-day and afterschool follow-up sessions for the fourth quarter were cancelled. Thus, an 8-month intervention, conducted from August 2018 to March 2019, comprised participation in three full-day PD sessions (i.e., September, November, February) and optional afterschool sessions after each full-day session. The school administration provided funds to procure substitute teachers for each participant so that they could attend the full-day PD sessions. The administration also approved stipends for 12 to 18 afterschool sessions per teacher to compensate participants for their time. The intent was to schedule the full-day session within the first month of each school quarter to allow for subsequent follow-up afterschool sessions if requested by teachers. The following delineates the structure of the peer-to-peer coaching intervention, including a timeline of events.

**Full-day PD sessions.** The purpose of the peer-to-peer coaching model centered on interdisciplinary peer dialogue and support. As such, I solicited feedback from teachers regarding their needs and desires prior to each session. I created an agenda and presentation for the full-day sessions using feedback solicited from teachers regarding specific needs and topics. The agendas and Google Slides presentations for the sessions included connections to the five components for meaningful learning with technology as well as suggestions for relevant apps and websites. The schedule for the sessions included two hours in the morning to review the focus topic, one of the five components of meaningful learning with technology, and share updates, with the remaining unstructured time to be used however teachers desired.
**Session 1.** I began the session by sharing the Google Slides presentation to teachers for easier viewing (see Appendix S). Next, I explicitly stated the purpose of the peer-to-peer coaching invention:

- Develop a community of practice
- Engage in an interdisciplinary exchange of information around meaningful learning with technology
- Create and curate lesson ideas and activities
- Forster a personalized learning path

Subsequently, I introduced the overview for the day, highlighting one of the five components of meaningful learning—active, constructive, cooperative, authentic, and intentional (Jonassen et al., 2008)—that served as the focus of the activities for the day. Due to having four full-day sessions but five components of meaningful learning, two of the five characteristics from Jonassen et al. (2008) were covered in the first full-day session day. For this session, the topics were active and cooperative learning. The peer technology coaches and I solicited teacher input on their understanding of what active learning meant by using the following format:

- Discussion around what does active learning looks like
- Presentation of the definition of active learning from Jonassen et al. (2008)
- Discussion around what role can technology play in this process

We followed a similar format for cooperative learning. The peer technology coaches and I encouraged participants to share how they could see the featured components incorporated as part of a lesson or unit.
Next, I introduced the teachers to the International Society for Technology in Education (ISTE) standards (2019) for educators, students, computer science educators, and coaches. Teachers were given time to explore the standards most pertinent to their teaching assignment or interest. Peer technology coaches and I then shared apps, websites, and activities that we have used with our students to generate conversation among teachers around current technology use. The intent was for teachers to hear how peers from other disciplines used technology to support meaningful learning and engage in academic discourse around best practices and strategies.

The peer technology coaches and I facilitated the discussion among the various flexible groupings. Teachers met with peers who shared a similar interest or learning goal for the day. Personalized learning, which teachers consistently report as a PD preference (Doering et al., 2014; Kopcha, 2012; Lauer et al., 2014; Lave, 1996; Matherson & Windle, 2017; Penuel et al., 2012; Polly & Hannafin, 2011; Sun et al., 2013), to a large extent determined the content presented and the tasks teachers engaged in with peers during the full-day sessions. At the conclusion of each full-day session, teachers completed the 3-2-1 Reflection.

**Session 2.** The second session followed a similar format to the first session. The day began with a review of the purpose of the peer-to-peer coaching intervention and overview of the planned activities. All teachers were given access to the Google Slides presentation as hyperlinks to outside sources were included (see Appendix T). Teacher were asked to share how they applied their learning from the first session into their instructional practices. Next, the peer technology coaches and I introduced the topic for the day which was intentional learning. We solicited teacher input on their understanding
of what intentional learning meant before giving them the definition from Jonassen et al. (2008). With a concrete definition in mind, the discussion turned to how technology could support intentional learning tasks in the classroom. Relevant apps and websites were shared with teachers. The rest of the day was devoted to work-time in which teachers could choose with whom they wanted to work and which technology tools they wanted to explore. The peer technology coaches and I facilitated the discussions. At the conclusion of the day, teachers were asked to complete the 3-2-1 Reflection.

**Session 3.** The third session began with the overview of the day before asking teachers to share how they have been able to apply what they learned from Session 2 into their classroom practices. Teachers were given access to the Google Slides presentation to follow-along as well as have the ability to explore the hyperlinks with relevant apps and websites (see Appendix U). The topic for this session was authentic learning tasks. The peer technology coaches and I encouraged teachers to share their understanding of authentic learning before providing the definition from Jonassen et al. (2008). After being introduced to the definition, the peer technology coaches and I shared ways that we have implemented authentic learning tasks into our instructional practices. We demonstrated some tools that supported authentic learning before giving teachers the opportunity to break off into small groups or dyads for in-depth exploration. The rest of the day was work-time for teachers. At the conclusion of the session, teachers completed the 3-2-1 Reflection.

**Afterschool PD sessions.** The afterschool sessions served as a follow-up for the full-day sessions; thus, individual teachers determined how many sessions they wanted by requesting additional sessions using the 3-2-1 Reflection. After each full-day PD
session, I emailed teachers to schedule potential dates and solicit specific topics for discussion. Thus, the afterschool sessions offered another opportunity to provide targeted support based on teacher interest or needs (i.e., in-depth coverage of specific apps, troubleshooting, student imports). Teachers could schedule afterschool sessions for 1:1 help or they could schedule informal sessions with peers. Only two afterschool sessions were formally scheduled. Following Session 1, two participants met to discuss how to set-up Flipgrid. One week after Session 3, five participants met to import students into EdPuzzle and create EdPuzzle assignments. No specific structure or agenda was created for the session. The hour time-frame was purposely left open. I did not collect any data when teachers solicited peer support in an informal manner, such as those that occurred in-between classes or at lunch. I facilitated both afterschool sessions.

**Data Collection.** Data collection for both the process and outcome evaluation questions occurred at specific times throughout the intervention (see Table 4.2). All data were kept on a password-protected laptop and in password-protected accounts online. Hardcopies of the data from the teacher reflections and focus group were kept in a locked secured location. Only the principal investigator and I had access to the data. A list of participant identification and participant numbers were stored separately from the data.

**Survey.** Pre- and posttest test surveys were collected via Qualtrics, a web-based dissemination and collection tool. Within the first 2 weeks of school starting, participants received an email explicating the purpose of the survey and the informed consent. Within 24 hours of receiving signed the informed consent, I emailed a link to the online survey to teachers (see Appendix V). I contacted teachers who did not complete the survey within the 7-day time frame to encourage them to complete the survey at their earliest
convenience. I administered the same survey after last full-day session which occurred during the third quarter of the school year (see Appendix W). The expected time-commitment for the survey completion was approximately 10 minutes.

Table 4.2

*Data Collection Timeline*

<table>
<thead>
<tr>
<th>Activities</th>
<th>Description</th>
<th>Timeline and Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preintervention Survey</td>
<td>Administered teacher self-efficacy and technology perception survey.</td>
<td>August 2018 1-week timeframe for completion</td>
</tr>
<tr>
<td>Session 1</td>
<td>Introduce components of meaningful learning with technology (Jonassen et al., 2008). Delved deeper into active and cooperative learning tasks. Teachers worked in small groups or dyads to explore, plan, and play with various technology tools. Teachers completed the 3-2-1 Reflection.</td>
<td>September 2018 8-hour session</td>
</tr>
<tr>
<td>Session 2</td>
<td>Shared application of concepts from Session 1. Reviewed components of meaningful learning with technology (Jonassen et al., 2008). Delved deeper into intentional learning tasks. Teachers worked in small groups or dyads to explore, plan, and play with various technology tools. Teachers completed the 3-2-1 Reflection.</td>
<td>November 2018 8-hour session</td>
</tr>
<tr>
<td>Session 3</td>
<td>Shared application of concepts from Session 2. Reviewed components of meaningful learning with technology (Jonassen et al., 2008). Delved deeper into intentional learning tasks. Teachers worked in small groups or dyads to explore, plan, and play with various technology tools. Teachers completed the 3-2-1 Reflection.</td>
<td>February 2019 8-hour session</td>
</tr>
<tr>
<td>Postintervention Survey</td>
<td>Administered teacher self-efficacy and technology perception survey.</td>
<td>March 2019</td>
</tr>
</tbody>
</table>
Focus Group Semi-structured questions solicited participant reflections on their peer-to-peer coaching experience. April 2019 1-hour session

Note. Due to changes in administration priorities, Session 4, scheduled to occur in April, was cancelled. Thus, the timeline for the postintervention survey and focus group were moved up from May to March and April.

3-2-1 Reflection. Data collection occurred through the administration of the 3-2-1 Reflection in which participants indicated three things learned, two unanswered questions, and one connection to practice. One closed-ended question asked participants to rank their perception of the level of peer-to-peer coaching support. The last closed-ended question asked participants how many additional afterschool follow-up PD sessions they believed they still needed. Data collection for the teacher reflections occurred at the end of each of the three full-day sessions during the 8-month intervention. Teachers accessed the 3-2-1 Reflection via a hyperlink to a Google Forms from the presentation shared at the beginning of each session. The expected time commitment for participant completion of the survey was approximately 10 minutes. I collected survey responses which were automatically uploaded to Google Sheets from the Google Forms.

Focus group. The focus group met in my classroom. The semi-structured interview questions solicited participant perceptions of the learning that occurred throughout the intervention as well as influences on instructional practices. Per the informed consent, I used the Voice Memos app on both an iPhone and iPad to record the audio for later transcription.
Data Analysis

An integrated mixed methods approach combines the quantitative and qualitative strands during data analysis (Creswell & Plano Clark, 2011). Data was de-identified prior to analysis with participant responses listed by code.

Quantitative data analysis. Data from the pre- and posttest surveys were imported into Excel and SPSS for descriptive statistics analysis. The 12 items from the short form of the Teachers’ Sense of Efficacy Scale (Tschannen-Moran & Woolfolk Hoy, 2001) were analyzed separately from the 42 items of the Technology Acceptance Model survey (Venkatesh, 2000). Descriptive statistics such as mean, median, mode, and standard deviation were examined within Excel, a spreadsheet software, to identify changes in self-efficacy, perceived ease of use, and perceived usefulness. A comparison between pre- and posttest means informed whether any changes occurred (see Appendices X & Y). Additional analysis included an examination of scores by individual questions and participants. Next, data were uploaded to SPSS to run a Wilcoxon signed rank test of related samples. The Wilcoxon signed rank test was used to determine statistical significance of changes between the pre- and posttest data for the cumulative score of the Teachers’ Sense of Efficacy Scale (Tschannen-Moran & Woolfolk Hoy, 2001) and the two subscales, perceived ease of use and perceived usefulness, from the Technology Acceptance Model survey (Venkatesh, 2000). Demographic data were analyzed using descriptive statistics.

Qualitative data analysis. Thematic analysis (Braun & Clarke, 2012) was used to analyze data from the 3-2-1 Reflection and focus group. The six steps that informed the analysis included: obtain familiarity through recursive readings of the data, develop
initial codes, identify themes, review themes and create thematic maps, refine themes, and conduct a final analysis for reporting purposes (Braun & Clarke, 2012).

I coded the various data sets by looking for semantic and latent meanings. Semantic meanings are those that derive from the direct words of the participants (Braun & Clarke, 2012). Latent meanings are those that involve the interpretation of the meaning behind the data (Braun & Clarke, 2012). To obtain familiarity with the data, I conducted multiple reads of both data sets. Words or phrases that aligned to the research questions and constructs of interest were highlighted and marked-up for further analysis. The annotations served to help identify potential themes. Additional examination of the annotations allowed for the development of thematic maps in which portions of the data were categorized. Next, refinement occurred with the subsequent expansion and collapse of themes to better identify those that answered the research questions and addressed the variables of interest. Final analysis of the themes contributed to the conclusions explicated in the discussion found in Chapter 5. Data from both the teacher reflections and focus group allowed for a thick description of their peer-to-peer coaching experience. Combining different data sets during the interpretation phase aligns to the definition of convergent parallel design (Creswell & Plano Clark, 2011).

To ascertain whether perceived ease of use of technology and perceived usefulness of technology served as mediating variables to teacher self-efficacy, I used in vivo codes from the 3-2-1 Reflection and focus group. In vivo codes (Creswell & Plano Clark, 2011) are derived from the direct words of the participants (Braun & Clarke, 2012). Key terms around teacher perception of technology (i.e., tools, use, relevance) were highlighted. Emerging patterns across individual participant responses were noted.
(i.e., learning outcomes, collaboration). Similarly, data from the 3-2-1 Reflection and focus group provided additional information about technology knowledge and skills. I initially uploaded themes and in vivo codes into a Google Sheets, which was color-coded by instrument. Subsequent reads allowed for the collapse and expansion of themes which were noted on a digitized PDF and hardcopy of the printed data sets.

**Researcher Subjectivity**

As the researcher, I served as an instrument for data collection and analysis (Creswell & Plano Clark, 2011). My personal goals and professional work functioned as the impetus for the intervention design and implementation as well as data collection and analysis. The purpose of this section is to note where researcher subjectivity may have influenced data collection and analysis (Patton, 2015).

I have worked at the target school for 19 years, serving as a history/social science teacher, department chair, and technology coordinator. As a faculty member, I taught six sections of world history in a classroom with a 1:1 student-to-device ratio. The academic levels of students in my classes included gifted learners, English language learners, and special education students. As the history/social science department chair, I attended district meetings with the sole purpose of bringing information back to my department members. I also attended department chair meetings at the school site with the responsibility to represent the interests of my department. Additionally, I served on the instructional leadership team responsible for writing and revising the school plan and action steps. As the technology coordinator, I designed and facilitated technology PD at the school and district level. I provided insight into technology purchases, and I
maintained account access to various platforms as well as the learning management system for the school.

My various leadership roles on campus prompted me to question how teachers used technology to serve the various academic needs of our student population. As a long-time faculty member of a small school \((N=29)\), several participants in the study and I have developed and maintained a close working relationship for many years. I have been privy to their struggles and triumphs when integrating technology. My history/social science colleagues and I have worked with several different departments prior to the intervention on how to integrate technology to support student learning outcomes in their respective disciplines. We met during one half-day session in the summer and approximately two to three full-day sessions during the school year. Facilitating technology PD at the school, district, and county level brought to light the varied degrees of technology use and integration across a broad group of K12 teachers from a variety of disciplines. Moreover, the introduction of computer-based testing (i.e., Smarter Balanced Assessment Consortium) meant a large influx of both iPads and Chromebooks across the district. Thus, transpired my inquiry into how technology could support meaningful learning for students.

To maintain transparency and for the purposes of an audit trail, I kept a reflexive journal in which I wrote reflections after each of the full-day sessions. The journal also contained notes from the qualitative analysis. As a new researcher, I am still learning how to analyze quantitative and qualitative data. Quantitative analysis involved familiarizing myself with formulas in both Excel and SPSS. Qualitative data analysis involved more steps than anticipated as I was compelled to familiarize myself with
several different methods for coding. The issues of trustworthiness, credibility, and reliability served as the impetus to keep a detailed record of what occurred during the full-day sessions as well as the steps I used to analyze the qualitative data.
Findings and Discussion

The purpose of this study was to examine the influence of peer-to-peer coaching on teacher instructional practices to incorporate meaningful learning with technology for students (Jonassen et al., 2008). In particular, the various components of the intervention were designed to help determine if peer-to-peer coaching contributed to changes in teacher self-efficacy, perceived ease of use and usefulness of technology, and technology skills and knowledge. This chapter focuses on the process and the outcome evaluations of the intervention. The chapter begins with a description of the implementation process and is followed by the findings and discussion, which are organized by research question. The discussion focuses on teacher self-efficacy, collegiality, and teacher technology practices as aligned to sociocultural and situated learning theories. The chapter concludes with limitations and implications for practice and research.

Process of Implementation

The 8-month peer-to-peer coaching model to address Grades 7 and 8 teacher technology practices was developed after considerable contemplation of the needs assessment and review of literature. Data from 10 teachers who taught across subject areas and grade levels were collected and analyzed. Due to changes in administrative priorities, I needed to cancel the last full-day session and subsequent afterschool follow-up sessions. As a result, teachers only participated in three full-day sessions and had the opportunity for follow-up sessions during three of the four quarters of the school year. All other components of the intervention were implemented as intended.
One purpose of the intervention design was to address individual teacher needs and interests. As such, I emailed participants one week prior to each session to solicit areas of need, including upcoming lesson topics and desired student learning outcomes. I created the session agendas and Google Slides presentations based upon their input. Additionally, I met with two peer technology coaches, faculty members and participants in this study, to gain their insight regarding the format of the day. An email was sent to participants a few days prior to each session notifying them of the meeting place and time.

At the start of each session, I explained the format of the day as well as emailed the link to the Google Slides presentation so participants could access the embedded hyperlinks. The sessions took place during teachers’ contracted hours; details of each session are provided below. Each full-day session concluded with teachers completing the 3-2-1 Reflection in which teachers were asked to reflect on the following:

- What are three things you learned?
- What are two questions you still have?
- What is one application to practice?

Two closed-ended questions on the 3-2-1 Reflection ascertained satisfaction of coaching support and number of follow-up sessions needed. After reviewing their responses, I contacted teachers who expressed an interest in scheduling afterschool sessions for follow-up support.

Session 1

The first session began with explaining the purpose of the study with an emphasis on promoting a personalized learning pathway and building a community of practice.
Next, participants were introduced to the conceptual framework of meaningful learning with technology (i.e., active, constructive, cooperative, authentic, and intentional; Jonassen et al., 2008) and received a laminated poster with a visual of the framework and definitions for each of the five components. To begin building a sense of community among participants, the peer technology coaches and I started the day’s content by discussing lunch options and fictitious group roles (e.g., doughnut supplier, coffee server, entertainment provider).

Next, teachers were introduced to the first of two concepts for the day: active learning. A discussion about what constituted active learning in their classrooms ensued. Some participants shared examples that centered on technology use, whereas others shared non-technology related activities. The purpose for soliciting teacher understanding about the concept of active learning was to give teachers an idea of how other disciplines and content areas addressed active learning both with and without technology. Another reason for sharing their interpretations was to honor the technology experts and novices in the group (Bransford et al., 2000). The teachers were then introduced to the definition of active learning (e.g., engagement, manipulation of objects and tools, observation of the effects; Jonassen et al., 2008). Next, teachers were encouraged to share their perceptions on the role of technology in the active learning process.

The same format was conducted for the second concept: cooperative learning (e.g., collaboration within knowledge-building communities, social negotiation of knowledge and task; Jonassen et al., 2008). I then introduced teachers to the International Society for Technology in Education (ISTE; 2019) standards for educators,
students, computer science educators, and coaches. The participants were given time to explore the set of standards most pertinent to their role to better understand how technology could support the acquisition and practice of key skills such as communication, collaboration, critical thinking, and creativity. This discussion took approximately 1 hour and 30 minutes.

Following an examination of the technology standards, teachers were asked to think of a lesson that they could adapt to include elements of active or cooperative learning. The remaining 4 hours were unstructured time reserved for teachers to explore, plan, and play with technology, as research revealed time as a barrier to technology use (Preus, 2012; Wong et al., 2008). Groups organically formed based upon interest, level of technology knowledge and skills, proximity, or content. Most teachers worked in dyads with the two peer technology coaches helping to facilitate the discussions. Because the school’s goal focused on listening and speaking skills, several teachers explored Flipgrid, a video recording app.

Session 2

The session began with an inspirational quote to get teachers to think about why their instructional practices needed to reflect meaningful learning with technology. Once again, the purpose for the day was relayed to teachers: come together as a community of practice, engage in interdisciplinary discussions about meaningful learning with technology, and personalize their learning pathway. A visual reminder of the five components of meaningful learning with technology was presented before asking teachers to share how they had applied the content from the first session. The discussion
focused on the various ways that teachers incorporated active and cooperative learning strategies into their instructional practices.

Next, teachers were asked to share their understanding of *intentional learning.* The definition of intentional learning (e.g., goal-directed, active, self-regulatory; Jonassen et al., 2008) was then shared with the group. To focus teachers on how to make learning student-centered, I shared resources from the Right Question Institute (2019). Teachers explored the website, focusing on content specific to their disciplines. Teachers familiar with the Right Question Institute shared how they used that resource in their classroom.

Next, teachers were reminded that the ISTE standards for students (2019) could serve as a guide to designing student-centered learning opportunities. Further information was shared with teachers regarding how technologies foster learning (e.g., supports knowledge construction, informational vehicle for exploration, provides an authentic context, acts as a social medium, and serves as an intellectual partner) and thinking (e.g., causal, analogical, expressive, experiential, and problem-solving skills). This portion of the session lasted approximately 1 hour and 30 minutes.

As with the previous session, the majority of the day was unstructured time purposely set aside for teachers to explore, plan, and play with the various resources shared. Once again, organic grouping occurred with teachers meeting in small groups or dyads. Some teachers chose to work with course-alike peers, while others met with colleagues who wanted to explore a particular app (e.g., Flipgrid, EdPuzzle, Quizlet) or learning skill (e.g., reading, writing, listening, and speaking literacy). The two peer technology coaches helped to facilitate the discussions.
Session 3

The session began with an inspirational quote that informed teachers of the need to address the digital use divide. Teachers who wanted to see the format of the day could check the shared folder in Google Drive for the presentation. As usual, the purpose for the day was outlined: fostering the development of a community of learners, engaging in interdisciplinary discussions, and choosing a personalized path for learning. A visual reminder of the five components of meaningful learning was projected on the board while teachers shared an update on their efforts to incorporate active, cooperative, and intentional learning opportunities since the last full-day session.

The focus for this session centered on authentic learning (e.g., shift from passive consumers to active creators, project- or problem-based tasks, inquiry-based learning, and contextualized tasks; Jonassen et al., 2008). Teachers were asked to share their understanding of authentic learning. After the definition of authentic learning was revealed, teachers examined the ISTE standards for students (2019) to gain a better understanding of the symbiotic relationship between authentic and student-centered learning. Next, teachers were introduced to technology tools (i.e., Flipboard, Google 20-Time) and resources (i.e., Project Based Learning Works; Buck Institute for Education, n.d.) that support authentic learning. Teachers familiar with the apps and project-based learning shared how they used those in their classes. This portion of the day lasted approximately one hour.

The rest of the session was unstructured time allocated for exploration of tools and websites that supported active, cooperative, intentional, or authentic learning opportunities. Teachers met in dyads or small groups with the peer technology coaches.
helping to facilitate discussions, provide clarification, and troubleshoot issues. As this was the third session, teachers had many different apps (e.g., Flipgrid, EdPuzzle, Socrative), websites, and activities to consider. Choosing a personalized learning pathway allowed teachers to focus on an area of interest whether it was an app they wanted to learn for themselves or a technology-based activity that they hoped to incorporate into their instructional practices.

Findings

This study examined the influence of peer-to-peer coaching on teacher technology practices. The findings from the study will be summarized by research question.

Satisfaction of Peer-to-Peer Support

The first research question focused on evaluating the process of the intervention, specifically the satisfaction of peer-to-peer coaching support as well as frequency and regularity of support. Descriptive statistics were used to determine the mean and mode for the variable Satisfaction of Peer-to-Peer Coaching Support from the 3-2-1 Reflection. Participants rated their perception of support on a 5-point Likert-type scale with 1 representing none and 5 representing perfect amount (see Table 5.1). For all three sessions, the mode was 5, with the mean ranging from 4.8 to 4.9 for the individual sessions, indicating that participants perceived they had the perfect amount of peer coaching support at the conclusion of all three sessions. Only one participant did not indicate a perfect amount of peer coaching support for all three sessions.

Frequency and regularity of peer-to-peer coaching support were defined as the dose and reach of the intervention. Attendance at both the full-day and afterschool sessions served as the quantitative measure. All 10 participants attended the three full-
day PD sessions that occurred during each of the first three semesters. Seven participants attended one of the two formal afterschool sessions. During Quarter 1, Participant 1 and Participant 9 met one time for an hour afterschool to review Flipgrid, a video recording and response tool. No participants met afterschool for follow-up support during Quarter 2. During Quarter 3, Participant 2, Participant 3, Participant 6, Participant 7, and Participant 10 met for 1-hour afterschool to review EdPuzzle, a tool for viewing videos with the option to add questions as a check for understanding. The number of times that participants sought support from peers outside of formally requesting time to meet afterschool is unknown.

Table 5.1

*Participant Satisfaction with Level of Peer Support*

<table>
<thead>
<tr>
<th></th>
<th>N = 10</th>
<th>Mean</th>
<th>Mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>Session 1</td>
<td>4.8</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Session 2</td>
<td>4.8</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Session 3</td>
<td>4.9</td>
<td>5</td>
<td></td>
</tr>
</tbody>
</table>

*Note.* Questions were measured on a 5-point Likert-type scale with 1 representing *none* and 5 representing *perfect amount.*

**Meaningful Learning with Technology**

The second research question sought to determine the extent to which the activities conducted during the full-day sessions reflected meaningful learning with technology. Thematic analysis of participant responses for the three open-ended questions demonstrated that comments focused on the topic of the PD, technology tools, and student learning outcomes. Responses from Sessions 1 and 2 included more explicit mention of the PD topic (i.e., active, cooperative, collaborative, intentional), as displayed in Table 5.2. For example, Participant 6 asked how to make projects more interactive and
meaningful, and Participant 10 wrote that she wanted to use technology to support active learning.

Table 5.2

*Sample of Responses that Reflect a Connection to the Components of Meaningful Learning with Technology, by Participant*

<table>
<thead>
<tr>
<th>Participant</th>
<th>What are three things you learned? What are two questions you still have? What is one connection that you can make to your instructional practice?</th>
<th>Session</th>
<th>Meaningful Learning with Technology</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>How can I make the college research projects in AVID more interactive and meaningful?</td>
<td>1</td>
<td>Active</td>
</tr>
<tr>
<td>2</td>
<td>I will put more thought into making learning student centered while using technology</td>
<td>2</td>
<td>Intentional</td>
</tr>
<tr>
<td>3</td>
<td>I appreciate you giving use more direction for student centered learning</td>
<td>2</td>
<td>Active</td>
</tr>
<tr>
<td>4</td>
<td>Collaboration for DWA [district writing assessment] using tech</td>
<td>2</td>
<td>Intentional</td>
</tr>
<tr>
<td>5</td>
<td>I learned and explored ways to incorporate technology into my special education classes</td>
<td>2</td>
<td>Active</td>
</tr>
<tr>
<td>6</td>
<td>We are using discussion and polls for active learning and collaboration</td>
<td>1</td>
<td>Active</td>
</tr>
<tr>
<td>7</td>
<td>We will connect technology to our group work via Google Classroom</td>
<td>1</td>
<td>Cooperative</td>
</tr>
<tr>
<td>8</td>
<td>Technology can play a role in active, collaborative learning</td>
<td>1</td>
<td>Active</td>
</tr>
<tr>
<td>9</td>
<td>I want to make technology more focused on reflective learning because it seems to be the missing piece to making the learning more meaningful</td>
<td>1</td>
<td>Cooperative</td>
</tr>
<tr>
<td>10</td>
<td>To enhance active learning via technology incorporation</td>
<td>1</td>
<td>Active</td>
</tr>
</tbody>
</table>

The majority of responses for Session 3 were specific to several technology tools (e.g., EdPuzzle, Aeries integration to Google Classroom), as listed in Table 5.3. For example, Participant 8 wrote that she learned how EdPuzzle, a video comprehension tool, could
support student engagement, and Participant 1 reflected on how Flipgrid, an interactive video platform, could be used for reading, listening, and speaking practice.

Table 5.3

*Sample of Responses that Reflect Specific Mention of Technology Tools and Applications, by Participant*

<table>
<thead>
<tr>
<th>Participant</th>
<th>What are three things you learned? What is one connection that you can make to your instructional practice?</th>
<th>Session</th>
<th>Meaningful Learning with Technology</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Flipgrid can be used for reading, listening, and speaking. It can also be used for error analysis if we share/watch the videos within the classroom.</td>
<td>1</td>
<td>Active</td>
</tr>
<tr>
<td>2</td>
<td>How to create quizzes on EdPuzzle and allow students to retake it multiple times</td>
<td>1</td>
<td>Active</td>
</tr>
<tr>
<td>3</td>
<td>I am also excited about having students interacting with video via EdPuzzle</td>
<td>3</td>
<td>Active</td>
</tr>
<tr>
<td>4</td>
<td>EdPuzzle, Aeries to Google Classroom, 20-Time in Education</td>
<td>3</td>
<td>Intentional</td>
</tr>
<tr>
<td>5</td>
<td>I learned about and downloaded: EdPuzzle, Google Classroom, YouTube Downloader for use with EdPuzzle</td>
<td>3</td>
<td>Active</td>
</tr>
<tr>
<td>6</td>
<td>How to add questions and comments to EdPuzzle</td>
<td>3</td>
<td>Active</td>
</tr>
<tr>
<td>7</td>
<td>How to implement Flipgrid into our formative assessments</td>
<td>2</td>
<td>Intentional</td>
</tr>
<tr>
<td>8</td>
<td>EdPuzzle as a “flipped” tool for engagement and formative assessment</td>
<td>3</td>
<td>Active Intentional</td>
</tr>
<tr>
<td>9</td>
<td>I learned to integrate Aeries and Google Classroom, key aspects of authentic learning, and different aspects to inspire creativity</td>
<td>3</td>
<td>Active Authentic</td>
</tr>
<tr>
<td>10</td>
<td>I can use video demonstrations [in] EdPuzzle and have students reflect and/or answer questions</td>
<td>3</td>
<td>Active</td>
</tr>
</tbody>
</table>

Although participant responses to the open-ended questions in the 3-2-1 Reflection mostly related to application to classroom practice or as a means to support
student learning outcomes, some responses reflected a broader view of technology’s role in the classroom. Participant 9, for example, wrote:

I learned about how different subjects used technology. I also learned that [student] cooperative learning are things that we all sometimes struggle with. Lastly, I learned that I have a lot to learn about the role of technology and how it relates to student learning (Session 1, p. 2).

This statement reflects a desire to learn how technology can be used in other disciplines, even though this participant, a peer technology coach, is considered a technology leader and expert by his colleagues.

According to Jonassen et al. (2008), people desire to “work together in learning and knowledge-building communities . . . [and] naturally seek out others to help them solve problems and perform tasks” (p. 4). This idea was realized during the full-day sessions as teachers stayed in their small groups or dyads during the unstructured work time. Participant 9—one of the peer technology coaches—tended to float between groups helping and sharing his expertise. Other examples of peer support and collaboration emerged from the data. Participant 6 reported, “I practiced helping Participant 5 update his rosters [in PowerSchool]” (Session 1, p. 1) and “I learned that I can use my colleagues to try things out and then I can use them [the new activities] when they work” (Session 2, p. 1).

Although much of the unstructured session time consisted of dyad and small group discussions, sometimes whole group discussions occurred. During Session 3, teachers wondered aloud whether an observer (e.g., principal) would understand the purpose of technology integration in their classrooms and if a quiet or a noisy classroom
would be perceived as a place of learning. Participant 3 to mused, “I like that others feel the same as I do. It’s amazing how much we do, and we think it’s the right thing, but we have to somewhat ‘defend’ what we do” (Session 3, p. 2).

When responding to the reflection question about application to practice, several participants wrote about how cooperative (i.e., collaborative) learning was evident during the full-day sessions. Participant 4 wrote, “Collaboration really does work when you are working with people you like and [who] are intelligent” (Session 1, p. 1). Participant 8 shared a similar view when stating that, “Collaboration is supposed to be authentic. Being in an environment with like-minded, interdisciplinary groups allow for new perspectives and learning” (Session 1, p. 1).

Another example of meaningful learning with technology for teachers-as-students was written by Participant 9 after the Session 2 topic of intentional learning: “I want to make sure that I focus on how to make the technology more of an intellectual partner rather than the medium for the learning” (p. 2). Participant 10 shared a similar sentiment when stating that “Students will demonstrate academic language and content vocabulary via Flipgrid” (Session 2 p. 1).

Teacher Self-Efficacy

The third research question sought to determine if peer-to-peer coaching contributed to changes in self-efficacy. The instruments used to measure teacher self-efficacy were the Teachers’ Sense of Efficacy Scale (Tschannen-Moran & Woolfolk Hoy, 2001) and a focus group.

**Teachers’ Sense of Efficacy Scale.** The Teachers’ Sense of Efficacy Scale was administered as a pre- and posttest measure to determine change over time. Though the
The efficacy scale consisted of three subscales (i.e., Efficacy in Classroom Management, Efficacy in Instructional Strategies, Efficacy in Classroom Management), for the purpose of this study, subscales were not analyzed individually. The cumulative mean on the pretest changed from a mean of 7.14 to 7.30 for the posttest. The mode for responses remained a 7 for both the pre- and posttest, which indicated that the majority of participants believed that *quite a bit* of their individual efforts would effect changes in student learning. A Wilcoxon signed rank test indicated that the posttest ranks were not statistically higher than the pretest ranks ($p = .285; p < .05$). Therefore, I failed to reject the null hypothesis, which means that changes to self-efficacy as determined by the Teachers’ Sense of Efficacy Scale were not statistically significant.

**Focus group.** Participant responses from the focus group (FG) served as an additional qualitative measure of self-efficacy. Thematic analysis was employed to analyze data using semantic and latent coding (Braun & Clarke, 2012). Participants shared a newfound confidence in their ability to integrate technology into their instructional practices. “I’m very old school [traditional], but I started doing a lot more technology and I felt really comfortable when I know I have a good support group” (Participant 10, FG, p. 2). This admission preceded her remark about being one of the last of the teachers in the school to give up using Scantrons (i.e., scannable multiple-choice answer sheets) for assessments when she stated, “I love Haiku [for online assessments], just so you know” (FG, p. 4). The online assessment option for PowerSchool (formerly Haiku Learning) allows teachers to easily revise test questions, conduct an item analysis by test question, and receive immediate feedback on student progress.
Similarly, Participant 1 remarked, “I'm very comfortable now” (FG, p. 3) when discussing how quickly she could transition her students between paper-and-pencil versus Chromebook tasks. Participant 7 explained that peer support enabled her to become self-reliant, to the point that she now reciprocates:

I’ve been relying on Participant 3 for years to do the technology stuff and share it with me. So, this [intervention] was really good because then I was able to learn how to do it on my own and, you know, every once in a while I share things with her (FG, p. 15).

The interdisciplinary nature of the group allowed teachers to learn how other content areas used technology. Discussions about how different subject areas used technology supported insight into how technology could be used for student learning outcomes. These discussions seemed to influence self-efficacy, as Participant 6 relayed:

But what I like about all this is that Participant 1 could use Flipgrid, other people can use different stuff [technology tools], and I find out what they did with it. I don’t have to necessarily use it right away. But I hear what you did, and it makes it easier for me to then do it (FG, p. 2).

Honest admissions of struggles and growth during the focus group may have contributed to perceptions of increased collegial ties:

It’s like team building, without those three release days [full-day PD sessions], do you really feel comfortable enough to just ask somebody, ‘Hey?’ . . . The team itself makes it more comfortable to say ‘Hey, Participant 7, what did you do with this one?’ (Participant 9, FG, p. 15).
Knowing that one could rely on peer support proved helpful even for those who are viewed by peers as a technology expert, “My idea of using technology is to dive in, I’m not afraid to do that” (Participant 8, FG, p. 6). Even the peer technology coaches seemed to benefit from the interdisciplinary conversations, “You know . . . this group has changed my approach to technology. I’m more willing to look at what math[ematics] will do with different things [technology] . . . let’s see what we can borrow and change it [the technology-based activity] for us [other subject areas], too” (Participant 9, FG, p. 10). The conversations, thus, provided participants with ways to implement various technology tools in their own subject areas.

**Technology Acceptance and Increased Technology Skills and Knowledge**

The final research question sought to inform if participation in peer-to-peer coaching contributed to technology acceptance (i.e., perceived ease of use, perceived usefulness) and increased technology skills and knowledge. The Technology Acceptance Model survey (Venkatesh, 2000) and the focus group were used to measure technology acceptance. The focus group was used to measure changes to technology skills and knowledge.

**Technology Acceptance Model survey.** The Technology Acceptance Model survey was administered as a pre- and posttest measure to determine change over time. Of the nine subscales, I focused on the two subscales that directly related to peer-to-peer coaching: Perceived Ease of Use and Perceived Usefulness. Perceived ease of use is defined as the “degree to which a person believes that using a system would be free of effort” (Venkatesh, Morris, Davis, & Davis, 2003, p. 451). Perceived usefulness is
defined as the “degree to which using an innovation is perceived as being difficult to use” (Venkatesh et al., 2003, p. 451).

**Perceived ease of use.** For the subfactor Perceived Ease of Use, the mean changed from a pretest mean of 5.20 to posttest mean of 5.30. The mode for the pretest was a 5 which indicates that participants *somewhat agreed* that interaction with new technology was clear and understandable, interacting with new technology did not require a lot of mental effort, new technology was easy to use, and getting new technology to do what they want to do was easy. The mode for the posttest changed to 6 which suggests that at the conclusion of the intervention participants *agreed* with the ease of use of new technology. However, a Wilcoxon signed rank test indicated that the posttest ranks were not statistically higher than the pretest ranks ($p = .725; p < .05$). Therefore, I failed to reject the null hypothesis, which means that changes to Perceived Ease of Use as determined by the Technology Acceptance Model survey were not statistically significant.

Interestingly, the mode for Statement 20, “Interacting with new technology (devices or tools) does not require a lot of my mental effort” decreased. The pretest mode of 5 indicates that participants *somewhat agreed* with the statement, whereas the posttest mode changed to 4, which indicates that at the conclusion of the intervention participants *neither agreed nor disagreed* with the statement.

Another noteworthy result stemmed from the comparison of standard deviations for Statement 19: “My interaction with new technology (devices or tools) is clear and understandable.” The pretest standard deviation of 1.20 ($M = 5.90$) changed to a standard deviation of .47 ($M = 6.00$) for the posttest with a score of 6 representing that participants
agreed with the idea that the use of new or unfamiliar technology was clear and understandable. The decrease in the standard deviations of the pre- and posttest suggests that participant scores concentrated closer to the mean at the conclusion of the intervention.

**Perceived usefulness.** For the subfactor Perceived Usefulness, the mean changed from a pretest mean of 6.20 to posttest mean of 6.50. The mode remained at 7, which suggests that, regardless of participation in the intervention, teachers strongly agreed with the perceived usefulness of technology to: improve their job performance, increase their productivity, and enhance their effectiveness. A Wilcoxon signed rank test indicated that the posttest ranks were statistically higher than the pretest ranks ($p = .072; p < .10$). Thus, I rejected the null hypothesis, which means that changes to Perceived Usefulness as determined by the Technology Acceptance Model survey were statistically significant.

A comparison using composite scores for both subscales indicated that Perceived Usefulness of technology was higher than Perceived Ease of Use. This was true for both the pre- and posttest measures (see Table 5.4).

Table 5.4

*Descriptive Statistic Results of Two Subscales from the Technology Acceptance Model Survey*

<table>
<thead>
<tr>
<th></th>
<th>Pretest</th>
<th>Posttest</th>
<th>Wilcoxon Signed Rank Test</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>Mode</td>
<td>Standard Deviation</td>
</tr>
<tr>
<td>Perceived Ease of Use</td>
<td>5.20</td>
<td>5.00</td>
<td>1.22</td>
</tr>
<tr>
<td>Perceived Usefulness</td>
<td>6.20</td>
<td>6.00</td>
<td>.85</td>
</tr>
</tbody>
</table>

*Note. *$p < .05$. **$p < .10$.*
**Focus group.** Data from the focus group served as the qualitative measure for Perceived Ease of Use, Perceived Usefulness, and Technology Skills and Knowledge. Thematic analysis (Braun & Clarke, 2012) using semantic and latent coding contributed to the development of themes and understanding about the three constructs for this research question.

**Perceived ease of use.** An overall assessment of the qualitative data from the focus group did not reveal many instances of specific mention of Perceived Ease of Use of technology. Specific attention was paid to words or phrases that indicated teacher beliefs that technology use or integration would require little or less effort. Some teachers noted that participation in the 8-month study made it “easier for me to try new things. I don’t get so scared to try something new on the fly” (Participant 3, FG, p. 1). This was concurred by Participant 6 who stated that listening to their peers and watching how they used technology “makes it easier for me then to do it” (Participant 6, FG, p. 2).

Having a positive perception of the ease of use of technology may reduce anxiety when it comes to curricular changes. In looking forward to the textbook adoption next year, Participant 6 stated “it’s going to be very easy for us to really make a lot of changes and incorporate different kinds of things” (FG, p. 8). The new history textbook adoption comes with embedded technology tools such as assessments, presentations, videos, and adjustable reading levels for the digital version of the textbook. All of the participants used PowerSchool, a learning management system, as the primary place to post information, videos, discussion boards, and assessments. Discussions about various technology tools that could be used in conjunction with PowerSchool to support student learning outcomes was evident, “We cover a lot . . . . And to realize that just meeting and
talking about it actually makes it so that you use it in the classroom. That’s the whole goal, right?” (Participant 8, FG, p. 1). Collaboration and use of common technology tools among peers may influence perceived ease of use of technology.

Being a small school, teachers shared many of the same students so the perceived ease of use of technology served a collective purpose, “That’s where this [full-day session] is really beneficial . . . you have the time to sit and look at well this is how it worked with my kids, which are your kids, which are your kids” (Participant 9, FG, p. 25). The focus group was able to relate to Participant 1 who humorously remarked, “Well it’s easier because the kids already know how to do it, then they can teach you how to do it. My ELD [English language development] kids, when I first started using Flipgrid, they were like ‘You set it up wrong!’” (FG, p. 25).

Technology integration comes with many challenges which prompted me to investigate the construct Perceived Ease of Use. Participant 6 brought up a valid point,

I think once you set it [technology] up, it’s really time-saving. Getting it set up, maybe isn’t. But you’re always with the idea that once I do this [use technology], it’s a minor fix if need to change something, it’s not a major rehaul of everything. So, I think that’s the biggest thing (FG, p. 13).

A sense of responsibility for colleagues emerged, “For everything we use, I try to figure out a way so that I can make it easier for us to import and export [files]” (Participant 9, FG, p. 6). “If I know in this group, we are using these different things, I have got to make sure I know how to troubleshoot all these different things, too” (Participant 9, FG, p. 12).
**Perceived usefulness.** Participant views regarding Perceived Usefulness was evident from the focus group data. Regarding the use of Flipgrid, a video recording and discussion tool, Participant 1 remarked, “I’m definitely using it more and even like daily. I would say almost in every class” (FG, p. 3). She went on to elaborate that she has her students transition between various technology tools such as Quizlet and Kahoot, both formative assessment tools, to then “Using Listenwise and ReadWorks which you know listening and speaking is a big thing and they have audio stories and that’s been great” (FG, p. 3). When she wants her students to review, she’s “been using Quizlet [because] everything is already built. I’m not making my own stuff, I just do a search for subject-verb agreement and there’s 35 choices for me so it’s a complete time-saver” (FG, p. 9).

For some participants, technology supported differentiation for the varied academic abilities of students while also addressing the schoolwide goals of listening and speaking literacy skills, “And the last time it was EdPuzzle . . . ‘this is great!’ . . . the kids are doing it at their own pace, we’re checking their understanding, [practicing] active listening” (Participant 10, FG, p. 17). The design of the peer-to-peer coaching intervention appeared to also support differentiation for the participants as they had the flexibility of time, group design, and content. Participant 8 relayed, “we worked in smaller teams and it was different every time” (FG, p. 16), with Participant 1 elaborating that the format of the day allowed for “things [to] happen organically” (FG, p. 16).

Perceived usefulness of technology extended to other areas and colleagues beyond the sample for the study. After learning how to do a mail merge in Google Docs from Participant 9, Participant 1 remarked, “So all of the library stuff, we’re not having to do analog anymore. And I was able to do it in AVID [Advanced via Individual
Determination] with all of our acceptance and deny letters . . . . I know how to do this process” (FG, p. 11). In this case, the teacher was able to use what she learned during the full-day PD sessions to help in her other responsibilities which include overseeing the library/media center and working as the AVID site coordinator. A spillover effect to colleagues outside of the study occurred, similar to that in Penuel et al. (2012) and Sun, et al. (2013):

I shared with her a reading fluency presentation and how we bring in Flipgrid, which goes with the standard. The next thing I know, Christina [a colleague] is in on it [began using Flipgrid]. That goes beyond our group and she finds something Listenwise and then she’s good about putting stuff together on a Google Slide [for us] (Participant 8, FG, p. 30).

Experience with technology was even shared with peers from different schools:

When I see how much we’ve done over the last few years, when I’m talking to another history teacher like Martin [from another school] or somebody else, I’ll pull up Haiku [i.e., PowerSchool] and I’ll show him this and their faces are like ‘What? You did all this? There’s just a ton of stuff there’ and then I realized there is [emphasis in original] a lot of stuff here and that’s what makes this good too because with that platform we can share and share and share” (Participant 6, FG, pp. 13-14).

**Technology knowledge and skills.** Qualitative data from the focus group revealed many examples of Technology Knowledge and Skills growth among all of the participants. Regarding the discussion about initial resistance to technology, Participant
10 stated, “I have to say that I think I have become a lot more techy [technologically savvy] this year” (FG, p. 2). A similar sentiment was relayed by Participant 6,

Half the stuff I read about the technology stuff, I don’t know what it is till somebody shows it to me, and so, for me, if it’s not one of you guys that says, ‘Hey, this is how it works’ . . . I’m not probably . . . well, I know [emphasis in original] I’m not going to do it. And so, a group like this helps somebody like me who was resistant at first anyway to even get into it (FG, p. 2).

Having time during the full-day PD sessions gave participants a chance to work with peers to learn how others used various technology tools. Participant 1 mused, “And to have the time . . . Flipgrid got set up. I could look at Participant 9’s Flipgrid, and I could look at hers [Participant 8] and see all of the different applications and then plan my lessons accordingly. It was nice” (FG, p. 17). Flipgrid was the first application introduced during the first full-day PD session. Only Participant 9 had used Flipgrid previously, so the conversations about integrating Flipgrid and sharing student work with peers attests to one example of the increase of technology knowledge and skills.

At times, problems with technology led to increased learning about how to collectively troubleshoot issues. One noteworthy exchange focused on the issue of cheating on assessments in PowerSchool, which the teachers realized was the result of students opening the test prematurely and then closing it. “We were after [confronted] the kids, remember? ‘You cheated! How did you get in?’ And then we realized what was going on” (Participant 6, FG, p. 4). The participants discussed how to resolve the issue during the focus group, which led to Participant 8 asking how others set up retakes for students in PowerSchool:
Participant 9: Just add another [number of times a student can access the test].
Participant 6: Usually you put [set permissions] that students can only take it once, so that they can’t go back in. And then all you have to do is change the number of times they could take it.
Participant 8: Is that what you do? Because Participant 9 taught me a way to do it and it was really awesome, I thought, because we just created another test . . . with a different password (pp. 4-5).

Other instances of real-time support that seemed to display increased technology knowledge and skills occurred when teachers shared their experiences with troubleshooting issues that could potentially help their colleagues:

I think you can copy the test. It doesn’t have to be a draft . . . . We do that for Part A and Part B for the second part of our test. And so that’s how I make a second part. I take it and save as and have another modified version of it. So, they’re not all the same (Participant 3, FG, p. 5).

As assessments play a key role in determining student mastery of content, teachers remain concerned about test security. Learning from the experience of peers contributes to the group’s ability to accurately assess student performance.

The reliance on each other for troubleshooting issues supported findings from the needs assessment of the existence of an informal support network of teachers. It was apparent that teachers were able to receive real-time support for technology issues. “Isn’t that fun though . . . what I like is that we’re, you know, doing our thing, and it could be a passing period [transition between classes] and you’ll see somebody walking over with their computer” (Participant 6, FG, p. 11). Several members laughed as Participant 3
asked, “Are you talking about me?” (FG, p. 11). To which Participant 6 remarked, “It could be you, it could be Participant 7, it could be Participant 10. It could be anybody and all of a sudden, it’s like blah, blah, blah and then it’s done [the issue is resolved; emphasis in original]” (FG, p. 11).

The benefit of the full-day PD sessions allowed members to develop a sense of camaraderie about the notion of peer support while fostering the development of technology knowledge and skills. Participant 8 shared, “If we didn’t have a group like this, we wouldn’t even be having these conversations [about technology], and we probably would stop right there because it is more work on our part” (FG, p. 7). Later, Participant 6 admitted,

My ability to integrate technology is totally dependent upon being here at this school. If I was at another school where there just wasn’t that kind of support, it [technology use] would end. I know it would. Learning new [emphasis in original] things would end (FG, p. 15).

Likewise, Participant 9, a technology leader on campus, added,

And to teach somebody how to use [emphasis in original] something. I think that the first time you do it, it’s going to be hard. Imagine if the first time you did it was by yourself in the classroom with no one to kind of walk you through the process (FG, p. 15).

This sentiment was shared by Participant 3 who remarked, “With a group like this, it’s good to know how apps work, and then you can use it however you want” (FG, p. 1).

Physical proximity likely contributed to the reliance on peers whose classrooms were located in the same area. “If I don’t have people that, you know, I can run over and
say, ‘It’s not working’ [laughter] . . . it’s [the technology] not very helpful” (Participant 8, FG, p. 6). Teachers were not averse to calling others for assistance as Participant 10 stated that she knows that she can “call during the middle of class” (FG, p. 2). Participant 9 confirmed that he receives calls that prompt him to “make sure [that he] knows how to troubleshoot” issues (FG, p. 12).

**Conclusions**

Teachers had varying levels of self-efficacy as well as knowledge and skills regarding meaningful learning with technology prior to the intervention. The cumulative mean from the Teachers’ Sense of Efficacy Scale may have changed from a mean of 7.14 to a mean of 7.30, but a Wilcoxon signed rank test revealed that the results of the pre- and posttest measures were not statistically significant. A similar result was found with the pre- and posttest measures from two subscales of the Technology Acceptance Model survey. For Perceived Ease of Use, the mean of 5.20 for the pretest changed to 5.30 for the posttest. For Perceived Usefulness, the pretest mean of 6.20 changed to 6.50 for the posttest. A Wilcoxon signed rank test revealed that the results of the pre- and posttest measures were not statistically significant for Perceived Ease of Use but were statistically significant for Perceived Usefulness.

Qualitative data from the 3-2-1 Reflection revealed changes in teacher perceptions regarding technology. Participants specifically mentioned technology applications and how they planned to integrate those into their instructional practices to make learning more active, collaborative, and meaningful. Teachers also reflected on the long-term implications and benefits of technology to support student engagement and learning outcomes such as reading comprehension as well as listening and speaking skills.
Similar findings stemmed from a thorough examination of the focus group data. Participants shared that being a member of the group allowed for risk-taking as they could rely on peers for real-time support. Several teachers who shared their initial resistance to technology were forth-coming about their newfound appreciation for how technology could be used to support student learning outcomes.

Discussion

A discussion of the findings from the study will illuminate whether participation in the peer-to-peer coaching intervention contributed to changes in self-efficacy, perceived ease of use, perceived usefulness, and technology skills and knowledge. This section is organized by research question.

Satisfaction with Peer-to-Peer Support

The first research question investigated the satisfaction of peer-to-peer coaching support opportunities, specifically regarding perceived level of support, frequency, and regularity. The results from the 3-2-1 Reflection indicate that 9 of the 10 participants were satisfied with the level of support provided during each of the sessions. Each of the full-day sessions included time for whole group discussion about individual progress with technology integration. The ability to ask and receive immediate answers to questions likely led to the high satisfaction rate. Lack of technology support serves as a barrier to technology integration (Ertmer & Ottenbreit-Leftwich, 2013; Wachira & Keengwe, 2011); however, in this case, peer technology coaches were available for immediate assistance (Raffanti, 2008).

In addition to satisfaction of support, another indicator of interest was dose. Dose consisted of providing three full-day sessions (i.e., September, November, February) with
four to six afterschool follow-up sessions for each full-day session. Teachers only requested two afterschool sessions, one in Quarter 1 and one in Quarter 3. No afterschool sessions were requested in Quarter 2, which may have been due to Thanksgiving break, winter break, and the end of semester grading responsibilities. I obtained approval for teachers to receive a stipend if they chose the afterschool follow-up sessions. As few teachers took advantage of the paid opportunity, it appears that money did not serve as a motivating factor for teachers to stay afterschool. Working at a small school taxes teachers’ availability as many of the participants had other responsibilities such as coaching, tutoring, and department chair or advisor duties. As evident from the focus group data, teachers chose to get quick answers or real-time support during the transitions between classes or class time.

Changes to administration priorities led to the cancellation of the final full-day session and subsequent follow-up sessions for the fourth quarter. Thus, the full dose of the intervention was not met. However, all other aspects of the intervention occurred as planned. The purpose for scheduling full-day sessions was to allow for ample time for teachers to explore and plan with colleagues. An oft-cited concern by teachers is the lack of time during PD (Devine et al., 2013; Ertmer & Ottenbreit-Leftwich, 2013; Wachira & Keengwe, 2011). Extending the sessions over an 8-month period purposely gave teachers time to apply their learning before introducing a new concept—addressing the issue of sustained duration (Desimone & Garet, 2015). Even so, mixed results on the influence of duration on changing teacher practices and student learning outcomes exist (Doppelt et al., 2009; Lauer et al., 2014; Ross et al., 2006). As such, the design of the peer-to-peer
coaching intervention also took into consideration the tasks and activities offered to teachers which will be addressed under Research Question 2.

The third indicator of interest for this research question is reach. In this case, reach focused on the inclusion of two teachers from English language arts, history, mathematics, science, and special education ($N = 10$). The impetus for using an interdisciplinary group of teachers stemmed from the benefits of sociocultural learning theory (Vygotsky, 1978) and communities of practice (Lave, 1996). Bringing together teachers from different content areas as well as varying levels of experience with a variety of technology tools provided the opportunity for teachers to support one another in the learning process. Thus, design of the peer-to-peer coaching intervention purposely encouraged teachers to move between groups or dyads for collaboration. In other words, teachers chose colleagues with whom they wanted to work, which may have contributed to a more positive perspective regarding collaboration. In fact, a sense of camaraderie and collective identification as a group seemed to develop over the course of the 8-month study. Fostering the development of a community of learners contributes to the development of collegiality and trust, two important factors that can potentially influence changes to teacher instructional practices (Meister, 2010; Penuel et al., 2012; Sun et al., 2013).

**Meaningful Learning with Technology**

The second research question determined if the topics for the PD reflected Jonassen and colleagues’ (2008) research on the five components of meaningful learning with technology: active (Session 1), cooperative (Session 1), intentional (Session 2), authentic (Session 3) and constructive learning tasks. The fifth component, constructive
learning, was not addressed because the fourth full-day PD session did not occur. Thus, participants only received information for four of the five components.

The open-ended question at the start of each full-day session encouraged teachers to share their current understanding of the topic and application to practice. The whole group discussion allowed teachers to elaborate and build upon each other’s thoughts. Thematic analysis of participant responses reflected explicit connections to the topics. When teachers used the 3-2-1 Reflections to ask about how to make projects more interactive, meaningful, or collaborative (see Tables 5.2 & 5.3), they were demonstrating a desire to learn how to use technology as well as attempting to make connections between the topics presented and student learning outcomes specific to their content areas. Asking teachers to provide two unanswered questions as part of the 3-2-1 Reflection supports the social construction of knowledge (Lave, 2005) through participation in a learning community, as their responses likely resulted from conversations about how to apply the concepts of meaningful learning with technology into their classroom practices.

Thematic analysis from the teacher reflections also revealed specific mention of technology tools and application to practice. Participants explicitly mentioned using technology tools such as Flipgrid and EdPuzzle to support student learning outcomes and skills acquisition. These reflections support the reason for providing teachers with learning opportunities that are content-based and relevant to their professional practice (Duncan-Howell, 2010; Harris & Hofer, 2011) as they leave the PD with applicable knowledge. Providing a content focus, as evident in the teacher reflections, also aligns to Desimone and Garet’s (2015) best practices for teacher PD. During the focus group,
teachers explained how using technology motivated and engaged their students in the learning process—essentially engaging in constructive learning (Jonassen et al., 2008). Thus, as in Duncan-Howell (2010), Harris and Hofer (2011), and Penuel et al. (2012), changing teacher instructional practices was possible through sustained, content-based PD.

The implementation of the peer-to-peer coaching intervention also considered the quality of program delivery. The intent was to provide participants with an authentic experience that included active learning and multiple opportunities for collaboration (Desimone & Garet, 2015). To avoid misconceptions about the definition for meaningful learning with technology, sensemaking strategies were encouraged (Anderson, 2017) so teachers could share their understanding of the concepts of active, cooperative, intentional, and authentic learning as aligned to the definitions by Jonassen et al. (2008). Perhaps the invitation for teachers to share their understanding contributed to their broader view of technology integration as found in the 3-2-1 Reflection. Participant 9, viewed as a technology expert by peers, shared that he found value in learning how peers from different disciplines used technology. He also honestly admitted that he still had much to learn about how technology could support student learning outcomes. His assertion that much more needs to be learned reflects his understanding that meaningful technology integration takes effort. Moreover, his reflection demonstrates that the peer-to-peer coaching intervention supports peer technology coaches and novices alike.

The design of the peer-to-peer coaching intervention purposely took into consideration how to support meaningful learning with technology for teachers-as-students. Building on the notion of situated learning theory (Lave, 2005), the full-day
sessions incorporated active, cooperative, intentional, and constructive activities in an authentic learning environment. The use of flexible grouping allowed teachers to organically form small groups or dyads depending on what they wanted to learn and with whom they wanted to work. Flexible grouping supports the notion of collective participation in that teachers came together based on common objectives (Desimone & Garet, 2015). The goal for each session was stated in the Google Slides presentation, which was to create a lesson that incorporated the topic of the day. Intentional and constructive learning were embedded into the design of each session so that the work done by teachers on those days reflected purposeful use of technology for learning. The technology knowledge and skills practiced on those days were for the sole purpose of providing teachers an opportunity to experience meaningful learning with technology.

An additional example of meaningful learning with technology for teachers-as-students emerged from Session 2 teacher reflections. Participant 9 wrote that he wanted to focus more on the using technology as an intellectual partner. A similar viewpoint was shared by Participant 2, “I will design online assignments with the students’ perspectives in mind in order to better gear it towards intentional learning” (Session 2, p. 1). The reflections by both Participants 9 and 2 demonstrate their desire to support intentional use of technology for meaningful learning. The purposeful design of the full-day sessions provided teachers an authentic or situated learning experience, one that they could directly apply into their instructional practices. Participant 5 summed up the design purpose well,

The Haiku [PowerSchool] tools I explored today can be implemented immediately in my classes. The discussions will make it nice for my students to
share their ideas in a safe way [away from the general public]. The polls will be a
great way to see their opinions and it will be a good jumping off point for
discussions (Session 1, p. 2).

**Teacher Self-Efficacy**

As teacher self-efficacy plays an important role in decisions to adopt and integrate
technology into instructional practices (Ertmer, 1999; Overbaugh et al., 2015; Shifflet &
Weilbacher, 2015), the third research question examined to what extent participation in
the peer-to-peer intervention contributed to teacher self-efficacy. The Teachers’ Sense of
Efficacy Scale (Tschannen-Moran & Woolfolk Hoy, 2001) provided a pre- and posttest
measure, which was triangulated with qualitative data from the focus group.

Although the study was conducted over an 8-month period with the expectation
that change would occur over time, a Wilcoxon signed rank test revealed that the changes
found were not statistically significant. The majority of participants both before and after
the intervention believed that *quite a bit* of their individual efforts would effect changes
in student learning. In fact, the self-efficacy of participants in this study were rated
highly at the beginning of the study so it may not be surprising that changes to their self-
efficacy scores were not statistically significant as a ceiling effect may have occurred.
Although another reason for not detecting a statistically significant change in teacher self-
efficacy scores may have been due to the chosen instrument and variable. Perhaps using
an instrument to measure pre- and postintervention technology-specific self-efficacy may
have revealed a statistically significant change.

The focus group occurred at the conclusion of the intervention. Thus, teacher
statements may have indicated growth over time. Changes to teacher self-efficacy
appeared to have occurred with teachers admitting that they were more comfortable and not so scared to try something new. It is promising to note that collaboration among the same group of colleagues over an 8-month period may have contributed to a more positive outlook concerning teacher ability to integrate technology into their classroom practices. The findings suggest that mastery experience may have contributed to an increase in self-efficacy as the result of practice and applicable experience with the support of colleagues (Bandura, 1977). In addition, the duration (i.e., 24 hours) and span (i.e., 8 months) of the peer-to-peer coaching intervention was sustained over time, a hallmark of effective PD (Desimone & Garet, 2015), which provided participants the opportunity to integrate components of meaningful learning with technology into instructional practices as well as reflect on their overall experience (Biancarosa et al., 2010; Cifuentes et al., 2011; Lee, 2005).

Listening to peers honestly admit their struggles and growth over time may have influenced others to note an increase in self-efficacy as long as a strong network of support, vis-à-vis a community of practice (Kopcha, 2012) or professional learning community (Cifuentes et al., 2011), was available. Knowing that the support of colleagues was readily accessible perhaps encouraged teachers who may not have felt confident in their knowledge and skills of technology. The idea of sharing how technology was used in different classrooms may have contributed to increased collegiality and the development of a group identity:

This is truly [emphasis in original] a PLC [professional learning community] and across different curricula or subject matter, which is not usually the case. I think we’ve been able to share things pretty easily. Just even giving you [referring to
several participants] access so you can look at things, ‘Okay, oh, that’s how you organize this, that works better, or this will work better for me’ . . . . Everybody gets ideas from everybody (Participant 6, FG, p. 14).

Bruning, Schraw, and Norby (2001) stipulate that “social interaction is fundamental to cognitive development” (p. 8). Although statistical significance was not identified for changes to pre- and posttest cumulative means for teacher self-efficacy, it appears that interaction between colleagues from different content areas provided for new insights and differing perspectives that may have influenced the self-efficacy of participants as shared in the focus group. Moreover, it appears that learning based in sociocultural theory may have impressed upon the self-efficacy of teachers through the exchange of knowledge and scaffolding between experts and novices (Vygotsky, 1978) as well as the shared goal to integrate meaningful learning with technology into their instructional practices.

**Technology Acceptance and Increased Technology Skills and Knowledge**

The fourth research question examined three different constructs of interest: Perceived Ease of Use, Perceived Usefulness, and Technology Skills and Knowledge. Pre- and posttest measures of two subscales, Perceived Ease of Use and Perceived Usefulness, from the Technology Acceptance Model survey (Venkatesh, 2000) were used to determine change over time. Results from the focus group served as the qualitative measure for triangulation purposes. Changes to Technology Skills and Knowledge were measured by qualitative data from the focus group.

**Technology acceptance.** Descriptive statistics from the Technology Acceptance Model survey revealed that pre- and posttest composite means for both Perceived Ease of
Use and Perceived Usefulness increased (see Table 5.4). A Wilcoxon signed rank test for Perceived Ease of Use detected no statistical significance. However, a statistically significant change was found for Perceived Usefulness. The mode for Perceived Ease of Use increased; however, no changes to the mode for Perceived Usefulness occurred. Therefore, it appears that participation in the 8-month peer-to-peer coaching intervention did not have an effect on perceived ease of use, but it did have an effect on perceived usefulness of technology. Prior research on the correlation between these two subscales showed that perceived ease of use influenced perceived usefulness (Holden & Rada, 2011; Venkatesh, 2000). As such, the current scores indicate that perhaps more attention needs to focus on to what extent perceived ease of use of technology affect changes to perceived usefulness.

The purpose of using mixed methods allows for the strengths of one strand to compensate for the weaknesses of another (Johnson & Onwuegbuzie, 2004). A convergent parallel design supports the combination of different measures during the interpretation phase (Creswell & Plano Clark, 2011). As such, qualitative data from the focus group was used to substantiate the findings through triangulation of the data.

One noteworthy finding occurred with Perceived Ease of Use Statement 20, “Interacting with new technology (devices or tools) does not require a lot of my mental effort” in which the pretest mode decreased from 5 or somewhat agree to 4 or neither agree nor disagree on the posttest. This change indicates that at the conclusion of the peer-to-peer intervention participants felt neutral regarding the mental effort to use new technology tools. An exchange between the two mathematics teachers during the focus group provides insight on this phenomenon:
Participant 3: I don’t get so scared to try something new on the fly [without thinking or planning in advance].

Participant 7: And we did do two EdPuzzles, since last time?

Participant 3: And the poster thing, the collaboration.

Participant 7: Oh yeah, yeah, yeah, Baiboard?

Participant 3: No, not that advanced, it’s just on [Google] Classroom, we did a project with Google Slides with four slides and it became too overwhelming for the kids. And we just did one page and they were way more productive (p. 1).

Whole group discussions that occurred at the beginning of each session likely introduced new technology tools that may have contributed to some teachers and their students feeling overwhelmed. In addition, even though participants were experts in their respective content areas, perhaps having a mixture of expert and novice technology users in the same group may have added undue pressure for novice technology users to keep pace with the experts.

The first full-day session focused on active and cooperative learning. Thus, teachers were encouraged to create collaborative tasks for their students. The mathematics department opted to try Google Slides for collaboration instead of using a large poster for this collaborative assignment. They discovered that, although using Google Slides provided for easier collaboration and accountability for students, perhaps the newly revised task was a bit too complicated as originally designed. Collaboration among course-alike peers supports novice teachers with planning and instructional support (Polly, 2012). Likewise, working with colleagues from the same school
encourages teachers to harbor an open mindset for change (Fairman & Mackenzie, 2015) as well as supports the idea of collective participation, one of Desimone and Garet’s (2015) best practices for effective PD. Exchanges such as the one previously noted were not uncommon both during the full-day sessions and the focus group.

The peer-to-peer coaching intervention fostered the development of a wider support network (Fairman & Mackenzie, 2015) than the one discovered during the needs assessment. Several participants mentioned the importance of the group’s support when attempting to use new technology. Being able to rely on peers for real-time support likely contributed to changes in perceived ease of use of technology:

Well, I remember trying an app before by myself . . . [If] you don’t have this community and then in the middle of third period if it doesn’t work, then you can’t use the app for the rest of the day. I remember having that problem
[laughter], I’m like, ‘Okay, new plan.’ And you know that’s the worst thing. And we can really get it fixed now. You know what I mean? It’s a big deal

(Participant 3, FG, p. 12).

Perhaps the response from Participant 6 aptly describes the benefit of the peer-to-peer support network, which was followed by group laughter:

I was only willing to start out with technology if [emphasis in original] it was going to be in my classroom all day . . . I was going to be able to really try [emphasis in original] it, knowing that I’d be able to immediately walk over [to a colleague’s room] and say this isn’t working (FG, pp. 11-12).
The varying levels of technology expertise among the group provided opportunities for teachers to take on the role of expert or novice (Bransford et al., 2000) depending on the technology tool. Participant 1 admitted,

Without this group, I wouldn’t be able to do my library overdue slips . . . . I’m like, Participant 9, show me how to do mail merge through Google Docs . . . I know how to do mail merge now . . . . I can do it now [emphasis in original] (FG, pp. 10-11).

To some extent, it appears that teachers may have experienced what Turniansky and Friling (2006) refer to as an expert novice state of mind. An expert novice is defined as a person who is an expert in their field, but who is able to take on a novice state of mind when in a learning situation (Turniansky & Friling, 2006). In this case, all teachers were content area experts with varying technology knowledge and skills. If teachers have a colleague who goes out of their way to provide technology support, then teachers may feel more comfortable trying new things which may influence their perception regarding the ease of use of new technology.

Davis’ (1989) research on perceived ease of use, perceived usefulness, and user acceptance of technology informed the development of Venkatesh’s (2000) Technology Acceptance Model survey. Davis purports similarities between perceived ease of use and Bandura’s (1982) definition of self-efficacy. Thus, teacher perceptions regarding the ease of use of technology may also indicate their level of self-efficacy to employ that technology as part of their instructional practices or job responsibilities.

Another interesting finding stemmed from a Perceived Ease of Use statement: “My interaction with new technology (devices or tools) is clear and understandable.”
The decrease in the standard deviations between the pre- and posttest suggests that participant scores concentrated closer to the mean at the conclusion of the intervention (see Table 5.4). Perhaps collective participation (Desimone & Garet, 2015; Jonassen et al., 2008) over the 8-month study served to eliminate the extreme scores of some participants, “it’s multidisciplinary and we get along so well and we worked in smaller teams and it was different every time” (Participant 8, FG, p. 16). Regarding the format of the full-day sessions, Participant 1 remarked, “It was so flexible though . . . a lot of things just happened organically that I ended up adding in because I heard so-and-so over there talking about it . . . ‘can I hop in on [join] that conversation?’” (FG, p. 16).

Acknowledging the complexity of measuring teacher professional growth and learning, Avalos (2011) stated, “An important part of teacher learning is mediated through dialogues, conversations and interactions centered [sic] on materials and situations” (p. 16). When engaging in discussions about technology integration, reflecting on gaps or misconceptions between beliefs and practices may have influenced teachers at the conclusion of the intervention to closely identify with their peers.

Though statistical significance was not found for changes in the pre- and posttest composite means for the construct Perceived Ease of Use, data from the focus group suggest that changes to Perceived Ease of Use occurred. Participation in the 8-month study made it easier for some teachers to try new things and take more risks. Listening to colleagues admit their initial reluctance to use technology may have encouraged others that they were not alone. A sense of collective responsibility among the teachers perhaps motivated them to push past their initial discomfort with technology because they realized that meaningful learning with technology could serve a greater purpose. Thus,
peer collaboration appeared to contribute to the development of a learning culture (Ching & Hursh, 2014) as well as provided mastery experiences that helped to bolster teachers’ sense of self-efficacy (Bandura, 1977; JohnBull et al., 2013).

More promising statements may be from the teachers as they looked beyond the peer-to-peer coaching study. Participant 6 mentioned that it would be easier to incorporate technology with the new textbook adoption next year. Similarly, Participant 10 shared, “I will feel more comfortable in the future to continue asking, ‘What else are you guys doing? Anything cool that you’d like to share?’ Just from being in this group and just trying new things” (FG, p. 21). Being part of the peer-to-peer coaching intervention may encourage continued integration of technology simply because the doors for communication have been opened (Fairman & Mackenzie, 2015; Meister, 2010; Penuel et al., 2012; Sun et al., 2013). Thus, the learning culture and mastery experiences as a result of participation in the peer-to-peer coaching intervention may have long-lasting effects on teachers.

As with the qualitative data for Perceived Ease of Use, analysis of data from the focus group revealed that Perceived Usefulness was evident. Specific mention of technology tools and its application to practice suggest that participants saw technology as an efficient means to support student learning outcomes. Likewise, prebuilt technology tools (i.e., Quizlet, Kahoot, EdPuzzle) provided teachers the ability to quickly find and apply technology as a formative assessment. Knowing the value of technology to support student learning outcomes (Ertmer, 1999) not only supports teachers’ perceptions regarding the usefulness of technology (Venkatesh, 2000) but also suggests
that teachers have a better understanding of meaningful learning with technology (Jonassen et al., 2008).

Perhaps one of the more enlightening results from the data analysis came from the discovery that teachers relayed their experience with technology with colleagues outside of the sample, essentially a spillover effect (Penuel et al., 2012; Sun et al., 2013). In this case, perceived usefulness of technology encouraged teachers to branch out and share their knowledge as relayed by Participant 1 who shared her growing understanding and skills with two colleagues who did not participate in the peer-to-peer coaching intervention. Likewise, a spillover effect was evident when Participant 8 explained during the focus group that he proudly showed his PowerSchool course to a history colleague from another school who expressed his surprise at the level of depth and interaction between teacher–student and student–student. Sharing their learning with others outside of the sample is promising because the idea of meaningful learning with technology is being disseminated across a larger network of teachers (Hall & Hord, 2015; Rogers, 2003).

**Increased technology skills and knowledge.** Thematic analysis (Braun & Clarke, 2012) of the focus group data revealed several examples of Technology Skills and Knowledge growth among all of the participants. Several participants readily admitted their initial resistance to technology with Participant 10 later elaborating that she began to use more technology this year because she knew she had a support group who could provide real-time assistance. Such admissions support the value of peer-to-peer coaching in the social construction of knowledge (Jonassen et al., 2008; Van den Bossche et al., 2006). Participant 6 confessed, “I think that’s the eye opener. I didn’t
want to do this [referring to technology; emphasis in original]. It would have been easier not to do it for me, but because I fear being left behind, I had to take that risk [emphasis in original]” (FG, p. 22). Pressure from early adopters (Rogers, 2003) in his department likely contributed to this line of thinking. Now, Participant 6 is one of the biggest proponents of integrating technology. Regarding certain faculty members, Participant 6 stated,

That puts them, in my opinion, at risk of being a standout resistor to the administration. And I think that’s where you get the pressure of ‘I don’t want to be the person that is left out’ and you kind of have to do something (FG, p. 28).

Further examples of an increase in Technology Skills and Knowledge emerged from real-time peer support during the focus group. As a few teachers reminisced about the potential cheating issues in PowerSchool, Participant 8 asked, “How do you guys do retakes?” (FG, p. 4). The conversation then shifted to members sharing their method for giving students retakes and offering insight into how those solutions worked or did not work for them. This type of collegial conversation displays the relationships built around peer supports (Collet, 2012). Evident is the fact that teachers were able to provide real-time coaching support (Fairman & Mackenzie, 2015) to build capacity for individual and collective change (Gormley & van Nieuwerburgh, 2014).

Collegiality and good-natured exchanges occurred as teachers laughed and joked about troubleshooting technology issues during the focus group. Teachers teased each other about seeing colleagues walking over during in-between classes with their laptop open or calling during class to ask for help because they were flustered and needed immediate assistance. Several light-hearted exchanges, including many that invoked
laughter among the teachers, provide evidence that collegiality and trust existed among the participants, two important factors that influence teachers to change their instructional practices (Meister, 2010; Penuel et al., 2012; Sun et al., 2013).

Perhaps more importantly, teachers shared the benefit of peer support in their individual development of technology skills and knowledge. Several teachers admitted that being at this particular school with this specific group of teachers served as the catalyst for their technology use. Even teachers considered by peers to be technology experts found value in the peer-to-peer coaching process as they could reach out to other peer-experts for immediate assistance. The development of a group identity, a peer-to-peer support network, was evident from the focus group.

**Limitations and Implications for Research and Practice**

To address the issues of trustworthiness and credibility, I kept a reflexive journal. A reflexive journal allows for “deep introspection . . . and ownership of one’s perspective” (Patton, 2015, p. 70). This self-awareness of one’s perspective is an integral part of qualitative data analysis. A limitation of the research design derived from constraints of the target school and available funding. An implication for future research is to replicate the steps used in the peer-to-peer coaching intervention in a different setting with a larger sample.

A pressing concern regarding the research design stemmed from threats to internal validity that may have occurred when other possible causes influenced the outcome or effects (Shadish, Cook, & Campbell, 2002). To address this threat, I used qualitative data from teacher reflections and the focus group to clarify the temporal relationships between the variables (see Figure 4.1). In this case, a mixed methods approach served to
strengthen the research design as opposed to relying solely on one strand over another (Burch & Heinrich, 2016; Creswell & Plano Clark, 2011).

Two other related threats to internal validity were of concern as well: history and maturation (Shadish et al., 2002). The 8-month study occurred concurrently with a history textbook pilot, district science benchmark revision, and district-wide adoption of the Next Generation Science Standards. Though the short- and medium-term outcomes of the treatment drew their strength from the variety of experiences and points of view from participants, district initiatives that solely affected one department over another may have contributed to changes in the dependent variables. Likewise, the threat of maturation may have occurred due to the duration of the treatment (Shadish et al., 2002). I expected that teachers would use technology on a regular basis and thus gain skills, knowledge, and efficacy. However, gains in those three areas may not have been the related to the treatment but rather due to individual efforts. Although I attempted to address the dual threats of history and maturation through the collection and analysis of qualitative data from teacher reflections and the focus group—once again, a strength of using a mixed methods approach in the research design (Creswell & Plano Clark, 2011)—I cannot determine with absolute confidence what prompted the changes in teacher self-efficacy or technology skills and knowledge.

Additionally, the threat of confounding factors may have occurred (Shadish et al., 2002), as mediating variables (i.e., teaching experience, technology skills) may have influenced several of the dependent variables (e.g., self-efficacy, perceptions). Although the outcome evaluation design allowed for multiple points and types of data collection to occur, the type of instruments as well as data analysis techniques may not have been
sufficient to determine to what extent one variable influenced another. In addition, I chose to examine the variable teacher self-efficacy; but perhaps investigating technology self-efficacy may have provided better insight into how teachers perceived their ability to use technology to support student learning outcomes.

Lastly, because I am a member of the faculty, researcher subjectivity needed to be considered (Shadish et al., 2002). Thus, I strove to remain open when analyzing both quantitative and qualitative data.

**Implications for Future Research**

Researchers need to remember that “teacher learning and development is a complex process” (Avalos, 2011, p. 17) and that a variety of factors need to be considered when attempting to measure growth. Though the design of the peer-to-peer coaching model was thoughtfully developed after conducting a needs assessment and several literature reviews that served to inform the theoretical frameworks and overall PD components, what may have worked for the teachers in this sample may not necessarily apply in other contexts.

An oft-cited concern for teachers when it comes to professional growth and learning is the lack of time to explore, plan, and apply new knowledge (Devine et al., 2013; Ertmer & Ottenbreit-Leftwich, 2013; Wachira & Keengwe, 2011). Though the peer-to-peer coaching intervention occurred over the course of 8 months, future studies should explore a longer duration so that teachers not only have time to apply their learning, but they can look forward to coming back together for follow-up support. Meeting on a regular basis may provide accountability, as well as comfort, knowing that time has been allocated for debriefing, receiving feedback, and exploring alternatives for
future application into instructional practices. As all of the data was self-reported, employing classroom observations as another data collection point may provide additional insight as to the value of peer-to-peer coaching support as well as whether the topical discussions about the five components of meaningful learning with technology can be applied with fidelity into teachers’ classroom instruction.

Although up to six afterschool sessions were offered per teacher per quarter, few teachers took advantage of these additional follow-up opportunities for support. Although the literature touts the benefit and necessity of follow-up support (Avalos, 2011; Darling-Hammond et al., 2017; Guskey, 2010; TNTP, 2015), future research should investigate additional ways to provide follow-up support that this study did not address (e.g., online, coteaching, reduced teaching load). Future research should also examine what motivates teachers as monetary compensation for afterschool follow-up support clearly did not.

Focus group data revealed that participants took advantage of informal peer support. Teachers from different disciplines readily sought support from peers regardless of the content or grade level taught. In fact, several teachers mentioned how peer support was integral to their technology use, regardless if the teacher was a technology expert or novice. What seemed to be important to teachers was the proximity and availability of support. Future studies should consider examining informal peer support structures and their role in providing real-time assistance to teachers.

Though the data from this study appear to support the value of peer-to-peer coaching on self-efficacy, perceived ease of use, perceived usefulness, and technology skills and knowledge, additional studies with a larger sample size in more diverse settings
may help to substantiate the findings. Extending the study to include multiple phases to bring in additional teachers may inform the influence of spill-over effects and the nuances in developing a group identity.

**Implications for Practice**

Based on the results of the study, several implications for practice exist. First, a learning community has the potential to positively influence teacher beliefs and practice (Lave, 1996). The sociocultural aspect of learning (Vygotsky, 1978) supported the development of relationships between teachers from different content areas that fostered new insights and perspectives for learning (Lave, 2005). As such, PD providers and educators need to consider allowing teachers to choose with whom they would like to collaborate as well as provide sufficient time to develop trust and build relationships. The current PD models that arbitrarily group teachers together under the guise of a professional learning community do a disservice in promoting teacher collaboration and growth. Unless teachers are empowered in their learning process, changes to instructional practices will not occur (Calvert, 2016). It is not that teachers do not want to improve their practices, but rather they desire opportunities for agency (Matherson & Windle, 2017).

Second, situating the learning within authentic problems of practice creates a meaningful learning experience for participants (Raphael, Vasquez, Fortune, Gavelek, & Au, 2014). The design and implementation of the peer-to-peer coaching model aligned to Jonassen and colleague’s (2008) research on the five components of meaningful learning with technology (see Figure 1.1). Teachers engaged in active, cooperative, intentional, constructive, and authentic learning tasks during the full-day PD sessions. Having access
to others’ courses in PowerSchool and Google Classroom was one way to help bolster the confidence of teachers as they could see how others integrated technology and then they could modify its use in their respective classrooms. These early adopters may then influence their colleagues to be more open to how technology can support student acquisition of skills and content. However, collaboration and team learning among adults does not occur by simply putting random people into a group. Successful team learning is built upon a common understanding and goals such as task interdependence, shared cognition, and group identity (Van den Bossche et al., 2006; Wijnia, Kunst et al., 2016). Working together with peers as they expanded their understanding about technology tools and effective pedagogical practices provided teachers with applicable experiences that they could take back and implement immediately into their instructional practices. Future iterations should consider scheduling full-day PD sessions for teachers throughout the school year or at least once a quarter so that teachers can come together, learn, and share their growth, which may serve to promote a cycle of continuous improvement (Jensen et al., 2016).

Third, the purposeful inclusion of an interdisciplinary group of teachers has the potential to expand one’s view on how technology can support student learning outcomes across different content areas (Penuel et al., 2012; Wijnia et al., 2016). New insights for how other content areas integrate technology allow teachers to expand their knowledge of meaningful learning with technology. Likewise, the development of collegiality and trust may foster a group identity in which teachers feel a sense of commitment and responsibility for the success of their peers—effectively contributing to collective efficacy (Fairman & Mackenzie, 2015; Meister, 2010). The sample for this study came
from a small school in which many of the teachers had already developed respect for one another, as evident from the needs assessment data. Schools in which the faculty are fragmented (Payne, 2008) or those with many new teachers may need to employ additional methods as well as allocate more time to build trust and collegiality in their efforts of creating a sustainable learning community (Calvert, 2016).

Fourth, when planning PD, school leaders should consider taking advantage of the knowledge and experience that teachers bring. As teachers are the ones who implement changes that directly affect student learning outcomes (Cuban, 2013; Garet et al., 2001), it is important that program facilitators and school leaders collaborate with teachers when planning and implementing PD. This notion of collective problem solving may not only support “whole-school cultural shifts . . . [but also] deep collective work sustained over time” (Tallerico, 2014, p. 129). All stakeholders, even those who are experts, should approach learning with a “novice state of mind,” defined as the recognition that expertise and experience allow learners to acknowledge gaps or deficits in understanding (Turniansky & Friling, 2006). There is much to be learned when educators come together with the mindset that everyone brings a certain level of expertise and an openness to learning something new.

Lastly, the literature is clear that a variety of PD models work if they take into consideration thoughtful design and fidelity of program implementation (Fishman et al., 2013; McConnell et al., 2012; Moon et al., 2014; Powell et al., 2010). The conceptual framework used for this study was Desimone and Garet’s (2015) best practices for PD (see Figure 5.1). Other conceptual frameworks may work equally well if consideration focuses on design and fidelity of the PD program. Nonetheless, differentiation of
professional development opportunities should remain a priority for professional
developers (Covay Minor, Desimone, Caines Lee, & Hochberg, 2016; Desimone &
Garet, 2015; Matherson & Windle, 2017) as teachers bring with them varying levels of
self-efficacy, beliefs, perceptions, and values regarding the integration of technology for
meaningful learning.

The peer-to-peer coaching model was designed with sociocultural and situated
learning theories in mind. The intent was to provide a venue and process for
collaborative learning to occur so that peers could assume the role of expert (i.e., coach)
or novice depending on the situation. Giving teachers a choice in learning process
supports effective PD design (Matherson & Windle, 2017). Likewise, effectively
designed PD includes content focus, active learning, coherence, sustained duration, and
collective participation, all hallmarks that contribute to changing teacher instructional
practices (Desimone & Garet, 2015).

*Figure 5.1 Conceptual Map of Best Practices of Teacher Professional Development*

*Figure 5.1. Key features of best practices around teacher professional development as
conceptualized by Desimone & Garet (2015). Effective PD to improve teacher
instructional practices and, thus, student learning needs to: focus on content; engage
teachers in active learning, application, and reflection; align to school and district policies
and goals; be on-going with follow-up support; and foster the development of a
community of practice.*
As professional development continues to serve as the main impetus to changing teacher instructional practices, program developers and school leaders should consider Desimone and Garet’s (2015) best practices in teachers’ professional development. Perhaps more importantly, professional developers should keep in mind tenants of adult learning theory (Knowles, 1970) as what may work for children does not necessarily work for adults.


doi:10.1080/00221341.2014.896393


doi:10.1080/15391523.2007.10782483


doi:10.1080/02635140903166026


Margolin, J., Pan, J., & Yang, R. (2019). *Technology use in instruction and teacher perceptions of school support for technology use in Iowa high schools* (REL


Appendix A

Faculty Recruitment Email for the Survey Portion of the Needs Assessment

Hi everyone,

Many of you may not be aware but I started my doctorate last fall at Johns Hopkins University. My focus is Technology Integration in K-16 Education. As part of the dissertation process, I am conducting several phases of research.

For phase one, I am looking for participants to complete a survey on teaching efficacy. The purpose is to determine values and perceptions teachers place on instructional design, collaboration, and student learning. This survey will take approximately 10-15 minutes.

I would love to have your input. I am hoping that you will be willing to set aside time to complete this survey. All survey responses will be kept confidential. I have attached the Letter of Consent and a hard copy will be placed in your mailboxes. If you are willing to participate in this phase of the research, please sign the hard copy of the Letter of Consent and place it in my box. I will email you the link to the survey within 24 hours of receiving the signed Letter of Consent.

Your participation in this study will be a valuable addition to current research on technology integration into instructional practices. However, you are under no obligation to participate. At any time, you may choose to stop your participation in this study.

I know that your time is valuable and we are quickly approaching a hectic time with Open House and end of the quarter grading, so please know that I appreciate your help at this stage in my doctoral journey.

If you have any questions, please do not hesitate to ask.

With much appreciation,

Catherine Atkinson
Appendix B

Informed Consent for Survey Portion of the Needs Assessment

Johns Hopkins University
Homewood Institutional Review Board (HIRB)

<table>
<thead>
<tr>
<th>Informed Consent Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>Title:</td>
</tr>
<tr>
<td>Examination of Opportunities and Barriers to Meaningful Technology Integration</td>
</tr>
<tr>
<td>Principal Investigator:</td>
</tr>
<tr>
<td>Dr. Christine Eith, Assistant Professor, School of Education</td>
</tr>
<tr>
<td>Date:</td>
</tr>
<tr>
<td>March 30, 2017</td>
</tr>
</tbody>
</table>

PURPOSE OF RESEARCH STUDY:
The purpose of this research study is to determine current supports and barriers to technology integration in instructional practices.

We anticipate that approximately 30 people will participate in this study.

PROCEDURES:
For this study, participants will complete a survey to determine beliefs, values, and confidence regarding technology use. The time commitment for this survey is approximately 10 minutes.

All demographic information will be kept confidential.

RISKS/DISCOMFORTS:
There are no anticipated risks for participation.

BENEFITS:
Potential benefits include an increased understanding of how teachers can use technology in the classroom interactions to help students learn 21st century skills such as communication, collaboration, critical thinking, and creativity.

Additional potential benefits include an increased understanding of current support systems and barriers to meaningful integration of technology in instructional practices. Data will inform potential interventions to address barriers to technology use in the classroom, including but not limited to personalized professional development, coaching, and release time to plan, explore, and collaborate with colleagues.

This study may inform policy changes at the district level to include personalized professional development targeted to specific needs of teachers to facilitate integrating technology into instructional practices. Likewise, this study may benefit the professional
development aims of the Office of Secondary Education if the results lead to a better understanding of the support system that needs to be in place for meaningful technology integration to occur at other school sites.

**VOLUNTARY PARTICIPATION AND RIGHT TO WITHDRAW:**
Your participation in this study is entirely voluntary: You choose whether to participate. If you decide not to participate, there are no penalties, and you will not lose any benefits to which you would otherwise be entitled.

If you choose to participate in the study, you can stop your participation at any time, without any penalty or loss of benefits. If you want to withdraw from the study, please inform the Secondary Investigator Catherine Atkinson in person or via email at catkinson@ggusd.us.

If we learn any new information during the study that could affect whether you want to continue participating, we will discuss this information with you.

**CONFIDENTIALITY:**
Any study records that identify you will be kept confidential to the extent possible by law. The records from your participation may be reviewed by people responsible for making sure that research is done properly, including members of the Johns Hopkins University Homewood Institutional Review Board and officials from government agencies such as the National Institutes of Health and the Office for Human Research Protections. (All of these people are required to keep your identity confidential.) Otherwise, records that identify you will be available only to people working on the study, unless you give permission for other people to see the records.

All data and measures will be examined by the Principal Investigator and research affiliates only (including those entities described above). No identifiable information will be included in any reports of the research published or provided to school administration. A participant number will be assigned to all surveys.

Surveys will be collected in an electronic format. Survey data completed electronically will be collected via a password protected account that belongs to Johns Hopkins University School of Education. If the participant is unable to complete the surveys electronically, paper copies will be provided. In both electronic and paper format, these data will not include identifiable information.

Handwritten notes will use participant numbers or pseudonyms. Handwritten notes will be transcribed to an electronic format.

All research data will be kept in a locked file cabinet. Electronic data will be stored on the Secondary Investigator’s computer, which is password protected. Any electronic or paper files will be erased and paper documents shredded, five years after collection.
Only group data will be included in publication; no individual data will ever be published.

**COMPENSATION:**
You will not receive any payment or other compensation for participating in this study.

**IF YOU HAVE QUESTIONS OR CONCERNS:**
You can ask questions about this research study now or at any time during the study, by contacting the Secondary Investigator, Catherine Atkinson via phone (714) 663-6551 x56614 or email catkinson@ggusd.us.

If you have questions about your rights as a research participant or feel that you have not been treated fairly, please call the Homewood Institutional Review Board at Johns Hopkins University at (410) 516-6580.

**IF YOU ARE HARMED BY PARTICIPATING IN THE STUDY:**
If you feel that you have been harmed in any way by participating in this study, please call Catherine Atkinson, Secondary Investigator at (714) 663-6551 x56614 or catkinson@ggusd.us. Please also notify the Homewood Institutional Review Board at Johns Hopkins University at (410) 516-6580.

This study does not have any program for compensating or treating you for harm you may suffer as a result of your participation.

**SIGNATURES**

**WHAT YOUR SIGNATURE MEANS:**
Your signature below means that you understand the information in this consent form. Your signature also means that you agree to participate in the study.

By signing this consent form, you have not waived any legal rights you otherwise would have as a participant in a research study.

<table>
<thead>
<tr>
<th>Participant's Signature</th>
<th>Date</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Signature of Person Obtaining Consent</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Investigator or HIRB Approved Designee)</td>
<td></td>
</tr>
</tbody>
</table>
Appendix C

Faculty Email with Link to the Efficacy Survey

Hi everyone,

Thank you for agreeing to participate in my research study. For this phase, you will complete a survey to determine the values and perceptions teachers place on instructional design, collaboration, and student learning. The survey should take approximately 10-15 minutes to complete.

Follow this link to the Survey: {insert link}

Or copy and paste the URL below into your internet browser: {insert link}

I know that this is a crazy time for all of us, so there is no rush. However, if you could have the survey completed by Friday, April 21 that would be much appreciated. As always, if you have any questions or concerns, please do not hesitate to ask.

Thank you!

Catherine
Appendix D

Patterns of Adaptive Learning Scales Survey Questions

Directions: Indicate your level of agreement with each of the following statements from strongly disagree (1) to strongly agree (5).

1. I give special privileges to students who do the best work.
2. If I try really hard, I can get through to even the most difficult student.
3. In this school: The importance of trying hard is really stressed to students.
4. I make a special effort to recognize students' individual progress, even if they are below grade level.
5. In this school: Student are told that making mistakes is OK as long as they are learning and improving.
6. Factors beyond my control have a greater influence on my students' achievement than I do.
7. In this school: It's easy to tell which students get the highest grades and which students get the lowest grades.
8. I am good at helping all the students in my classes make significant improvement.
9. I display the work of the highest achieving students as an example.
10. In this school: Students who get good grades are pointed out as an example to others.
11. During class, I often provide several different activities so that students can choose among them.
12. In this school: Students hear a lot about the importance of getting high test scores.
13. I consider how much students have improved when I give them report card grades.
14. In this school: A lot of the work students do is boring and repetitious.
15. In this school: Grades and test scores are not talked about a lot.
16. In this school: Students are frequently told that learning should be fun.
17. I help students understand how their performance compares to others.
18. Some students are not going to make a lot of progress this year, no matter what I do.
19. I encourage students to compete with each other.
20. In this school: The emphasis is really understanding schoolwork, not just memorizing it.
21. I point out those students who do well as a model for the other students.
22. In this school: A real effort is made to recognize students for effort and improvement.
23. I am certain that I am making a difference in the lives of my students.
24. There is little I can do to ensure that all my students make significant progress this year.
25. In this school: Students hear a lot about the importance of making the honor roll or being recognized at honor assemblies.
26. I gave a wide range of assignments, matched to students' needs and skill level.
27. In this school: A real effort is made to show students how the work they do in school is related to their lives outside of school.
28. I can deal with almost any learning problem.
29. In this school: Students are encouraged to compete with each other academically.
Appendix E

Collective Efficacy Survey Questions

Directions: Indicate your level of agreement with each of the following statements from strongly disagree (1) to strongly agree (6).

1. Teachers in the school are able to get through to the most difficult students
2. Teachers here are confident they will be able to motivate their students
3. If a child doesn't want to learn teachers here give up
4. Teachers here don't have the skills needed to produce meaningful student learning
5. If a child doesn't learn something the first time teachers will try another way
6. Teachers in this school are skilled in various methods of teaching
7. Teachers here are well-prepared to teach the subjects they are assigned to teach
8. Teachers here fail to reach some students because of poor teaching methods
9. Teachers in this school have what it takes to get the children to learn
10. The lack of instructional materials and supplies makes teaching very difficult
11. Teachers in this school do not have the skills to deal with student disciplinary problems
12. Teachers in this school think there are some students that no one can reach
13. The quality of school facilities here really facilitates the teaching and learning process
14. The students here come in with so many advantages they are bound to learn
15. These students come to school ready to learn
16. Drugs and alcohol abuse in the community make learning difficult for students here
17. The opportunities in this community help ensure that these students will learn
18. Students here just aren't motivated to learn
19. Learning is more difficult at this school because students are worried about their safety
20. Teachers here need more training to know how to deal with these students
21. Teachers in this school truly believe every child can learn
### Appendix F

**Classroom Observation Matrix**

Date:  
Participant Code:  

<table>
<thead>
<tr>
<th>Meaningful Learning Categories</th>
<th>Incidents (Quantitative)</th>
<th>Comments* (Qualitative)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Student Use of Technology</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Communication</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Collaboration</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Critical thinking</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Creativity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Comments</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Include SAMR level
Appendix G

Semi-structured Interview Questions

1. How do you use technology in your professional context (professional growth)?
   Personal context?

2. What role (if any) do you see technology has in student learning?
   a. To what extent do students have a choice in which technology tools/apps/sites to use?

3. How did you hear about the technology app/tool/site?

4. What kind of technology support do you feel like you have at this time?
   a. Who do you contact?
   b. What is the turn-around time?
   c. Have you had any 1:1 support?
   d. Do you utilize the support of the technology teachers on special assignment? Why or why not?

5. What do you see as barriers to technology integration? How can these barriers be eliminated or reduced?
   a. What do you see as the biggest barrier to technology integration?
   b. If given the choice between release time or stipend, which is your preference and why?

6. To what extent do you work with others in creating assignments/activities?
   Technology lessons?
Appendix H

Informed Consent for Classroom Observation Portion of the Needs Assessment

Johns Hopkins University
Homewood Institutional Review Board (HIRB)

<table>
<thead>
<tr>
<th>Informed Consent Form</th>
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<tbody>
<tr>
<td><strong>Title:</strong> Examination of Opportunities and Barriers to Meaningful Technology Integration</td>
</tr>
<tr>
<td><strong>Principal Investigator:</strong> Dr. Christine Eith, Assistant Professor, School of Education</td>
</tr>
<tr>
<td><strong>Date:</strong> May 18, 2017</td>
</tr>
</tbody>
</table>

**PURPOSE OF RESEARCH STUDY:**
The purpose of this research study is to determine current supports and barriers to technology integration in instructional practices.

We anticipate that approximately six people will participate in this study.

**PROCEDURES:**
There are several components to this study:
- Observation of classroom instructional practices
- Follow-up interview after observation
- Unobtrusive data collection regarding activities, assignments, and assessments through review of technology-based tools such as Google Classroom, HMH, and Haiku Learning

All demographic information will be kept confidential.

Time required:
- Classroom observation (45 minutes)
- Follow-up interview within 24-48 hours after the classroom observation (15-20 minutes)

**RISKS/DISCOMFORTS:**
There are no anticipated risks for participation.

**BENEFITS:**
Potential benefits include an increased understanding of how teachers can use technology in classroom interactions to help students learn 21st century skills such as communication, collaboration, critical thinking, and creativity.

Additional potential benefits include an increased understanding of current support
systems and barriers to meaningful integration of technology in instructional practices. Data will inform potential interventions to address barriers to technology use in the classroom, including but not limited to personalized professional development, coaching, and release time to plan, explore, and collaborate with colleagues.

This study may inform policy changes at the district level to include personalized professional development targeted to specific needs of teachers to facilitate integrating technology into instructional practices. Likewise, this study may benefit the professional development aims of the Office of Secondary Education if the results lead to a better understanding of the support system that needs to be in place for meaningful technology integration to occur at other school sites.

**VOLUNTARY PARTICIPATION AND RIGHT TO WITHDRAW:**
Your participation in this study is entirely voluntary: You choose whether to participate. If you decide not to participate, there are no penalties, and you will not lose any benefits to which you would otherwise be entitled.

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**SIGNATURES**

**WHAT YOUR SIGNATURE MEANS:**
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<th>Date</th>
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<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Investigator or HIRB Approved Designee)</td>
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Appendix I

Descriptive Statistics for the Patterns of Adaptive Learning Scale

Table I.1

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<th>N</th>
<th>Sum</th>
<th>M</th>
<th>SD</th>
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<tbody>
<tr>
<td>I give special privileges to students who do the best work.</td>
<td>21</td>
<td>45</td>
<td>2.14</td>
<td>.96</td>
</tr>
<tr>
<td>If I try really hard, I can get through to even the most difficult student.</td>
<td>21</td>
<td>78</td>
<td>3.71</td>
<td>.90</td>
</tr>
<tr>
<td>In this school: The importance of trying hard is really stressed to students.</td>
<td>21</td>
<td>81</td>
<td>3.86</td>
<td>1.01</td>
</tr>
<tr>
<td>I make a special effort to recognize students' individual progress, even if they are below grade level.</td>
<td>21</td>
<td>84</td>
<td>4.00</td>
<td>.84</td>
</tr>
<tr>
<td>In this school: Students are told that making mistakes is OK as long as they are learning and improving.</td>
<td>21</td>
<td>88</td>
<td>4.19</td>
<td>.81</td>
</tr>
<tr>
<td><em>Factors beyond my control have a greater influence on my students' achievement than I do.</em></td>
<td>21</td>
<td>49</td>
<td>2.33</td>
<td>1.24</td>
</tr>
<tr>
<td>In this school: It's easy to tell which students get the highest grades and which students get the lowest grades.</td>
<td>21</td>
<td>60</td>
<td>2.86</td>
<td>.85</td>
</tr>
<tr>
<td>I am good at helping all the students in my classes make significant improvement.</td>
<td>21</td>
<td>82</td>
<td>3.90</td>
<td>.83</td>
</tr>
<tr>
<td>I display the work of the highest achieving students as an example.</td>
<td>21</td>
<td>57</td>
<td>2.71</td>
<td>1.27</td>
</tr>
<tr>
<td>In this school: Students who get good grades are pointed out as an example to others.</td>
<td>21</td>
<td>68</td>
<td>3.24</td>
<td>.62</td>
</tr>
<tr>
<td>During class, I often provide several different activities so that students can choose among them.</td>
<td>21</td>
<td>50</td>
<td>2.38</td>
<td>.86</td>
</tr>
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<td>In this school: Students hear a lot about the importance of getting high test scores.</td>
<td>21</td>
<td>67</td>
<td>3.19</td>
<td>1.12</td>
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<tr>
<td>I consider how much students have improved when I give them report card grades.</td>
<td>21</td>
<td>64</td>
<td>3.05</td>
<td>1.50</td>
</tr>
<tr>
<td><em>In this school: A lot of the work students do is boring and repetitious.</em></td>
<td>21</td>
<td>80</td>
<td>3.81</td>
<td>.75</td>
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<td>Sentences</td>
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<td>Score</td>
<td>Confidence</td>
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<td>--------------------------------------------------------------------------</td>
<td>---</td>
<td>-------</td>
<td>------------</td>
</tr>
<tr>
<td>21</td>
<td>In this school: Grades and test scores are not talked about a lot.</td>
<td></td>
<td>88</td>
<td>4.19</td>
</tr>
<tr>
<td>22</td>
<td>In this school: Students are frequently told that learning should be fun.</td>
<td></td>
<td>51</td>
<td>2.43</td>
</tr>
<tr>
<td>23</td>
<td>I help students understand how their performance compares to others.</td>
<td></td>
<td>53</td>
<td>2.52</td>
</tr>
<tr>
<td>24</td>
<td>Some students are not going to make a lot of progress this year, no matter what I do.</td>
<td></td>
<td>75</td>
<td>3.57</td>
</tr>
<tr>
<td>25</td>
<td>I encourage students to compete with each other.</td>
<td></td>
<td>41</td>
<td>1.95</td>
</tr>
<tr>
<td>26</td>
<td>In this school: The emphasis is really understanding schoolwork, not just memorizing it.</td>
<td></td>
<td>79</td>
<td>3.76</td>
</tr>
<tr>
<td>27</td>
<td>I point out those students who do well as a model for the other students.</td>
<td></td>
<td>66</td>
<td>3.14</td>
</tr>
<tr>
<td>28</td>
<td>In this school: A real effort is made to recognize students for effort and improvement.</td>
<td></td>
<td>72</td>
<td>3.43</td>
</tr>
<tr>
<td>29</td>
<td>I am certain that I am making a difference in the lives of my students.</td>
<td></td>
<td>81</td>
<td>3.86</td>
</tr>
<tr>
<td>30</td>
<td>There is little I can do to ensure that all my students make significant progress this year.</td>
<td></td>
<td>87</td>
<td>4.14</td>
</tr>
<tr>
<td>31</td>
<td>In this school: Students hear a lot about the importance of making the honor roll or being recognized at honor assemblies.</td>
<td></td>
<td>44</td>
<td>2.10</td>
</tr>
<tr>
<td>32</td>
<td>I gave a wide range of assignments, matched to students' needs and skill level.</td>
<td></td>
<td>62</td>
<td>2.95</td>
</tr>
<tr>
<td>33</td>
<td>In this school: A real effort is made to show students how the work they do in school is related to their lives outside of school.</td>
<td></td>
<td>64</td>
<td>3.05</td>
</tr>
<tr>
<td>34</td>
<td>I can deal with almost any learning problem.</td>
<td></td>
<td>73</td>
<td>3.48</td>
</tr>
<tr>
<td>35</td>
<td>In this school: Students are encouraged to compete with each other academically.</td>
<td></td>
<td>48</td>
<td>2.29</td>
</tr>
</tbody>
</table>

*Note.* Scores measured on a 5-point Likert scale with 1 representing *strongly disagree* and 5 representing *strongly agree*. Italicized items are reverse-coded.
Appendix J

Descriptive Statistics for the Collective Efficacy Scale

Table J.1

<table>
<thead>
<tr>
<th>Question</th>
<th>N</th>
<th>Sum</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>36 Teachers in the school are able to get through to the most difficult</td>
<td>21</td>
<td>78</td>
<td>3.71</td>
<td>1.01</td>
</tr>
<tr>
<td>students</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>37 Teachers here are confident they will be able to motivate their</td>
<td>21</td>
<td>85</td>
<td>4.05</td>
<td>.86</td>
</tr>
<tr>
<td>students</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>38 <em>If a child doesn't want to learn teachers here give up</em></td>
<td>21</td>
<td>93</td>
<td>4.43</td>
<td>1.33</td>
</tr>
<tr>
<td>39 Teachers here don’t have the skills needed to produce meaningful</td>
<td>21</td>
<td>111</td>
<td>5.29</td>
<td>1.15</td>
</tr>
<tr>
<td>student learning</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>40 If a child doesn't learn something the first time teachers will try</td>
<td>21</td>
<td>97</td>
<td>4.62</td>
<td>.92</td>
</tr>
<tr>
<td>another way</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>41 Teachers in this school are skilled in various methods of teaching</td>
<td>21</td>
<td>110</td>
<td>5.24</td>
<td>.94</td>
</tr>
<tr>
<td>42 Teachers here are well-prepared to teach the subjects they are</td>
<td>21</td>
<td>104</td>
<td>4.95</td>
<td>.97</td>
</tr>
<tr>
<td>assigned to teach</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>43 Teachers here fail to reach some students because of poor teaching</td>
<td>21</td>
<td>94</td>
<td>4.48</td>
<td>1.47</td>
</tr>
<tr>
<td>methods</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>44 Teachers in this school have what it takes to get the children to</td>
<td>21</td>
<td>105</td>
<td>5.00</td>
<td>.89</td>
</tr>
<tr>
<td>learn</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>45 <em>The lack of instructional materials and supplies makes teaching very</em></td>
<td>21</td>
<td>100</td>
<td>4.76</td>
<td>1.26</td>
</tr>
<tr>
<td>difficult</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>46 Teachers in this school do not have the skills to deal with student</td>
<td>21</td>
<td>100</td>
<td>4.76</td>
<td>1.04</td>
</tr>
<tr>
<td>disciplinary problems</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>47 Teachers in this school think there are some students that no one</td>
<td>21</td>
<td>77</td>
<td>3.67</td>
<td>1.35</td>
</tr>
<tr>
<td>can reach</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>48 The quality of school facilities here really facilitates the teaching</td>
<td>21</td>
<td>96</td>
<td>4.57</td>
<td>1.4</td>
</tr>
<tr>
<td>and learning process</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>49 The students here come in with so many advantages they are bound to</td>
<td>21</td>
<td>37</td>
<td>1.76</td>
<td>.89</td>
</tr>
<tr>
<td>learn</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50 These students come to school ready to learn</td>
<td>21</td>
<td>71</td>
<td>3.38</td>
<td>.86</td>
</tr>
<tr>
<td>51 <em>Drugs and alcohol abuse in the community make learning difficult for</em></td>
<td>21</td>
<td>91</td>
<td>4.33</td>
<td>1.06</td>
</tr>
<tr>
<td>students here</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>52 The opportunities in this community help ensure that these students</td>
<td>21</td>
<td>62</td>
<td>2.95</td>
<td>1.12</td>
</tr>
<tr>
<td>will learn</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>53 <em>Students here just aren’t motivated to learn</em></td>
<td>21</td>
<td>90</td>
<td>4.29</td>
<td>.90</td>
</tr>
<tr>
<td>54 Learning is more difficult at this school because students are</td>
<td>21</td>
<td>115</td>
<td>5.48</td>
<td>.93</td>
</tr>
<tr>
<td>worried about their safety</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>55 Teachers here need more training to know how to deal with these</td>
<td>21</td>
<td>95</td>
<td>4.52</td>
<td>1.03</td>
</tr>
<tr>
<td>students</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>56 Teachers in this school truly believe every child can learn</td>
<td>21</td>
<td>96</td>
<td>4.57</td>
<td>1.21</td>
</tr>
</tbody>
</table>

Note. Scores measured on a 6-point Likert-type scale with 1 representing *strongly disagree* and 6 representing *strongly agree*. Italicized items are reverse-coded.
Appendix K

Summary Matrices

Table K.1

*Process Evaluation Summary Matrix: Fidelity of Implementation*

RQ1. To what extent are participants satisfied with the peer-to-peer coaching support opportunities specifically regarding perceived level of support, frequency, and regularity?

<table>
<thead>
<tr>
<th>Variable</th>
<th>Instrumentation</th>
<th>Data Collection</th>
<th>Data Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Satisfaction of peer-to-peer coaching support</td>
<td>QUAN: 3-2-1 Reflection Google Forms</td>
<td>Participants</td>
<td>At the end of each of the three full-day sessions; once a quarter</td>
</tr>
<tr>
<td>Frequency and regularity</td>
<td>QUAN: Attendance records</td>
<td>Researcher</td>
<td>At the end of each of the three full-day sessions and subsequent afterschool workshops (4-6 times a quarter, four times a year)</td>
</tr>
<tr>
<td>• <em>Dose</em></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• <em>Reach</em></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table K.2

*Process Evaluation Summary Matrix: Fidelity of Implementation*

RQ2. To what extent do the coaches facilitate activities conducted during the full-day sessions that reflect the five components of meaningful learning with technology?

<table>
<thead>
<tr>
<th>Variable</th>
<th>Instrumentation</th>
<th>Data Collection Source(s)</th>
<th>Frequency</th>
<th>Data Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Topics for professional development</td>
<td>Qual/Quan: 3-2-1 Reflection</td>
<td>Participants</td>
<td>At the end of each of the three full-day sessions; once a quarter</td>
<td>Thematic analysis (Braun &amp; Clark, 2012)</td>
</tr>
<tr>
<td><strong>Quality of program delivery</strong></td>
<td>Google Forms</td>
<td></td>
<td></td>
<td>Descriptive statistics</td>
</tr>
<tr>
<td><strong>Dose delivered</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Quality of program implementation</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**Table K.3**

*Outcome Evaluation Summary Matrix: Teacher Self-Efficacy*

RQ3. To what extent does participation in peer-to-peer coaching contribute to teacher self-efficacy?

<table>
<thead>
<tr>
<th>Variable</th>
<th>Instrumentation</th>
<th>Data Collection</th>
<th>Data Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teacher self-efficacy</td>
<td>QUAN: Teachers’ Sense of Efficacy Scale (Tschannen-Moran &amp; Woolfolk Hoy, 2001)</td>
<td>Participants</td>
<td>Twice as pre- and posttest measure to occur at the beginning and end of the intervention</td>
</tr>
<tr>
<td>Qualitative: Focus group</td>
<td>QUAL: Focus group</td>
<td>Participants</td>
<td>At the conclusion of the intervention</td>
</tr>
</tbody>
</table>
Table K.4

**Outcome Evaluation Summary Matrix: Technology Acceptance and Increased Technology Skills and Knowledge**

RQ4. To what extent does participation in peer-to-peer coaching contribute to technology acceptance (i.e., perceived ease of use, perceived usefulness) and increased technology skills and knowledge?

<table>
<thead>
<tr>
<th>Variable</th>
<th>Instrumentation</th>
<th>Data Collection Source(s)</th>
<th>Frequency</th>
<th>Data Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceived ease of use of technology</td>
<td>QUAN: Technology Acceptance Model survey (Venkatesh, 2000)</td>
<td>Participants</td>
<td>Twice as pre- and posttest measure to occur at the beginning and end of the intervention</td>
<td>Descriptive statistics</td>
</tr>
<tr>
<td></td>
<td>QUAL: Focus group</td>
<td>Participants</td>
<td>At the conclusion of the intervention</td>
<td>Thematic analysis (Braun &amp; Clark, 2012)</td>
</tr>
<tr>
<td>Perceived usefulness of technology</td>
<td>QUAN: Technology Acceptance Model survey (Venkatesh, 2000)</td>
<td>Participants</td>
<td>Twice as pre- and posttest measure to occur at the beginning and end of the intervention</td>
<td>Descriptive statistics</td>
</tr>
<tr>
<td></td>
<td>QUAL: Focus group</td>
<td>Participants</td>
<td>At the conclusion of the intervention</td>
<td>Thematic analysis (Braun &amp; Clark, 2012)</td>
</tr>
<tr>
<td>Technology skills and knowledge</td>
<td>QUAL: Focus group</td>
<td>Participants</td>
<td>At the conclusion of the intervention</td>
<td>Thematic analysis (Braun &amp; Clark, 2012)</td>
</tr>
</tbody>
</table>
Appendix L

Faculty Recruitment Email for the Peer-to-Peer Coaching Intervention

Hi everyone,

Based on the needs assessment conducted in spring 2017 and informal conversations I have had with many of you, I am interested in exploring the process of peer-to-peer coaching in teacher technology implementation practices.

I am planning to implement a year-long professional development (PD) model that includes a pre- and posttest survey, quarterly release days, afterschool follow-up sessions (optional), and a focus group. I would like to assemble an interdisciplinary team of teachers committed to working together for the entire school year.

I am looking for participants to complete a survey on teaching efficacy and perceptions of technology use. The purpose is to determine values and perceptions teachers place on instructional design, collaboration, student learning, and technology. I am looking at change over time, so I am asking participants to complete the same survey twice as a pre- and posttest measure. The online survey will take approximately 20 minutes.

The personalized PD portion of this study will consist of one release day and 4-6 after school sessions per quarter. The frequency of afterschool sessions is on an as-needed basis to be determined by you. Because the PD plan aligns with the district strategic plan and school action steps, you will receive stipends for the afterschool sessions. The topics for the release days will align with the components of meaningful learning with technology, but the focus will be determined through feedback from you.

At the conclusion of the study, I would like to assemble participants as part of a focus group to gather feedback of the peer-to-peer coaching process. The date for the focus group will be scheduled towards the end of May 2019. The focus group will take approximately one hour and will occur afterschool in the library/media center.

All responses from the survey and focus group will be kept confidential. The specifics for confidentiality and data storage are detailed in the informed consent form.

I would love for you to participate in this personalized PD opportunity. I have attached the informed consent and a hard copy will be placed in your mailboxes. If you are willing to participate, please sign the hard copy of the informed consent and place it in my box. I will email you the link to the survey within 24 hours of receiving the signed informed consent.

Your participation in this study will be a valuable addition to current research on technology integration into instructional practices. You are under no obligation to participate. At any time, you may choose to stop your participation in this study.

I know that your time is valuable, so please know that I appreciate your help at this stage in my doctoral journey.

If you have any questions, please do not hesitate to ask.

With much appreciation,

Catherine Atkinson
Appendix M

Informed Consent for the Peer-to-Peer Coaching Intervention

Johns Hopkins University
Homewood Institutional Review Board (HIRB)

Informed Consent Form

Title: Peer-to-Peer Coaching in Teacher Technology Implementation Practices

Principal Investigator: Dr. Carey Borkoski, School of Education

This study is being conducted by Catherine Atkinson who is a faculty member at James Irvine Intermediate School where the research is taking place.

Date: August 27, 2018

PURPOSE OF RESEARCH STUDY:
The purpose of this research study is to explore peer-to-peer coaching supports in teacher technology implementation practices.

We anticipate that approximately 10 people will participate in this study.

PROCEDURES:
There are several components to this study:

- Completion of an online survey (pre and post)
- Participation in quarterly (four) release days
- Participation in quarterly afterschool meetings (optional)
- Participation in a focus group

All demographic information will be kept confidential.

Time required:

- Online survey (approximately 20 minutes)
- Quarterly release days (four days)
- Quarterly after school meetings (four to six per quarter, optional)
- Focus group interview to occur within one month of the last quarterly release day (one hour)

RISKS/DISCOMFORTS:
The risks associated with participation in this study are no greater than those encountered in daily life.
**BENEFITS:**
Potential benefits include an increased understanding of how teachers can use technology in classroom interactions to help students learn valuable skills such as communication, collaboration, critical thinking, and creativity.

Additional potential benefits include increased collaboration and collegiality among participants within the interdisciplinary community of practice.

This study may inform policy changes at the district level to include personalized professional development targeted to specific needs of teachers to facilitate integrating technology into instructional practices. Likewise, this study may benefit the professional development aims of the Office of Secondary Education if the results lead to a better understanding of the support system that needs to be in place for meaningful technology integration to occur at other school sites.

**VOLUNTARY PARTICIPATION AND RIGHT TO WITHDRAW:**
Your participation in this study is entirely voluntary: You choose whether to participate. If you decide not to participate, there are no penalties, and you will not lose any benefits to which you would otherwise be entitled.

If you choose to participate in the study, you can stop your participation at any time, without any penalty or loss of benefits. If you want to withdraw from the study, inform the Secondary Investigator Catherine Atkinson in person or via email at catkinson@ggusd.us.

If we learn any new information during the study that could affect whether you want to continue participating, we will discuss this information with you.

**CONFIDENTIALITY:**
Any study records that identify you will be kept confidential to the extent possible by law. The records from your participation may be reviewed by people responsible for making sure that research is done properly, including members of the Johns Hopkins University Homewood Institutional Review Board and officials from government agencies such as the National Institutes of Health and the Office for Human Research Protections. (All of these people are required to keep your identity confidential.) Otherwise, records that identify you will be available only to people working on the study, unless you give permission for other people to see the records.

All data and measures will be examined by the Principal and Secondary Investigators and research affiliates only (including those entities described above). No identifiable information will be included in any reports of the research published or provided to school administration. Handwritten notes will use participant numbers or pseudonyms. Handwritten notes will be transcribed to an electronic format.

Audio notes will be transcribed to an electronic format.
All research data will be kept in a locked file cabinet. Electronic data will be stored on the Secondary Investigator’s computer, which is password protected. Any electronic files will be securely deleted, and paper documents shredded three years after collection.

Only group data will be included in publication; no individual data will ever be published.

**IF YOU HAVE QUESTIONS OR CONCERNS:**
You can ask questions about this research study now or at any time during the study, by contacting the Secondary Investigator, Catherine Atkinson via phone (714) 663-6551 x56614 or email catkinson@ggusd.us.

If you have questions about your rights as a research participant or feel that you have not been treated fairly, please call the Homewood Institutional Review Board at Johns Hopkins University at (410) 516-6580.

**SIGNATURES**

**WHAT YOUR SIGNATURE MEANS:**
Your signature below means that you understand the information in this consent form.
Your signature also means that you agree to participate in the study.

By signing this consent form, you have not waived any legal rights you otherwise would have as a participant in a research study.

<table>
<thead>
<tr>
<th>Participant's Signature</th>
<th>Date</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Signature of Person Obtaining Consent</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Investigator or HIRB Approved Designee)</td>
<td></td>
</tr>
</tbody>
</table>
Appendix N

Participant Recruitment Email for the Focus Group

Hi everyone,

I would like to conduct a focus group after school on Wednesday, April 10. The time commitment would be no longer than one hour.

I do not need everyone to participate in this. But if you are interested, would you please let me know?

Thank you!

Catherine
Appendix O

Teachers' Sense of Efficacy Scale (short form; Tschannen-Moran & Woolfolk Hoy, 2001)

Directions: Indicated your opinion with each of the following statements from nothing (1) to a great deal (9).

1. How much can you do to control disruptive behavior in the classroom?

2. How much can you do to motivate students who show low interest in school work?

3. How much can you do to get students to believe they can do well in school work?

4. How much can you do to help students value learning?

5. To what extent can you craft good questions for your students?

6. How much can you do to get children to follow classroom rules?

7. How much can you do to calm a student who is disruptive or noisy?

8. How well can you establish a classroom management system with each group of students?

9. How much can you use a variety of assessment strategies?

10. To what extent can you provide an alternative explanation or example when students are confused?

11. How much can you assist families in helping their children do well in school?

12. How well can you implement alternative strategies in your classroom?
Appendix P

Technology Acceptance Model Survey Questions (Venkatesh, 2000)

Directions: Indicate your level of agreement with each of the following statements from strongly disagree (1) to strongly agree (7).

1. If I had access to technology (in general), I intend to use it.
2. If I had access to technology (devices or tools), I would use it.
3. Using technology (devices or tools) improves my performance in my job.
4. Using new technology (devices or tools) in my job increases my productivity.
5. Using new technology (devices or tools) enhances my effectiveness in my job.
6. I find new technology (devices or tools) to be useful in my job.
7. My interaction with new technology (devices or tools) is clear and understandable.
8. Interacting with new technology (devices or tools) does not require a lot of my mental effort.
9. I find new technology (devices or tools) to be easy to use.
10. I find new technology (devices or tools) to be easy to use.
11. I find it easy to get new technology (devices or tools) to do what I want it to do.

Directions: Indicate your level of agreement with each of the following statements by selecting yes or no.

12. I could complete my job using new technology (devices or tools) if there was no one around to tell me what to do as I go.
13. I could complete my job using a new technology tool if I had never used a tool like it before.
14. I could complete my job using new technology (devices or tools) if I had only the manuals for reference.
15. I could complete my job using new technology (devices or tools) if I had seen someone else using it before trying it myself.
16. I could complete my job using new technology (devices or tools) if I could call someone for help if I got stuck.
17. I could complete my job using new technology (devices or tools) if someone else had helped me get started.
18. I could complete my job using new technology (devices or tools) if I had a lot of time to complete the job for which the tool was provided.
19. I could complete my job using new technology (devices or tools) if I had just the built-in help facility for assistance.
20. I could complete my job using new technology (devices or tools) if someone showed me how to do it first.
21. I could complete my job using new technology (devices or tools) if I had used a similar device or tool before this one to do the same job.
Directions: Indicate your level of agreement with each of the following statements from *strongly disagree* (1) to *strongly agree* (7).

22. I have control over using new technology (devices or tools).
23. I have the resources necessary to use new technology (devices or tools).
24. I have the knowledge necessary to use new technology (devices or tools).
25. Given the resources, opportunities, and knowledge it takes to use technology, it would be easy for me to use new technology (devices or tools).
26. Oftentimes, new technologies are not interoperable (compatible) with other technology (devices or tools) I use.
27. Computers do not scare me at all.
28. Working with a computer makes me nervous.
29. I do not feel threatened when others talk about computers.
30. It wouldn't bother me to take computer courses.
31. Computers make me feel uncomfortable.
32. I feel at ease in a computer class.
33. I get a sinking feeling when I think of trying to use a computer.
34. I feel comfortable working with a computer.
35. Computers make me feel uneasy.
36. How would you characterize yourself when you use new technology (devices or tools)? (Mark all that apply)
   - spontaneous (1)
   - unimaginative (2)
   - flexible (3)
   - creative (4)
   - playful (5)
   - unoriginal (6)
   - uninventive (7)
37. I find using technology (devices or tools) to be enjoyable.
38. The actual process of using technology (devices or tools) is pleasant.
39. I have fun using technology (devices or tools).
40. My supervisors expect me to use technology (devices or tools).
41. My use of technology (devices or tools) is voluntary.
42. My supervisors do not require me to use technology (devices or tools).
43. Although it might be helpful, using technology (devices or tools) is certainly not compulsory in my job.
Appendix Q

3-2-1 Reflection Form

Email address:

Last name:

1. What are THREE things you learned?

2. What are TWO questions you still have?

3. What is ONE connection that you can make to your instructional practice?

4. On a scale of 1-5 with 1 representing none and 5 representing the perfect amount, rank the level of support that you feel you have received today.

   o 1
   o 2
   o 3
   o 4
   o 5

5. How many after school sessions do you believe you will need to support the integration of technology and the strategies learned today into your instructional practice?

   o 5-6
   o 3-4
   o 1-2
   o None
Appendix R

Focus Group Questions and Protocol

Protocol and consent: I will begin the focus group by asking the participants to agree to the importance of keeping information discussed in the focus group confidential. In addition, I will ask each participant to verbally agree to keep everything discussed in the room confidential.

Script (to participants): Welcome! Thank you for graciously volunteering to be here today. The purpose of this focus group is to gather your perception of the P2P coaching process and the influence on teacher instructional practices regarding meaningful learning with technology. During this interview I will ask you questions regarding the topics covered during the release days and any potential applications to practice. This interview will last approximately one hour; however, you are free to leave at any time. Though I would like for everyone to have a chance to share, you are free to pass on any questions that you do not want to answer.

As previously mentioned, this session is being audiotaped. I will use this recording for the sole purpose of making a transcript, which will not contain any personal identification. Do you have any questions?

May I have a verbal acknowledgment that whatever is mentioned during this next hour will remain confidential?

Thank you. Let’s begin. Reflect on some of the things you learn during the release days…(round robin, who wants to start?)

Interview Questions:

1. How, if at all, did what you learn during the P2P coaching experience change your instructional practices?
   • Will what you learned change what you do with your students? If so, how? If no, why?
2. How did what you learned throughout the year-long PD affect how you see your ability to integrate technology?
   • Would you like to continue with this type of PD model next year? If yes, how? If no, why?
3. Who did you work with? What did you work on?
4. What did you take away from by participating in the P2P coaching experience?
   • What value, if any, did you find when working with teachers from different disciplines?
5. What did you enjoy about the P2P coaching model?
6. What changes would you make to improve the P2P coaching model?
7. Describe your thoughts about past PD experiences compared to the P2P coaching model.
   • How are they different/similar?
Appendix S

Session 1 Google Slides Presentation

Active & Cooperative Learning
Peer-to-Peer Professional Learning
Quarter I

Purpose
- Develop a community of practice
- Interdisciplinary exchange of information around meaningful learning (with technology)
- Create and curate lesson ideas and activities
- Personalized learning path

Meaningful Learning with Technology

Lunch Poll
- Seafood Cove OR
- Seafood Cove

We believe in choice.

Group Roles
- Malasadas
- Decals
- Icebreaker (videos of crying children)
- Vietnamese coffee (for peer technology coaches)

What does active learning look like?
Active Learning
- Actively engaged in a meaningful task
- Manipulating objects and tools
- Observing the effects

What role can technology play in this process?

Cooperative Learning
- Working together in knowledge-building communities
- Socially negotiating a common understanding of the task or methods

What does cooperative learning look like?

What role can technology play in this process?

ISTE Standards
- Educators
- Students
- Computer Science Educators
- Coaches

Game Plan

Work Time
3-2-1 Reflection

Follow-Up Support
- Six hours
- Before or after school
- Coordinate date/time

Next Quarter: Intentional Learning
Appendix T

Session 2 Google Slides Presentation

Intentional Learning
Peer-to-Peer Professional Learning
Quarter 2

"We are currently preparing students for jobs that don't yet exist...using technologies that haven't yet been invented...in order to solve problems we don't even know are problems yet."
- Richard Riley, Secretary of Education under Clinton

Purpose
• Come together as a community of practice
• Interdisciplinary discussions around meaningful learning (with technology)
• Create and curate lesson ideas and activities
• Personalized learning path

Meaningful Learning with Technology

Lunch Poll
• Brodard (the chateau)
• Brodard (not the chateau)

How's it going?
What does intentional learning look like?

Intentional Learning

- Goal-directed
- Active
- Self-regulatory

How can we make learning student-centered?

How Technologies Foster Learning

- Supports knowledge construction
- Informational vehicle for exploration
- Provides authentic context
- Social medium
- Intellectual partner

How Technologies Foster Thinking

- Causal
- Analogical
- Expressive
- Experiential
- Problem-solving

Game Plan

Work Time

Lunch
Work Time

3-2-1 Reflection

Follow-Up Support

- Six hours
- Before or after school
- Coordinate date/time
- See secretary for timecard

Next Quarter: Authentic Learning
Appendix U
Session 3 Google Slides Presentation

Authentic Learning
Peer-to-Peer Professional Learning Quarter 3

“One of the most important aspects of technology in education is its ability to level the field of opportunity for students”

- John King, U.S. Secretary of Education

Purpose
- Come together as a community of learners
- Interdisciplinary discussions around meaningful learning (with technology)
- Create and revise lesson ideas and activities
- Personalized learning path

Meaningful Learning with Technology

Lunch Poll
- Seafood Cove

How’s it going?
What does **authentic learning** look like?

**Authentic Learning**
- Shift from passive consumers to active creators
- “Their-world”
- Project-based or problem-solving tasks
- Inquiry-based

**ISTE Standards for Students**
- Empowered learner
- Digital citizen
- Knowledge constructor
- Innovative designer
- Computational thinker
- Creative communicator
- Global collaborator

How can technology support **authentic learning** experiences?

**Game Plan**

**Work Time**

**Lunch**

**Work Time**
3-2-1 Reflection

Follow-Up Support
- Six hours
- Before or after school
- Coordinate date/time
- See secretary for timecard

Next Quarter: Constructive Learning

Resources
- Primary Genius Hour
- Genius Hour for Middle School
- 21st Century in Education
- Project-Based Learning
Appendix V

Faculty Email with Link to the Teacher Efficacy and Perception Preintervention Survey

Hi everyone,

Thank you for agreeing to participate in my research study. For this phase, you will complete a survey on teaching efficacy and perceptions of technology use. The survey should take approximately 10-15 minutes to complete.

Follow this link to the Survey: {insert link}
Or copy and paste the URL below into your internet browser: {insert link}

I know this is a crazy time for all of us, so there is no rush. However, if you could have the survey completed by September 7 that would be much appreciated. As always, if you have any questions or concerns, please do not hesitate to ask.

Thank you!

Catherine
Appendix W

Faculty Email with Link to the Teacher Efficacy and Perception Postintervention Survey

Hi everyone,

Thank you once again for agreeing to participate in my research study. For this portion, you will complete a posttest survey on teacher perception regarding student learning and technology use. The survey should take approximately 15-20 minutes to complete.

Follow this link to the Survey: {insert link}
Or copy and paste the URL below into your internet browser: {insert link}

If you would complete the survey by Monday, March 11 that would be much appreciated. As always, if you have any questions or concerns, please do not hesitate to ask.

Thanks so much!

Catherine
### Appendix X

Descriptive Statistic Results for the Teachers’ Sense of Efficacy Scale

Table X.1

**Pretest Participant Scores**

<table>
<thead>
<tr>
<th>Question</th>
<th>N</th>
<th>Sum</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>1  How much can you do to control disruptive behavior in the classroom?</td>
<td>10</td>
<td>85</td>
<td>8.50</td>
<td>.85</td>
</tr>
<tr>
<td>2  How much can you do to motivate students who show low interest in school work?</td>
<td>10</td>
<td>64</td>
<td>6.40</td>
<td>1.26</td>
</tr>
<tr>
<td>3  How much can you do to motivate students who show low interest in school work?</td>
<td>10</td>
<td>64</td>
<td>6.40</td>
<td>1.26</td>
</tr>
<tr>
<td>4  How much can you do to help students value learning?</td>
<td>10</td>
<td>60</td>
<td>6.00</td>
<td>.82</td>
</tr>
<tr>
<td>5  To what extent can you craft good questions for your students?</td>
<td>10</td>
<td>77</td>
<td>7.70</td>
<td>1.34</td>
</tr>
<tr>
<td>6  How much can you do to get children to follow classroom rules?</td>
<td>10</td>
<td>82</td>
<td>8.20</td>
<td>.92</td>
</tr>
<tr>
<td>7  How much can you do to calm a student who is disruptive or noisy?</td>
<td>10</td>
<td>79</td>
<td>7.90</td>
<td>.99</td>
</tr>
<tr>
<td>8  How well can you establish a classroom management system with each group of students?</td>
<td>10</td>
<td>79</td>
<td>7.90</td>
<td>.99</td>
</tr>
<tr>
<td>9  How much can you use a variety of assessment strategies?</td>
<td>10</td>
<td>69</td>
<td>6.90</td>
<td>1.45</td>
</tr>
<tr>
<td>10 To what extent can you provide an alternative explanation or example when students are confused?</td>
<td>10</td>
<td>78</td>
<td>7.80</td>
<td>.79</td>
</tr>
<tr>
<td>11 How much can you assist families in helping their children do well in school?</td>
<td>10</td>
<td>45</td>
<td>4.50</td>
<td>1.27</td>
</tr>
<tr>
<td>12 How well can you implement alternative strategies in your classroom?</td>
<td>10</td>
<td>75</td>
<td>7.50</td>
<td>.71</td>
</tr>
</tbody>
</table>

*Note. Scores measured on a 9-point Likert-type scale with 1 representing strongly disagree and 9 representing strongly agree.*
### Table X.2

**Posttest Participant Scores**

<table>
<thead>
<tr>
<th>Question</th>
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<td>8.40</td>
<td>.84</td>
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<tr>
<td>2  How much can you do to motivate students who show low interest in school work?</td>
<td>10</td>
<td>61</td>
<td>6.10</td>
<td>.99</td>
</tr>
<tr>
<td>3  How much can you do to motivate students who show low interest in school work?</td>
<td>10</td>
<td>66</td>
<td>6.60</td>
<td>1.17</td>
</tr>
<tr>
<td>4  How much can you do to help students value learning?</td>
<td>10</td>
<td>66</td>
<td>6.60</td>
<td>1.17</td>
</tr>
<tr>
<td>5  To what extent can you craft good questions for your students?</td>
<td>10</td>
<td>79</td>
<td>7.90</td>
<td>.99</td>
</tr>
<tr>
<td>6  How much can you do to get children to follow classroom rules?</td>
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<td>81</td>
<td>8.10</td>
<td>.88</td>
</tr>
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<td>7  How much can you do to calm a student who is disruptive or noisy?</td>
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<td>83</td>
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<td>7.40</td>
<td>.70</td>
</tr>
</tbody>
</table>

*Note.* Scores measured on a 9-point Likert-type scale with 1 representing *strongly disagree* and 9 representing *strongly agree.*
Appendix Y

Descriptive Statistics for the Technology Acceptance Model Survey

Table Y.1

*Pretest Participant Scores for Perceived Ease of Use and Perceived Usefulness Subscales*

<table>
<thead>
<tr>
<th>Question</th>
<th>N</th>
<th>Sum</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>1  My interaction with new technology (devices or tools) is clear and understandable.</td>
<td>10</td>
<td>59</td>
<td>5.9</td>
<td>1.20</td>
</tr>
<tr>
<td>2  Interacting with new technology (devices or tools) does not require a lot of my mental effort.</td>
<td>10</td>
<td>49</td>
<td>4.9</td>
<td>1.29</td>
</tr>
<tr>
<td>3  I find new technology (devices or tools) to be easy to use.</td>
<td>10</td>
<td>53</td>
<td>5.3</td>
<td>1.25</td>
</tr>
<tr>
<td>4  I find it easy to get new technology (devices or tools) to do what I want it to do.</td>
<td>10</td>
<td>47</td>
<td>4.7</td>
<td>.95</td>
</tr>
<tr>
<td>5  Using technology (devices or tools) improves my performance in my job.</td>
<td>10</td>
<td>62</td>
<td>6.2</td>
<td>1.03</td>
</tr>
<tr>
<td>6  Using new technology (devices or tools) in my job increases my productivity.</td>
<td>10</td>
<td>62</td>
<td>6.2</td>
<td>.79</td>
</tr>
<tr>
<td>7  Using new technology (devices or tools) enhances my effectiveness in my job.</td>
<td>10</td>
<td>59</td>
<td>5.9</td>
<td>.99</td>
</tr>
<tr>
<td>8  I find new technology (devices or tools) to be useful in my job.</td>
<td>10</td>
<td>65</td>
<td>6.5</td>
<td>.53</td>
</tr>
</tbody>
</table>

*Note.* Scores measured on a 7-point Likert-type scale with 1 representing *strongly disagree* and 7 representing *strongly agree*. Questions 1-4 measure perceived ease of use. Questions 5-8 measure perceived usefulness.
Table Y.2

*Posttest Participant Scores for Perceived Ease of Use and Perceived Usefulness Subscales*

<table>
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Curriculum Vitae

Catherine A. Cabiness-Atkinson

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Education

Johns Hopkins University, Baltimore, MD 2019
Ed.D., Specialization: Technology Integration in K16 Education

California State University Fullerton, Fullerton, CA 2010
M.S., Specialization: Educational Technology

University of California Santa Barbara, Santa Barbara, CA 1992
B.A., Major: Psychology

Fellowships & Awards

Edward Franklin Buchner Fellowship in Education 2018-2019
Johns Hopkins University, Baltimore, MD

Bernard Kravitz Outstanding Multicultural Project Award 2011
California State University Fullerton, Fullerton, CA

Professional Experience

James Irvine Intermediate School, Garden Grove, CA 1995-
History/Social Science Teacher, Department Chair, Technology Coordinator

Johns Hopkins University, Baltimore, MD 2017-2019
Doctoral Level Teaching Assistant, School of Education

Orange County Department of Education, Costa Mesa, CA 2011-2016
Leading Edge Certification Instructor, Professional Development Facilitator

Scholarly Activity

Emerging Voices in Education, Drexel University, Philadelphia, PA 2019
Guest Peer Reviewer

Peer-reviewed Book Chapter

Journal