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The Impact of Instructional Technology on Lesson Effectiveness and Obstacles to Incorporating Technology Into Lesson Design as Perceived by Elementary School Teachers

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ABSTRACT

The Impact of Instructional Technology on Lesson Effectiveness and Obstacles to Incorporating Technology into Lesson Design as Perceived by Elementary School Teachers

by Sarah Curlin-Loring

Purpose. The purpose of this qualitative study was to identify and describe the impact of instructional technology on lesson effectiveness and obstacles to incorporating instructional technology into lesson design as perceived by elementary school teachers.

Methodology. A qualitative ethnographic method was used in this study. Triangulation was accomplished through the collection and analysis of direct interviews, and artifacts shared by educators and strengthened by information-rich data provided in direct observations.

Findings: Major finding of the study showed high student engagement with the use of technology, and unavailability of the internet/Chromebooks as a big obstacle to technology integration.

Conclusions: Based on the major findings, conclusions were formed and implications for action were established. An important implication was for teachers to always have a back-up instructional plan in case the technology failed.

Recommendations: The recommendations for future studies were outlined in Chapter V. Recommendations for this study to be replicated to obtain administrators' and students' perspectives were also included.

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CHAPTER I: INTRODUCTION

The field of education constantly changes to keep up with the ever-changing demands of a world that is in flux. According to Thomas and Brown (2009), successful educators need to utilize a theory that will allow them to adapt to an educational environment that is constantly changing. Advancements in technology and communication have brought the world closer together. In fact, the digital age is birthing a global society, which is replacing a national, state, and local one. Thus, people are no longer separated by distant geographical boundaries; technology is bridging that gap. As Friedman and Mandelbaum (2011) stated, anyone with access to technology can send e-mails, pictures, texts, PowerPoints, or other forms of correspondence that can be accessed by someone from any place in the world. Subsequently, world leaders and educators are searching for ways to maintain a world-leader status while preparing students to compete globally in the 21st century. The United States too seeks answers on how to compete in the global arena and prepare its citizens to be skilled 21st century contenders.

In a press conference from The White House in 2010, President Barack Obama expressed that it makes no sense for China’s rail systems and Singapore’s airports to be better than those of the United States. Additionally, Obama commented that China has the fastest supercomputer on earth—that once was the United States (The White House, 2010). Similarly, Katel (2001), in an article in the *CQ Researcher*, echoed President Obama’s concerns regarding the United States no longer leading the world in high-tech innovation as well as manufacturing. First, Katel asserted that during the 21st century China may replace the United States as the world’s top manufacturing power. Next, Katel claimed that students in the United States are not getting adequate training to compete in the high-tech world arena, hence, producing an urgency for the United States to regain the global, economic leadership status it once functioned in to continue to be a world leader during the 21st century. In short, the United States is looking to education for answers to the current situation.

Koretz (2009) reported in his study that, on a national level, U.S. students consistently test lower in math than students in other countries that are either similar or competitors. Additionally, there are urban communities with high levels of poverty and underperforming students. California also has a high population of low-income, migrant students who are not proficient in English who struggle with the achievement tests. Furthermore, in 2013, per the National Center for Education Statistics, the average math score for California eighth graders was 276 out of a possible score of 333, whereas the average national score for eighth-grade public school students was 284 out of a possible score of 333. Moreover, State Superintendent of Public Instruction Tom Torlakson, asserted that California students made quantifiable progress on the California Assessment of Student Performance and Progress (CASPP) online test, but more needs to be done to align student achievement with that of the rest of the nation (California Department of Education, 2016).

Locally, the Central Valley (an agricultural area) is comprised of rural, underperforming schools with a high ELL population. As a matter of fact, this situation reflects that of many other farming communities in California. Table 1 contains the 2016 CASPP scores.

Table 1

2016 CASPP Scores

Subject	Category	State of California	Tulare County
ELA	Standard not met	28%	37%
Math	Standard not met	35%	46%

Note. From Test results for English Language Arts/Literacy & Mathematics, California Assessment of Student Performance and Progress, 2016 (http://caaspp.cde.ca.gov/sb2016 /search).

The 2015-2016 CASPP results for the Tulare County School Districts (Grades 3-8 and 11) show a higher percentage of students in both mathematics and English language arts (ELA) scoring in the Standard Not Met category than their state counterparts, as the table illustrates. Conclusively, the results indicate a disparity between Tulare County School District's test results and the state test results.

Thus, shortfalls in economic competitiveness, an inequitable national disparity, and educational deficits make it necessary to address and rectify these issues. This study will focus on educational technology's impact on student achievement and subsequently on national and global competitiveness.

Background

Prepare Students to Compete Globally in the 21st Century

During the tenure of both President George W. Bush and President Barack Obama, the United States changed the education standards in an effort to boost the country's status in global academic competition. First, President Bush's No Child Left Behind (NCLB) Act of 2001, as Burks et al. (2015) asserted, sought to raise educational standards and assess student attainment. Under that legislation, all public schools were required to test students in English and math in Grades 3 through 8 and subsequently in high school (Murnane & Papay, 2010). Also, all students were required to test *proficient* per the state's definition by 2014, with schools making adequate yearly progress (AYP) toward that goal. According to Murnane and Papay (2010), if schools did not consistently meet targeted goals, they would be subject to harsh penalties.

Then, in 2009, the National Governor's Association developed the Common Core State Standards (CCSS), which President Obama's administration supported. State leaders including governors and state commissioners of education from 48 states, the District of Columbia, and two territories were involved in the process. State governors and school chiefs saw the need to develop global learning goals that would equip all students (regardless of their socioeconomic status or location) for college and beyond (Common Core Stare Standards Initiative, 2018).

The Common Core State Standards were, as Burks et al. (2015) termed, designed to be "real-world learning goals" to prepare students to be successful in school as well as in a career (p. 254). Computerized assessments were also included in the CCSS. Thus, schools had an additional challenge—technology. The students needed to be able to navigate through a technological platform. This presented many issues to students, teachers, and administrators. The technology challenge was bigger than just equipping every student with a computer or technology device. In fact, teachers had a new challenge of efficiently integrating instructional technology into every facet of teaching, from lesson design to assessments. As a result, many educators who were not proficient with technology had to view instruction through a new lens. Leaders were equally challenged to address the technological hurdles such as the infra-structure, curriculum, and a new mindset of the use of technology in education. Conclusively, the educational world would need to understand how to use various forms of technology as well as how to integrate them into the new national Common Core Standards. As a result of the new national standards, a theoretical framework was developed to guide and support educators in integrating technology into instruction

Technology: Theoretical Background/Framework

Shulman (2013) and Mishra and Koehler (2006) are responsible for the development of the framework for the use of technology to enhance content and pedagogy. First, in 1986 Shulman introduced the notion of content knowledge and pedagogical content knowledge in a speech to the American Educational Research Association emphasizing the importance of presenting the topic in a way that is easy to understand (Shulman, 2013). In 2006, a framework for educational technology was submitted by Mishra and Koehler utilizing Shulman's beliefs about content and pedagogical knowledge.

Shulman (2013) characterized content knowledge as the knowledge in the mind of a teacher and how it is organized. Further, he connected content knowledge and pedagogy, calling it pedagogical content knowledge. In addition, pedagogical content knowledge (PCK), as Shulman outlined, embodies several things. First, it is the teacher's ability to understand what conceptions and preconceptions students bring with them into the classroom in learning frequently taught subjects. Next, according to Shulman, the teacher must know which instructional strategies should be used to organize the student's understanding to support learning. Teachers' perceptions are that students do not appear before them as blank slates. In fact, students come with a wealth of knowledge and background experience to integrate into the new content. Chomsky (2000) supports the aforementioned statement in his assertion that the ability to ride a bicycle cannot be evaluated on the basis of aptness because elements of cognition are involved in the learning process of mastering that objective.

In 2006, a framework for educational technology was submitted by Mishra and Koehler utilizing Shulman's (2013) beliefs about content and pedagogical knowledge. After 5 years of research focusing on teacher development using Shulman's pedagogical content knowledge as a foundation, Mishra and Koehler (2006) added their concept of teachers integrating technology into their pedagogy, thereby proposing three main components that worked in conjunction with each other—rather than separately—to produce an effective teaching model. Finally, technological knowledge, pedagogical knowledge, and content knowledge (TPACK)—the framework for designing lessons to enhance content and pedagogy using technology—was established.

Gomez (2015) asserted that TPACK provided educators a conceptual framework to effectively utilize technology in instruction. Additionally, TPACK helps educators look at instructional technology from a new and different perspective. TPACK shows educators how technology in education is not a separate entity but is interrelated with pedagogical knowledge and content knowledge.

Enhance Learning

Flair (2013) emphasized that using electronics and digital tools enhance student learning. First, students enjoy using technology, and it can provide them with greater learning experiences. For example, a student can physically manipulate shapes and angles on an iPad to help gain a better understanding of a mathematical concept. Next, Flair asserted that through manipulating a model of an atom in science, a student can better understand the concept being taught. Therefore, the use of electronic devices is a way to enhance student learning. As a result, instructors are using technology with visuals to bring abstract ideas to life, thereby giving meaning to assist learning.

Students understand digital learning and technology better than many of their teachers because they use smartphones, computers, tablets, iPods, and other devices daily. Bergman and Sams (2012) stated, “When technology is used, we are speaking their language” (p. 20). According to Jackson (2015), people born into the digital culture, familiar with technology and use it from the day they are born, are digital natives. In addition, Hsu (2016) suggested that through higher level technology use, students will grow intellectually instead of just acquiring isolated technology skills. He further maintained that in using high-level technology, students will have enhanced learning experiences across the curricula.

The requirements of a universal society in the 21st century necessitate a workforce that possesses digital literacy skills. Technology has brought the world digitally closer together, creating a globally accepted need for a digitally literate workforce that can collaborate across cultural boundaries and find creative solutions to problems, thus creating a need for updated teaching and learning practices (Metcalf & Fenwick, 2009). Additionally, modern educational technology broadens the educational base by allowing classes to be delivered remotely (Flair, 2013). Consequently, universities are using technology such as Skype to have guest professors give lectures from a different location to students. This advance in technology provides the opportunity for students in poor areas to access to learning opportunities and acquire digital skills that were once not available to them (Flair, 2013).

Designing Lessons Integrating Technology Across the Curriculum

Research by Dilworth et al. (2012) showed that technology is changing the way students learn, providing them with opportunities to understand concepts in more meaningful ways. However, growth in understanding will only take place if teachers learn to use technology effectively. Although everything in education is rapidly moving to technology, there are still many teachers who are not prepared to design lessons that are technology based. Hartshorne, Ferdig, and Dawson (2005) noted the need to develop programs to prepare all teachers to use technology effectively in lesson design. In the same way, the accelerated technology use in daily life demands that education keeps up with the pace. Also, in support of the need for teachers to update their skills, Onal (2016) reported that student learning is changing because of advanced technology, causing a need for teachers to upgrade their expertise.

Teachers lacking in technological knowledge and skills are not the only significant barriers in lesson design to integrate instructional technology. Another barrier to consider is teachers' beliefs. As Hew and Brush (2007) noted, a teacher's beliefs may include pedagogical beliefs as well as his or her beliefs about technology. Therefore, using instructional technology requires instructors to view teaching in a new and different way. For example, educators need to consider learning to use the tools of the digital natives they teach to create a student-centered, learning-rich environment using technology. Hew and Brush also put forth that insufficient technological skills, the inability to effectively use technology, and skills and difficulty in handling classroom management relative to technology are significant obstacles to integrating tech into the classroom. Therefore, all of the aforementioned things pose significant barriers to designing lessons to integrate instructional technology across the curriculum.

Technology Across the Curriculum to Teach Core Subjects

The United States has a high percentage of ELLs. According to the 2013-2014 report of the National Center for Education Statistics (NCES), at least 10% of students in public schools in six states (New Mexico, Texas, Alaska, Colorado, Nevada and California) were ELLs, and California had the most ELLs of all six states with 22.7%. According to Ed-Data Educational Data Partnership (n.d.), rural Tulare County farming communities in California reported a higher average of ELLs during the 2013-2014 school year than the state. For example, Alpaugh School District in the southwestern part of the county had a 33.7% ELL population. Additionally, in southern Tulare County, Earlimart Elementary School district had 73.4% ELLs, and Pixley Elementary had 74.4% ELLs. Not only are these students placed in core classrooms, but they are also expected to achieve academically.

Instructional technology is being implemented across the curricula to support various aspects of student learning. For instance, Rance-Roney (2010) reported that an engaging way to assist ELLs in English language acquisition in the class is to combine telling stories with any of a number of multimedia tools such as audio, video, and animation. This is an example of pedagogical skills. PowerPoint with animation is also being used to teach English and math. For example, teachers are using technology to teach math lessons illustrating angles of objects in the real world. Additionally, digital ecosystems afford gifted students a chance to actively participate with a variety of technology applications (Besnoy, Dantzler, & Siders, 2012).

Technology for Formative Assessment

Technology is also a useful tool in education for assessments. Specifically, its use for formative assessment provides teachers, students, parents, and administrators with rapid feedback. According to Shirley and Irving (2014), the feedback enables instructors to make instructional decisions regarding future lessons. For example, an educator can determine which standards students are successful in and which ones may need to be retaught. Similarly, Shirley and Irving asserted that data collected through technology enable the teacher to identify students who are ready for the next instructional step as well as students who need individual assistance. They also allow students and parents to see areas of strength as well as areas in need of improvement.

Obstacles to Technology Integration

Researchers agree that technology is valuable in supporting student achievement but note that barriers exist in integrating technology into daily practice. For example, Hew and Brush (2007) listed unavailability and accessibility of technology, adequate system support, and time as contributing influences. First, as Karagiorgi (2005) claimed, technology availability includes not only computers but the auxiliary devices and software needed. Next, teaching staff need time to plan and research material for technology integration into their lessons. Teachers may not have the extracurricular time to incorporate technology, asserted Kelly (2015). Finally, technical support is a concern for teachers using technology in the classroom, and as Hew and Brush (2007) expressed, teachers must have adequate technical assistance with various forms of technology.

Researchers also identify the level of technical skill, training, and experience as obstacles to integrating technology. According to Hew and Brush (2007), some educators lack the expertise to use instructional technology. Therefore, instructors skilled in technology often assist other employees with its use. For example, technology-savvy teachers are often the "go to" staff members for other personnel (Kelly, 2015). Although they are viewed as school leaders on technical issues, many times they do not understand their colleagues' challenges with technology. Another problem in technology integration is teachers' experience with technology. As Ertmer (2005) asserted, experience drives teachers' beliefs in their capacity for integrating technology into the lesson design. Moreover, negative experiences become a barrier to a teacher's ability to use technology in instruction (Kelly, 2015).

Gap in Research

In a review of the literature, there are several areas that represent gaps in research. First, Hew and Brush (2007) stressed the importance of further examination of potential obstacles in integrating instructional technology. For example, they expressed that there is a need for further research on technology use where it is incongruous with a subject culture. Next, Ertmer (2005) asserted that there has been little research on how teachers' pedagogical beliefs influenced their use of technology—another area showing a gap. Additionally, An and Reigeluth (2012) suggested that there is an abundance of literature regarding the integration of technology, conversely there is a limited amount of literature on the integration of student-centered technology. These are some of the areas where the literature review suggests gaps in research may exist.

Statement of the Research Problem

According to Hew and Brush (2007), technology integration is basically viewed as using technology in education for the purpose of teaching or disseminating information. In addition, the use of instructional technology has been added to many states' teacher evaluation rubrics, noted Kopocha (2012). Moreover, Kelly (2015) added several pertinent points to the conversation. First, teachers were being evaluated without the benefit of time for proper planning and training to incorporate technology into their lessons. Next, the teachers were being excluded from the decision-making and implementation process of technology integration. However, because policy affects more individuals than just teachers in a school district, all parties should work together. Finally, Kelly illustrated that there are educators with varying degrees of technological knowledge and skills—many teachers have expertise in using technology as well as incorporating it into their classrooms and curricula. As a result, they are usually the person their colleagues (and students) go to for assistance when they encounter a technology problem.

Many studies accept technological knowledge, pedagogical knowledge, and content knowledge (TPACK) as the framework established for designing lessons to enhance content and pedagogy using technology; however, there are many scholars unfamiliar with TPACK. Gomez (2015) claimed that TPACK has given people in academia a theoretical instrument for understanding what is required to teach effectively with technology.

Purpose Statement

The purpose of this qualitative study was to identify and describe the impact of instructional technology on lesson effectiveness and obstacles to incorporating instructional technology into lesson design as perceived by elementary school teachers.

Research Questions

Central Question

What is the impact of instructional technology on lesson effectiveness and obstacles to incorporating technology into lesson design as perceived by elementary school teachers?

Subquestions

1. What is the impact of instructional technology on lesson effectiveness as perceived by elementary school teachers?
2. What is the impact of instructional technology on obstacles to incorporating instructional technology into lesson design as perceived by elementary school teachers?

Significance of the Problem

This research will contribute to existing literature regarding the impact of instructional technology on teachers' perceptions of lesson effectiveness and obstacles to incorporating technology into lesson design. The study's intent is to research areas of gap in the literature regarding how instructors view achievement of objectives and target problems using instructional technology and what they perceive as barriers.

The CCSS of 2009 require that students have the necessary technological skills to take the computerized assessment (National Governor's Association, Council of Chief State School Officers, 2010). Therefore, educators need to know how to use various forms of technology, as well as know how to integrate it into their daily lesson. As Onal (2016) asserted, student learning is changing because of advanced technology causing a need for teachers to upgrade their expertise. In addition, Ertmer (1999) claimed that although teachers recognize the importance of integrating technology into the curricula, they at times encounter barriers that limit their efforts.

In a review of literature, Hew and Brush (2007) noted teachers' beliefs and collaboration to create technology-integrated lesson plans as gaps in research. Additionally, Ertmer (2005) expressed that teachers' pedagogical beliefs are important factors in technology integration. Ertmer, Ottenbreit-Leftwich, Sadik, Sendurur, and Sandurur (2012) also maintained that state assessments posed a barrier and impediment to teachers adopting new teaching practices.

This study is important in terms of providng educational leaders and instructors with better insight into how to address obstacles encounteed when integrating instructional technology and the problems faced in incorporating it into lesson design, thereby supporting improved student achievement.

Definitions

California Assessment of Student Performance and Progress. Beginning with the 2013-2014 school year, the CAASPP became the new student assessment system in California, replacing the Standardized Testing and Reporting system (STAR; California Assessment of Student Performance and Progress [CASPP], 2016).

Digital immigrants. Adults who embraced the use of technology (Prensky, 2001).

Digital natives. Digital natives are people born into the digital culture, familiar with technology, and who use it from the day they are born; they are digital natives (Jackson, 2015).

Elementary Schools. Kindergarten through eighth grade are the elementary schools represented in this study (California Department of Education, 2018).

English language learners (ELLs). English learner students are those students whose primary language in the home is a language other than English; they have not passed the age-appropriate state competency assessment for English (California Department of Education, 2018).

Pedagogical content knowledge (PCK). It includes teachers' understanding what knowledge, conceptions, or misconceptions students bring and which instructional strategies to use to bring meaning (Shulman, 2013).

Technology integration. The use of computing devices such as desktop computers, laptops, handheld computers, software, or Internet in schools for instructional purposes (Hew & Brush, 2007).

Technological knowledge, pedagogical knowledge and content knowledge (TPACK). The conceptual framework for educational technology built on Shulman's pedogagogical content knowledge formula and adding teachers' integration of technology into their pedagogy or method of teaching (Mishra & Koehler, 2006).

Delimitations

To gain a greater insight into the impact of instructional technology on teachers' perceptions of lesson effectiveness for students in rural agricultural areas, the population was delimited to schools in rural Tulare County.

Organization of the Study

This study was organized into four chapters, references, and appendices. Chapter I contained the introduction to the study. Chapter II provides the background and a review of the literature regarding the impact of instructional technology on elementary school teachers' perceptions of lesson effectiveness and obstacles to incorporating instructional technology into lesson design. Chapter III explains the research design and methodology of the study, including the population and sample, instrumentation, and data collection and analysis procedures. Chapter IV presents the results of the data collected and an analysis and discussion of the findings of the study. Chapter V contains the summary, findings, conclusions, and recommendations for further research.

CHAPTER II: LITERATURE REVIEW

The digital age presents new challenges as well as new opportunities for educators. One of the greatest instructional challenges the United States is faced with is preparing students to successfully compete in the high-tech global society of the 21st century. This chapter gives a historical background on the development and the use of technology in instruction across the 20th century. In addition, it explores the purpose of the use of instructional technology in education. Throughout this research, instructional technology will be synonymous with technology in the context of instruction. Moreover, technological pedagogical content knowledge (TPACK) is the theoretical lens used to examine the impact and obstacles of integrating technology in elementary K-8 schools. A literature matrix was used in synthesizing and assessing the primary focus areas (see Appendix A). The literature review establishes the basis for the ensuing study.

Instructional Technology History

Technology for instructional purposes in the United States was used as early as the first part of the 20th century. Reiser and Dempsey (2017) stated that "early definitions of the field of instructional technology focused on instructional media—the physical means via which instruction is presented to learners" (p. 1). In 1910, as Saettler (1986) asserted, the Rochester, New York, public schools was the first school system to adopt one of the first instructional media educational films made for classroom use. Following the New York schools' adoption of instructional media, the Chicago schools developed a visual education department in 1917 (Cuban, 1986). During the visual instructional movement (start of the 20th century through the 1920s), public schools started to use films, lanterns, slides and pictures more frequently in instruction (Reiser &

Dempsey, 2017). Subsequently, by 1931, 25 states had instructional media units devoted to films and related media in their educational departments (Cuban, 1986).

From the late 1920s through the 1940s, the influence of advancements in media (sound recordings, radio, and motion pictures with sound) created a change in the focus from visual instruction to audiovisual instruction, and that trend was still active in the 1950s (Reiser & Dempsey, 2017). During the latter part of the 1930s, the radio was viewed by audiovisual enthusiasts as the instrument for revolutionizing education (Reiser, 2001a). However, by 1945, the popularity of the radio in the classroom had decreased (Cuban, 1986). In addition, during World War II, audiovisual instruction declined in the schools but increased in the military. As Reiser (2001a) stated,

> During the war the United States Army Air Force produced more than 400 training films and 600 filmstrips, and during a two-year period (from mid-1943 to mid-1945) it was estimated that there were more than four million showings of training films to United States military personnel. (p. 56)

The use of instructional television grew throughout the 1950s. According to Reiser (2001b), "This growth was stimulated by two major factors: (a) the setting aside by the Federal Communications Commission of educational channels, and (b) Ford Foundation funding" (p. 58). In 1962, President John F. Kennedy also obtained a $32 million appropriation from Congress for the development of classroom television (Cuban, 1986). This led to the tremendous growth in the number of educational television stations in the United States (Reiser, 2001a). Educational television stations grew to a magnitude of more than 50 stations by 1960 (Blakely, 1979). However, the use of instructional television started to wane during the mid-1960s (Reiser, 2001a).

The next technological innovation in education was the computer. As reported by Reiser (2001a), in the 1950s, IBM developed a computer-assisted instruction (CAI) program, one of the first of its kind used in the public schools. In the late 1970s, Apple II computers also started to be used in the educational system (Petrina, 2003). Additionally, in 1980, IBM (lagging in the personal computer market) enlisted the help of Microsoft to develop software (PC-DOS) for the personal computer they unveiled in 1981 (Isaacson, 2014). As asserted by Isaacson (2014), Apple released the user-friendly Macintosh personal computer in 1984 with a mouse pointer, innovative windows environment, and graphical user interface. Subsequently, during the 1980s, many high school computer labs were equipped with computers that used DOS and later Microsoft's Windows operating system (Flair, 2013). By 1983, in the United States computers were being used in a large number of elementary schools and in an even greater number of high schools (Center for Social Organization of Schools, 1983).

Many people embraced the microcomputers because they were economical, small, and offered the same basic features of the larger cumbersome machines (Reiser, 2001a). For example, students could perform a range of feats on the microcomputer ranging from word processing to spreadsheet calculations (Flair, 2013). In addition, educational software for content-specific areas was developed during the 1980s, thereby enabling instructors to teach subject matter in new and interesting ways (Solomon, 2015). Thus, increased advancement in the Internet, computers, and various forms of electronic devices following 1995 heightened the focus on using instructional technology in the classroom (Reiser, 2001a). As Papert (1984) concluded, a radical change was taking place in the educational system, sparked by the computer.

Moving into the 21st century, educators faced new and increased challenges in the use of instructional technology. As Collins and Halverson (2009) asserted, the main challenge was whether public schools can adapt to and incorporate the new power of technology-driven learning. Collins and Halverson also claimed that the "Information Revolution" or the "Knowledge Revolution" of the 21st century empowers people to pursue their own interests or goals through access to personal computers, cell phones, video games, the Internet, and other forms of media (p. 4). The more affluent provide their children with access to more advanced methods of technological instruction (through private venues) than what is available in the public school setting (Collins & Halverson, 2009). Therefore, the pressing challenge for 21st century educators in the public school system is to ensure equitable access to technology and quality technology-driven instruction for all learners.

At the beginning of the 21st century, the iPad was introduced into many school districts as a digital tool for student use. However, the introduction of the low-priced Chromebook in 2013 caused a decline in the purchase of iPads for educational purposes (Shaffhauser, 2015). Some school districts were looking for student devices with capabilities comparable to those of the teacher devices. Shaffhauser (2015) asserted that the Chromebook offered students an environment conducive to creative thinking, communication, and collaboration—21st century learning objectives. Many teachers use Google applications; Chromebooks also offer Google applications for students. Thus, Chromebooks are a reasonable economical choice for many school districts. The affordability of technological devices results in greater access to digital tools for all students.

Purpose of Instructional Technology in Education

Prepare Students to Compete Globally in the 21st Century

At the VII Glion Colloquium in Switzerland, Thomas and Brown (2009) depicted the 21st century as a time of continuous change. In addition, Gliksman (2015) contended that the fuel that feeds the extreme exponential changes of the 21st century is technology. The extremely rapid changes taking place in the world today affect the type of skills students will need to possess upon graduation (Gliksman, 2015). Therefore, as Collins and Halverson (2009) claimed, educational practices must adapt to prepare students for the changing world they are entering.

According to Burks et al. (2015) the Common Core State Standards (CCSS) of 2009 are learning goals that connect students to the real world and equip them to succeed in higher education, career, and life. Also, the California CCSS computerized assessments add the need for instructional technology in education. As Gliksman (2015) asserted, the technology revolution is altering all of the educational paradigms. Similarly, Collins and Halverson (2009) claimed that technology improves the quality of education for students and should be embraced by educators to help change the structure of the educational system. The CCSS align with the paradigm shift in education, and as Burks et al. (2015) affirmed, both those who support the Common Core and those who oppose it embrace its main objective of equipping students to be adept contenders in the constantly changing global community of the 21st century.

Real-World Learning Goals

It is important to have technology standards and learning goals germane to 21st-century global demands for students and teachers using technology in their instruction.

Ottenbreit-Leftwich and Brush (2018) stated, “In K-12 education, common standards for students are important in order to delineate a baseline by which to assess student progress toward meeting developmental goals” (p. 177). Ottenbreit-Leftwich and Brush further asserted that the International Society for Technology in Education (ISTE) identifies six overarching standards for students to accomplish to be technology literate: “(1) creativity and innovation, (2) communication and collaboration, (3) research and information fluency, (4) critical thinking, problem solving and decision making, (5) digital citizenship, and (6) technology operations and concepts” (p. 177).

These standards are reminiscent of the goals of the CCSS for supporting student acquisition of knowledge through higher order thinking skills to equip them to be successful in a world economy and society (Common Core State Standards Initiative, 2018).

Creativity and Innovation

Tom Torlakson, California State Superintendent of Public Instruction, asserted that the CCSS for math and literacy address the need for students to meet 21st-century challenges through creativity and innovation (Common Core State Standards [CCSS], 2013). Similarly, the International Society for Technology in Education (ISTE) stated, that students can exhibit creative thinking, knowledge construction, and develop novel creations with the use of technology (Williamson & Redish, 2009). Thus, the CCSS goals and those of the ISTE are in alignment when speaking of real-world learning goals that will support student success in the 21st century.

Communication and Collaboration

The ISTE maintains that students use digital media and environments to communicate and work collaboratively. As Banks, LaFors, and Brown (2015) pointed out, the CCSS also emphasizes student communication coupled with collaboration in their learning environments. Again, agreement between the two standards can be seen.

Research and Information Fluency

The goals for research and information fluency for the CCSS and the ISTE mirror each other. The ISTE standards assert that students can utilize digital tools for gathering, evaluating, and synthesizing information (Williamson & Redish, 2009). Correspondingly, the CCSS (2013) pointed out that students should employ research and technology to examine the vast amount of information available to them and use it in both oral and written applications.

Decision-Making, Critical Thinking, and Problem-Solving

Under the CCSS, rote learning and memorization are replaced with students' learning the art of critical thinking, problem-solving, and decision-making (Children Now, 2015). For example, in mathematics, students analyze, hypothesize, and create solutions rather than leaping to unfounded conclusions (CCSS, 2013). In like manner, ISTE stressed the importance of utilizing critical-thinking skills to solve problems through research employing technological resources to help students arrive at informed conclusions (Williamson & Redish, 2009).

Digital Citizenship

ISTE standards for digital citizenship state that students need to comprehend cultural, human and societal issues pertaining to technology exemplifying the highest standard of legal and ethical behavior (Williamson & Redish, 2009). As Holzweiss (2014) pointed out, students can utilize a variety of web tools to enhance their learning in conjunction with the CCSS and the ISTE standards. Holzweiss further emphasized that as educators integrate technology into their lesson plans and assessments, students will develop digital citizenship and technological and interpersonal skills in addition to acquiring a knowledge of the standardized curriculum.

Technology Operations and Concepts

Collins and Halverson (2009) claimed that the present paradigm shift in knowledge is powered by technology that fuels the mind more so than the body. Collins and Halverson (2009) further stated, “Technology can provide the support for students to tackle complex problems” (p. 28). In addition, Tucker (2012) stated that CCSS necessitate student collaboration and interaction to create and publish written works using technology. The ISTE standards also emphasize that students exhibit a sound knowledge of technological systems, ideas and operations (Williamson & Redish, 2009). Thus, both the ISTE standards and the CCSS necessitate that students possess a degree of proficiency in technology operations as well as in academic concepts.

Computerized Assessments

Adoption of the CCSS presents educators with additional challenges—computerized assessments. As Swanson and Piehle (2013) asserted, the introduction of the CCSS creates a need to develop new assessment methods. What is more, the use of computerized assessments requires that students possess adequate skills to navigate through technological challenges they encounter on the test. Gullen (2014) affirmed that a wide range of students may experience frustration because they lack the technological skills to successfully navigate through the computerized assessment. Gullen also asserted that many digital natives also lack basic skills needed for successful online test taking, such as navigating a cursor, dragging text, and keyboarding. Conclusively, the CCSS's computerized assessment requirement is a precursor to instructional technology in the classroom.

Need for Teacher Proficiency in Use of Technology in Instruction

According to Morrison and Lowther (2000), instructors should use what they know about technology and how students learn to create student-centered learning spaces. Additionally, Johnson (2003) argued that technology should add to content value and enhance learning rather than just entertain. Thus, instructors not only need to be proficient in technology use but must also know how to facilitate student learning. The teacher as facilitator also needs to understand how to provide a resource-rich environment and guide students through the learning process rather than just give them the information. Therefore, being proficient in the use of technology involves more than just understanding technological functions. Reiser and Dempsey (2017) emphasized the importance of the instructor's familiarity with the use and functions of the various technological components (both software and hardware) when utilizing instructional technology. Similarly, Janssen and Lazonder (2016) stated that providing student teachers with training specific to the effective use of technology in instruction might foster more effectual use of technology in their lessons. Reiser and Dempsey (2017) further noted, "Because technology is constantly updating, teachers need continuous professional development to keep their knowledge updated" (p. 181).

Furthermore, according to Mehta, Henriksen, and Rosenberg (2019), teachers need to develop a creatively focused, technology fluent (CFTF) mindset. Rather than depending on "canned" programs, teachers should experiment with new technologies to learn how to boost their own creativity. In turn, the teachers will have an increased level of confidence in her or his ability to independently integrate various forms of technology into her or his lesson design. Substantiating this premise, Mehta et al. (2019) put forth, "In a world where technologies are always changing, building a more general sense of confidence for the new may be even more valuable than directly learning tools that may be gone tomorrow" (p. 67).

Correlating with the premise of building confidence in teachers, Bruner (1996) asserted that teachers develop a sense of confidence as they step out of their comfort zone and successfully navigate through unfamiliar technology. Mehta et al. (2019) correspondingly put forth that teachers learn as they see and hear the information, interact and experiment with the new technology, and most importantly, experience technology in a way that will be integrated into their lesson design.

In the article "To Stem Teacher Burnout, Go Digital," Tucker (2018) suggested that to promote the engagement of students in technology, teachers need to play the role of a facilitator. As teachers, "We feel pressure to do it all" (Tucker, 2018, p. 1). Teachers must work smarter by letting go and creating a collaborative relationship with their students in technology. Tucker also suggested that students learn more and feel greater ownership of their learning when they initiate their own learning. According to Tucker, the following activities must be followed to create greater collaboration between students and teachers:

1. Have students direct the work.
2. Form partnerships with students.
3. Simplify student assessment and feedback process.
4. Share student work with parents through digital platforms.
5. Establish professional online learning groups.

In addition to the teacher's and students' roles in developing student-centered classrooms, the school leaders must provide support in teaching strategies to infuse technology into the lessons. This professional learning must be part of the scenery and not a one-time event. This continuous support must give teachers an opportunity to experiment and iterate with the integration of technology into lesson design.

Technology: Theoretical Foundations

The increase in availability and use of technology in instruction for the K-12 settings requires educators to seek out and use the most effective methods for integrating these tools and resources into instruction (Ottenbreit-Leftwich & Brush, 2018). Various theorists have contributed to the theoretical foundation for using technology meaningfully in teaching. Many view technology as a change agent. Culp, Honey, and Mandinach (2005) noted that numerous publications forcefully support the claims of the ability of technology to effectuate transformation in the quality of learning and instruction, and that change is inclined to move toward a learning-based inquiry and away from a lecture format. Additionally, Culp et al. (2005) asserted that digital tools provide greater potential for impacting the learning environment and instructional practices while creating a more flexible, challenging and engaging atmosphere.

Young and Bush (2004) explained that teaching practices and methods should be the catalyst for adopting instructional technology that will create a positive impact on the overall teaching and learning environment. Therefore, teachers must first consider pedagogical goals when considering integrating technology (Young & Bush, 2004). In addition, when integrating instructional technology, Young and Bush stated it should be done with careful consideration and planning that address the specific purpose, possible effect on instruction, students and desired outcomes. Keengwe, Onchwari, and Wachira (2008) concluded that to realize the total benefit of technology in education, the expertise of a highly qualified instructor is key to strategizing planning and effective implementation.

The U.S. Department of Education (2004), indicated that often in smaller school districts where technology is being used to change curricula, innovative teaching designs are starting to appear. There are several models that focus on effective integration of instructional technology in the classroom. Further, Ottenbreit-Leftwich and Brush (2018) asserted that according to the literature, the most frequently used models are the substitution, augmentation, modification, redefinition (SAMR) model and the technological, pedagogical, and content knowledge (TPACK) model. As Ottenbreit-Leftwich and Brush (2018) stated, “Both focus mainly on the teacher—that is, areas a teacher should consider in order to effectively integrate technology to support instruction” (p. 176).

Substitution, Augmentation, Modification, Redefinition (SAMR)

The SAMR model, though not represented in the existing literature, continues to gain popularity in the field of technology in instruction (Hamilton, Rosenberg, &

Akcagolu, 2016). Hilton (2016) explained that Dr. Puentedura's SAMR design, which became well-known during late 2012, has provided a framework to help teachers integrate new technology into their instructional practices. In addition, Cummings (2014) asserted that the SAMR model is designed to accommodate both student and staff acquisition of proficient technology use, thereby promoting 21st century skills. Furthermore, Hamilton et al. (2016) stated that the model emboldens teachers to elevate from lower levels to higher levels of instruction using technology, which according to Puentedura, results in an increased learning and teaching exchange.

Puentedura's SAMR model is defined by Hamilton et al. (2016) as a four-level method for K-12 selection, use, and evaluation of educational technology. Additionally, Hilton (2016) explained that SAMR is separated into four distinct functions that are organized under two categories: enhancement and transformation. Subsequently, substitution and augmentation come under enhancement, meaning that technology is used for improving or replacing devices that already exist in the learning exercise. Whereas, with redefinition and modification (under transformation) the door is open for cutting-edge learning possibilities (Kirkland, 2014).

Despite its increasing popularity, differing opinions exist on the use and merit of the SAMR model. For example, Hilton (2016) claimed that SAMR provides teachers with one approach to consider in integrating technology into instruction. On the other hand, Hamilton et al. (2016) identified three challenges of the SAMR model: (a) no theoretical explanation in the peer-reviewed literature, (b) limited links to theory and research, and (c) scant quantitative or qualitative backing of the differentiation of levels. Hamilton et al. (2016) also noted that the lack of definitive theoretical support for the

SAMR design might cause educators to represent and interpret SAMR differently as it relates to technology use in instruction.

Technological, Pedagogical, and Content Knowledge (TPACK): Theoretical Framework

The concept of content knowledge (CK) and pedagogical content knowledge (PCK) was introduced by Shulman (2013) in a speech to the American Educational Research Association in 1986 as the method in which subject matter is denoted and articulated so that it can be understood by others. In addition, CK was represented as the degree of knowledge coordination in the teacher's mind. Building on the basis of CK, Shulman stated, "A second kind of content knowledge is pedagogical content knowledge, which goes beyond knowledge of subject matter per se to the dimension of subject matter knowledge for teaching" (p. 9). Subsequently, the intersection of CK and PK, introduced by Shulman, became the theoretical building blocks for Mishra and Koehler's TPACK framework (Gomez, 2015).

In 2006, after 5 years of research, Mishra and Koehler stated, "In this article we propose a conceptual framework for educational technology by building on Shulman's formulation of 'pedagogical content knowledge' and extend it to the phenomenon of teachers integrating technology into their pedagogy" (p. 1017). Archambault and Barnett (2010) reported that Mishra and Koehler (2006), notwithstanding the problems with the inceptive framework, expanded on PCK by adding the important element of technology, thereby creating the technological pedagogical concept (TPACK). TPACK is represented as three overlapping circles of knowledge: technology, pedagogical, and content (Reiser & Dempsey, 2017). Another essential point Reiser and Dempsey (2017) made was that the three circles overlap, creating seven distinct constructs of knowledge: (a) CK, (b) PK, (c) PCK, (d) TK, (e) TCK, (f) TPK, and (g) TPCK.

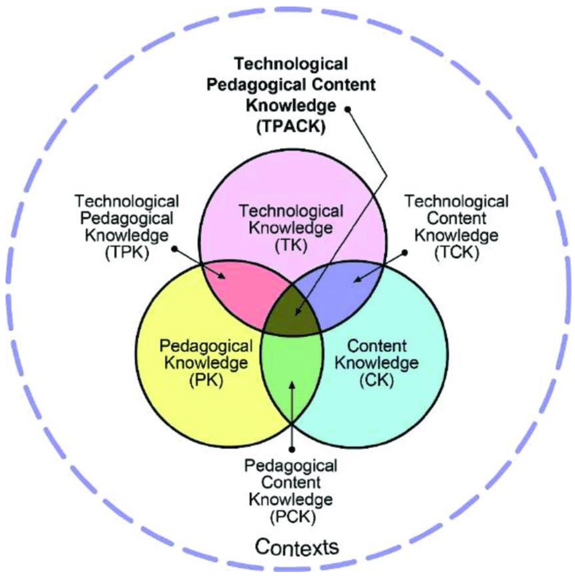

Figure 1. Constructs of knowledge. From "Revisiting Technological Pedagogical Content Knowledge: Exploring the TPACK Framework," by R. M. Archambault and J. H. Barnett, 2010, *Computers & Education, 55,* 1656-1662 (https://doi.org/10.1016/j.compedu.2010.07.009).

Mishra and Koehler (2006) outlined the importance of elements and relationships in their proposed framework as stated below:

Content knowledge (CK). CK is the educator's understanding of the material that is to be taught or learned. The content taught in an elementary school English class differs from that taught in a high school algebra class. Thus, teachers must be well versed in the theories, important concepts and practices inside the realm of their concern and possess a practical understanding of other fields of learning. Teachers could easily disseminate incorrect information to their students if they are not knowledgeable in the other various areas of instruction.

Pedagogical knowledge (PK). PK is a thorough understanding of educational practices and how it includes overall learning objectives. This is a general knowledge that encompasses classroom decorum, lesson planning, instruction, learning, and evaluation. PK includes knowledge of mediums and strategies to be used to instruct and to measure learning for a particular group. Pedagogical knowledge includes cognitive, developmental learning theories and their application in an instructional setting.

Pedagogical content knowledge (PCK). PCK includes understanding instructional strategies that utilize visual, kinesthetic and auditory means to clarify misconceptions in learning. Teachers know how to arrange various components of the content and which instructional techniques to use to bring clear concise meaning for the students. PK involves the theory of knowledge, awareness of students' prior knowledge, developing and representing concepts and teaching techniques. It also includes knowledge students bring to an instructional situation that may impede or enhance learning. This student knowledge includes learning strategies, prior conceptions or misconceptions they have about a certain area.

Technology knowledge (TK). TK includes regular technologies like whiteboards, dry erasers, and textbooks. It also includes cutting edge technologies like digital video and the Internet. TK also embodies an adeptness for operating certain technologies. It also includes the ability to install and remove software and peripherals, as well as create and file documents. Technology constantly changes necessitating the need for educators to adjust to and stay abreast of the iterations.

Technological content knowledge (TCK). TCK refers to what is known about the reciprocity of content and technology. Instructors must know the material they teach and how it can be affected by using technology. For example, virtual reality programs allow students to interact in a three-dimensional environment in a seemingly real or physical way, whereas another program may just allow them to manipulate objects. Virtual reality technology adds another dimension to student learning.

Technological pedagogical knowledge (TPK). TPK is having an awareness of the different technological components and their potential when used in education. It also includes being aware of how instruction can change due to using certain technologies. Additionally, TPK includes being aware of various devices and methods for taking attendance, inputting grades, and keeping various types of class records, and knowledge of technology-based forums such as chat rooms and discussion boards.

Technological pedagogical content knowledge (TPCK). TPCK is a developing form of knowledge that surpasses content, pedagogy, and technology. It is the foundation for quality teaching using technology that necessitates the ability to comprehend the way concepts are represented through technologies, instructional strategies that use technology constructively to teach content, knowledge of why concepts are easy or hard to grasp, and how to use technology to address challenges students encounter. Additionally, TPCK is based on understanding students' previous knowledge, theories of knowledge, and knowing how to use technology to expand existing knowledge to develop new learning theories.

Hilton (2016) referred to TPACK as a framework created to unify components of pedagogy, content and technology in a way to enable teachers to create and present powerful technology-filled instruction. In addition, Gomez (2015) noted, "The technological pedagogical content knowledge (TPACK) conceptual framework, since its introduction in 2006, has provided researchers and educators a theoretical means by which to understand the knowledge required to teach effectively with technology"

(p. 278). However, Archambault and Barnett (2010) cautioned that although TPACK is gaining popularity in practitioner and researcher groups, more work still needs to be done in ascertaining how the disciplines relate.

Avoiding a tunnel vision approach, Mishra, Koehler, and Henriksen (2011) asserted that educators need to go beyond the content and realign instruction to concentrate on such higher order learning procedures as critical thinking, versatility, creativity and inquisitiveness. In order to prepare students for the challenges they will encounter in the 21st century, educators need to revamp learning structures. Mezirow (2000) spoke to this issue in his transformative learning theory wherein he called for learners to approach ideas from a completely new perspective or to even reconsider prior knowledge.

Mishra et al. (2011) expressed the importance of transdisciplinary knowledge, a type of knowledge that surpasses the disciplinary operations from which learners emerge and broadens their focus from looking for one specific answer to a process that combines multiple aspects or solutions. The transdisciplinary method looks for common things among the strategies and the thought processes of creative people in any given field (Mishra et al., 2011). Root-Bernstein and Root-Bernstein (1999) claimed that creative people such as composers, writers, artists, scientists, and mathematicians, at a given stage of the creative process, use "tools for thinking" (such as visualization, feelings of emotion, sensations of the body, analogies, and patterns that can be replicated).

Mishra et al. (2011) based their study on Root-Bernstein and Root-Bernstein's (1999) tools for thinking, proffering seven main cognitive skills that summarize the thinking of creative minds across a diverse number of fields. As stated by Mishra et al.

(2011), “These seven cognitive tools are: perceiving, patterning, abstracting, embodied thinking, modeling, play, and synthesizing” (p. 24). The seven tools make up a framework for interdisciplinary creativity and can be the foundation for the types of curricula essential to the “conceptual age” (Gardner, 2007). Mishra et al. (2011) used the transformative learning theory and transdisciplinary theory to form the foundation for connecting TPACK to transdisciplinary cognitive tools. Mishra et al. (2011) stated, “Here we describe each cognitive tool and offer examples of how each can be instantiated in a classroom context through appropriate, TPACK driven use of technology” (p. 25).

Cognitive Tools

Perceiving. This tool is a process that is two layered (observing and hearing) and is very important to the sciences and arts. Observing, a well-tuned skill, which gathers information through the five senses, is concerned with attention to, focus on, and curiosity about a given thing. For example, a musician may identify musical keys by sound; whereas, a wine connoisseur may use the sense of smell as well as the sense of taste to identify a type or vintage of wine. However, imaging requires being able to recall ideas, feelings, or opinions in the absence of external stimuli. People such as engineers, artists, and architects and law enforcement officers possess highly developed imaging skills which are crucial to their occupations.

It is possible with practice to refine imaging and observation, which will improve perception skills. Teachers can utilize various websites to design lessons that provide students the opportunity for development of perceptions skills. Websites such as Found Functions provide pictures of objects found in the real world along with corresponding graphs to enable students to make visual connections between the textbook abstract to the mathematical reality of actual objects found in the world. An exercise of this nature employs knowledge emphasized in TPACK's framework wherein technology's use is inextricably tied to pedagogy and content.

Patterning. Creative specialists are continuously participating in both recognizing and creating patterns. Distinguishing patterns require discerning a repetitious configuration or strategy in what seems to be a random positioning of things or procedures. The analytical segment of patterning is recognizing, whereas forming is the act of creatively developing new patterns. An example is an architect looking over land and using the patterns that appear in the landscape to design a building. He is identifying as well as creating patterns.

Instructors can be instrumental in assisting students in developing patterning skills both within and across disciplines. An example demonstrating a possible way in which the TPACK framework can be used in developing patterns in math as well as in music is using a software called trakAxPC. This freely available software allows users to download samples of music to copy and paste in a mixer. Students are able to cut the samples into smaller sound units and also rearrange them. The thing that is so riveting (from a TPACK standpoint) is that by manipulating the software, the students can explain and describe ratios, fractions, and percentages. Students can also creatively locate and construct patterns by connecting tempo and rhythm to math concepts. The components of TPACK represented in the above lesson represent just one of many possibilities. Pedagogy, technology, and content can be seamlessly woven into lesson design to support the development of students' patterning skills.

Abstracting. Creative people use abstracting to isolate a particular element of a process or thing to discover its intrinsic nature. For example, scientists extract excess features (texture, color, size, or shape) from physical situations to focus on essential aspects like mass or boiling point. Finding analogies of seemingly dissimilar things is an additional facet of abstracting. Scientists use analogical thinking the same as poets. This is demonstrated in the comparison Newton made of the moon to a hard-thrown ball that missed earth on its descent and went into orbit.

Students composing mathematical poetry demonstrate a creative form of abstracting. Creatively writing about mathematical themes requires an acute understanding of both mathematics and poetry. For students to take a mathematical idea and express it in a new or different way necessitates them completely understanding what the main idea is and translating it using analogies with rhetorical moves to create poetry. An additional example is students in a biology class using abstracting to create poetry and share it online. This demonstrates how pedagogy, technology, and content are coalesced to support transformative learning and facilitate abstracting and analogizing (transdisciplinary skills).

Embodied thinking. Embodied thinking is composed of two skills: empathetic thinking and kinesthetic thinking. The two components of empathetic thinking and kinesthetic thinking may each take a part (separately or jointly) in the way this skill operates. Kinesthetic thinking denotes thinking with the body, which includes the sensations of skin, muscles, and tendons, and the feelings of movement, tension, and balance in the body. An example of kinesthetic thinking is shown in Einstein’s thought experiments where he imagined himself being a photon and described what he saw and felt in his body. Empathizing is another vital part of embodied thinking—visualizing oneself in another person's position or having their feelings and thoughts. Actors must empathize with the role of the person they portray in order to depict them realistically to the audience.

Modeling. Modeling is representing something realistically or theoretically so as to study its composition, purpose, or nature. Architects often produce scale models of a project design before working on the real project. Modeling requires the use of abstractions, analogies, and dimensional thinking. Creative people use dimensional thinking to alter the scale of an object from a blueprint from two dimensional to three dimensional. Dimensional thinking along with analogies and abstractions is used in creating models of processes and things to describe the world realistically.

Teachers used portable die cutters to teach visualization and mathematics to young children as part of a project located at the University of Virginia. Students created 2-D cutouts that were then die-cut and changed into 3-D figures. Models depicting the major tectonic plates of the earth were designed and assembled using a tennis ball. These explorations combine the power of maneuvering digital bytes and bits with the physical aspect of atoms.

Deep play or transformational play. The outcome of innovative people playing with procedures, ideas, or things may produce advanced ways of thinking through unforeseen discoveries. Creative individuals in divergent disciplines play with boundaries, distinctions, impregnable truths, and the limits of possibility, and they are transformed through the playing. This is called deep play to make a distinction between it and everyday play. Deep play is creative, whereas everyday play may be superficial. Deep play attempts to establish advanced ways of being.

Online video games, puzzles, simulations, and interactive software provide students with opportunities to play with concepts, explore, and test solutions. This type of play is considered deep play because it is creative and seeks to develop new ways of understanding. When considering games for instructional purposes, their open-endedness must be considered.

Synthesizing. This cognitive tool unites all of the previously mentioned tools. Synthesizing requires that multiple ways-of-knowing are put together. When something is fully understood, the senses, feelings, experiences, and knowledge unite in a multifaceted, cohesive type of knowing. Intellectual and creative processes are very powerful when thinking and feeling are in sync; this is called synesthetic.

By combining the six habits of mind previously mentioned, synthesis permits the development of more in-depth connections between topics. Therefore, these methods of reasoning, and their examples, are not totally free of each other. For example, composing a poem involves pattern forming as much as it involves abstraction. The cognitive tools described herein work together in developing a synthesis that is greater than total of its parts.

Mishra et al. (2011) maintained that the cognitive tools that emerge from disciplinary practices are vital aspects of the transformative learning that needs to be achieved. Through an emphasis on transdisciplinary cognitive tools and the proper uses of technology, students will be empowered to learn with greater depth across the domains (Mishra et al., 2011).

Impact and Obstacles of Integrating Technology Into Elementary K-8 Schools

Researchers and scholars continue to examine the impact as well as the obstacles of integrating technology into education. According to Hsu (2016), expansive use of technology will augment students' experiences in learning throughout the curriculum, fostering intellectual growth of students instead of just supporting solitary technological skills. Additionally, Ottenbreit-Leftwich and Brush (2018) asserted that although research describes multiple ways technology can be used to impact education, the level of its use has room for improvement. Moreover, Hew and Brush (2007) affirmed that even though research indicates that instructional technology may boost student progress, there are some barriers that affect its use.

Impact of Instructional Technology on Teachers' Perceptions of Lesson Effectiveness

Based on the findings of Domingo and Gargante (2016), a wealth of research indicates that teachers perceive the impact of technology and the benefits of its use in the classroom as positive. Teachers also report that the use of technology produces an increase in student engagement in the classroom in general (Williams, Atkinson, Cate, & O'Hair, 2008). To elaborate, Williams et al. reported, "One teacher shared her belief that 'the technology is helping the students transfer their knowledge among the content areas and helping them make connections'" (p. 299). Domingo and Gargante's (2016) findings summarized teachers' perceptions of the impact of technology on student achievement as follows: "Providing new ways to learn, increasing engagement to learning, fostering autonomous learning, facilitating access to information, and promoting collaborative learning" (p. 22). Conclusively, research indicates that teachers view the effect of instructional technology on learning as positive.

Teachers' Perceptions of Obstacles to Incorporating Technology Into Lesson Design

Hew and Brush (2007) described six main barriers to incorporating technology into the lesson design in K-12 schools as follows:

- Resources (either not having the time and/or methods for gaining access to computer systems and inadequate system support)
- Knowledge and skills (inadequate expertise in the effective use of technology for instructional purposes and how to manage technology in the classroom)
- Institution (principals not understanding technology's role in more student-centered learning and school not allocating enough blocks of time for technology infused study)
- Attitudes and beliefs (what teachers feel and believe about using technology)
- Assessment (tests that carried serious ramifications, and possible anxiety arising from problems caused using certain technology that was not permitted in national exams)
- Subject culture (a "set of institutionalized practices and expectations which have grown up around a particular school subject and shapes the definition of that subject as a distinct area of study" [p. 231])

Internal barriers such as teachers' knowledge and beliefs regarding technology are found to be major challenges in technology integration. Hew and Brush (2007) expressed that some key barriers to integrating technology centered around a lack of particular expertise and mastery related to technology, technology management in the classroom and the dynamics of instructional technology on learning. Ottenbreit-Leftwich and Brush (2018) also stated that instructors should have common knowledge of how to operate software and hardware when incorporating technology, and how to use it to promote instruction and learning. As Ertmer et al. (2012) claimed, because of the speed in which technology grows and develops, even teachers proficient in technology feel there is still a lot about technology they do not know. Thus, teachers need to constantly improve on their technological skills and knowledge.

The attitudes and the beliefs of teachers are also a significant part of technology integration into the classroom. According to Ertmer et al. (2012), "Attitudes and beliefs of other teachers were perceived to be the most impactful barrier on students' uses of technology" (p. 428). For example, teachers make the decision regarding whether and how to use instructional technology in their classroom (Ertmer, 2005). Consequently, "It is important for teachers to believe the technology they are bringing into the classroom is useful and will add to the knowledge and experience of their students" (Kelly, 2015, p. 41).

Findings from this study will assist educators in better understanding how to incorporate technology into their lesson design and how to overcome obstacles in the technology integration process to facilitate optimal student outcomes. Thus, this research endeavors to identify and describe the effect of the use of technology in instruction through seeking out and probing into the impact of instructional technology on teachers' perceptions of lesson effectiveness and obstacles to incorporating instructional technology into lesson design. Conclusively, as educators and researchers continue to explore instructional paradigms to prepare students to successfully navigate through the digital highways of a high-tech global society, technology in instruction will be at the forefront. Therefore, the goal of this study is to identify and describe instructional practices that support or deter greater educational dividends through examining the impact of instructional technology on lesson effectiveness and obstacles to integrating technology into lesson design as perceived by teachers.

CHAPTER III: METHODOLOGY

Overview

Chapter III describes the methods and procedures used in this study to understand the impact of instructional technology on teachers' perceptions of lesson effectiveness and obstacles to incorporating instructional technology into lesson design. The purpose of the study and the research questions are presented, followed by a description of the research design. In addition, the population and sample for the study are discussed. Then, the instrumentation, reliability, and validity of the study are presented. This chapter also describes the data collection procedures and explains the scoring and evaluation of data. Finally, the chapter discusses limitations of the study and presents a summary.

Purpose Statement

The purpose of this qualitative study was to identify and describe the impact of instructional technology on lesson effectiveness and obstacles to incorporating instructional technology into lesson design as perceived by elementary school teachers.

Research Questions

Central Question

What is the impact of instructional technology on lesson effectiveness and obstacles to incorporating technology into lesson design as perceived by elementary school teachers?

Subquestions

1. What is the impact of instructional technology on lesson effectiveness as perceived by elementary school teachers?

2. What are the obstacles to incorporating instructional technology into lesson design as perceived by elementary school teachers?

Research Design

The research design selected for this study was a qualitative ethnographic method. As Patton (2015) asserted, qualitative research records real-life experiences of people in the real world in their own words, from their perspective, and from their setting. A qualitative design method was selected for this research to examine the lived experience of elementary school teachers as it relates to the impact of instructional technology on teachers' perceptions of lesson effectiveness and obstacles to incorporating technology into lesson design.

Leininger (1985) described ethnography as "the systematic process of observing, detailing, describing, documenting, and analyzing the lifeways or particular patterns of a culture (or subculture) to grasp the lifeways or patterns of the people in their familiar environment" (p. 35). Furthermore, Patton (2015) affirmed that in an ethnographic study any group of people who interact over an extended period of time form a culture. Thus, the teachers and students, because of their long-term interaction in a school setting, represent a culture. Students use various forms of technology daily in the home environment, so the researcher wanted to observe the interactions of student to student and student to teacher related to instructional technology within the framework of the school culture. An ethnographic approach was used to assist the researcher in grasping the lifeways and patterns of teachers and students in their familiar environment to acquire a deeper understanding of how teachers perceive technology's impact on lesson effectiveness and obstacles to incorporating technology into the lesson design.

The study also used purposeful sampling strategies. As Patten (2012) asserted, qualitative researchers use this type of sampling to select participants they think will be rich sources of information on their research topic. In addition, Patton (2015) noted that in qualitative research, triangulation can be acquired by using multiple methods and mixing different types of purposeful sampling to strengthen the study. Although various forms of data collection may result in differing results, a reasonable explanation for the differences can strengthen the credibility of the data. As Patton stated, “The fact that observational data produce different results from interview data does not mean that either or both kinds of data are ‘invalid.’ . . . More likely it means different kinds of data have captured different things” (p. 662). Purposeful sampling was used to enable the researcher to select participants deemed to be good sources of information on the impact of technology on teachers’ perceptions of lesson effectiveness and teachers’ perceptions of obstacles to incorporating technology into lesson design.

According to Creswell (2007), qualitative researchers normally collect data from the people at the location where the experience takes place. Creswell further stated, “This up-close information gathered by actually talking directly to people and seeing them behave and act within their context is a major characteristic of qualitative research” (p. 37). Similarly, McMillan and Schumacher (2010) noted that “qualitative researchers try to reconstruct reality from the standpoint of participant perspectives, as the participants they are studying see it” (p. 323). A qualitative ethnographic framework is correct for this study in that it allows the researcher to observe and collect data from participants’ lived experiences in their environment. Therefore, the observer can better understand and describe how educators perceive the effectiveness of instructional technology and the obstacles encountered in integrating technology into lesson design. Thus, the study's purpose—to identify and describe the impact of instructional technology on middle school teachers' perceptions of lesson effectiveness and obstacles to technology integration into lesson design—is accomplished.

Population

Population was defined by McMillan and Schumacher (2010) as the "total group to which results can be generalized" (p. 129). This study's population was comprised of teachers in k-8 elementary schools in California. The California Department of Education (CDE, 2017) reported that there are 1,026 school districts in California. California; 524 of these school districts are elementary school districts.

Target Population

The total group of people selected out of an identified population and from which data are collected to generate conclusions is the target population. According to McMillan and Schumacher (2010), "It is important for researchers to carefully and completely define both the target population and the sampling frame" (p. 129). Time constraints, proximity, access, and cost create a challenge when observations are included to study large groups; therefore, population samples were selected from the larger group. The target population for this study was comprised of kindergarten through eighth-grade elementary school teachers from the south San Joaquin Valley, which houses five counties (Madera, Fresno, Kings, Tulare, and Kern). The five districts used for gathering data for this study were Earlimart, Palo Verde, Sunnyside, Terra Bella, and Visalia. These districts were selected because they utilize technology on a daily basis. Each district included in the study also had a high English Language Learner population. In addition, their proximity provided easy and convenient access for conducting observations in a timely, cost-efficient manner.

Sample

A sample, as McMillan and Schumacher (2010) stated, is the group of subjects from whom the researcher collects data. The sample for this study consisted of teachers from five elementary K-8 school districts within the southern San Joaquin section of California's Central Valley, where staff and students have continuous access to instructional technology, and instructors use digital teaching practices routinely as part of their lesson design. Patton (2015) asserted that small information-rich cases can yield valuable in-depth information; and in qualitative research, saturation can be used as a guideline to help establish the size of a sample. saturation is a yardstick that can be used to determine sample size. Patten (2012) also stated, "At the point at which several additional participants fail to respond with new information that leads to the identification of additional themes, the researcher might conclude that the data collection process has become saturated" (p. 152). As McMillan and Schumacher (2010) asserted, there are no rules for sample size in qualitative inquiry—only guidelines: "Thus, qualitative samples can range from 1 to 40 or more" (p. 328). Therefore, the researcher put in place a minimum target sample size of 13 based on criteria set forth by McMillian and Schumacher for sample size.

The following criteria were used to select the 13 teachers who participated in the target sample for the study; the teacher

1. had one or more years teaching using instructional technology at the elementary K-8 school level;

2. had one or more years teaching, integrating instructional technology into lesson design;
3. participated in professional development training on the use of instructional technology; and
4. had a site administrator recommendation as being an outstanding instructor who met the above criteria.

The sampling method used in this study was purposeful sampling. Patton (2015) stated, “Purposeful sampling focuses on selecting information-rich cases whose study will illuminate the questions under study” (p. 264). Participants for the purposeful sample included elementary K-8 school instructors from Earlimart, Palo Verde, Strathmore, Terra Bella and Visalia. The researcher used purposeful sampling to obtain the needed number of participants to satisfy the study criteria and elucidate the study questions. In selecting the participants, the superintendents were contacted in person, by e-mail, or by phone, requesting permission to contact site principals regarding participation in the study. Thereafter, principals were contacted and provided an overview of the study and the criteria for teacher participation. Principals were also asked for the name and e-mail address of each instructor they felt met the study criteria. An introductory e-mail was then sent to prospective participants inviting them to take part in the study (see Appendix B). Upon accepting the invitation to participate, an e-mail was sent to the teachers containing the participant’s bill of rights (Appendix C), informed consent to participate in research (Appendix D), and the privacy act statement and consent agreement for audio recording (Appendix E). A follow-up telephone call was then made to participants to schedule interviews and/or observations and request any written communications (PowerPoint lessons, lesson plans, etc.) that might strengthen the findings of the study.

Instrumentation

In qualitative research, the researcher is the key instrument for collecting data (Creswell, 2007). As explained by Corbin and Strauss (2014), "Each researcher has perspectives, biases, and assumptions that they bring with them to the research process" (p. 46). Additionally, the interviewer's verbal and nonverbal communication may impact the participant's response (Corbin & Strauss, 2014). Therefore, there was a high probability that biases may have formed during the study. Thus, to address the bias issue, the researcher formulated nonleading interview questions to use that did not solicit preferred responses. The researcher also journaled about any detected reciprocal influence that the participant and researcher could have on each other during the interview. This allowed for greater researcher transparency and minimized the presence of biases in the study.

Patton (2015) stated that qualitative findings are based on open-ended or semistructured interviews, direct observations, and written communications. This study used all of the aforementioned methods for data collection. The review of literature signaled a need to examine the impact of instructional technology on lesson effectiveness as perceived by middle school teachers. In-depth interviews provided firsthand information regarding the experiences, feelings, knowledge, and perspectives of the participants. Therefore, semistructured, in-depth interview questions were developed based on the review of literature and Mishra and Koehler's (2006) TPACK framework to research instructional technology's impact on lesson effectiveness as perceived by teachers. Direct observation of the lesson was used to help elucidate teachers' perceptions of technology effectiveness as well as of obstacles to incorporating technology into the instructional design. The researcher also collected artifacts from participants that addressed the study's guiding questions.

Observations

The research conducted observations of student-to-student and student-to-teacher interaction as it related to the use of technology in the class setting. As Patton (2015) asserted, interviews are an efficient way to understand perspectives, whereas observations allow for the researcher to draw inferences about perspectives that cannot be established from an interview alone.

Artifacts

Collecting written communication supplied artifacts such as lesson plans and printed PowerPoint lessons. The various forms of data collection had the potential to provide differing results, but a reasonable explanation for the differences can strengthen the credibility of the data.

Interviews

Semistructured, in-depth interviews were used to collect data germane to the purpose of the study and responsive to its guiding research questions. The same set of open-ended questions was administered to participants in the same manner during the interview process as set forth in guidelines by Patton (2015). According to Patton, the process facilitates data analysis by making it easy to find and compare responses.

Ten interview questions were developed based on the study's theoretical framework of TPACK (Mishra & Koehler, 2006) and the literature review (Appendix F).

An alignment table was also used in formulating the interview questions (Appendix G). The information from the three sources (TPACK, the alignment table and the literature review) assisted the researcher in developing questions of inquiry relevant to the study's purpose. Additionally, follow-up questions were developed to further illuminate responses and information gathered during the study. The interviews were recorded to ensure accuracy.

Direct Observations

Direct observations, as asserted by McMillan and Schumacher (2010), are an essential data collection strategy for ethnographic studies. Additionally, direct observations over an extended period can provide the researcher with a deeper understanding of the phenomenon being studied (McMillan & Schumacher, 2010). Direct observations also permitted this researcher to observe student-to-student and student-to-teacher interactions as related to the use of technology in the class setting. Thus, the researcher utilized direct observations of six participants to compare with interviews and other documentation to support triangulation of the data (see Appendix H).

Participant Artifacts

Several types of artifacts were collected from the participants to strengthen the validity of the study. As asserted by Patton (2015), records, documents, and artifacts constitute a rich source of information about organizations and programs. Thus, artifacts obtained for this study consisted of lesson plans, observational notes, e-mails, and printed PowerPoint lessons to corroborate findings from other sources.

Validity and Reliability

Validity

Validity in qualitative research, as asserted by McMillan and Schumacher (2010), is the level of agreement that exists between the explanations of events and the realities of the world; therefore, validity is determined by the degree to which interpretations have the same meanings for both the researcher and the participants. Thus, several data collection strategies, as outlined by McMillan and Schumacher, were used in this study to increase agreement on the description by the researcher and the participants. For example, participant language, pilot tested interviews, recorded interviews, recorded observation notes and artifacts were used to strengthen the validity of the research.

An important strategy used was participant language—the interview questions were phrased in the participants' language so they could be easily understood (McMillan & Schumacher, 2010). The interview questions were also reviewed and validated by experts in the field of research. Prior to conducting interviews, the researcher administered a pilot test with two teachers who met the criteria of the sample population. Participants were also provided with a list of terms and definitions to be used in the interview to ensure word-meaning agreement between the participant and the examiner. The researcher also informally checked with participants to clarify information and to maintain the accuracy of data collected during observations. Additionally, interviews were tape recorded for transcription to ensure accurate records. Participants were also asked to review the transcript and note discrepancies to be corrected in order to maintain accuracy. In accordance with McMillian and Schumacher (2010), data received from participants were analyzed for comprehensive integration of findings.

Field Testing

A sample of two participants—characteristic to those to be used in the study (McMillan & Schumacher, 2010)—were administered the semistructured, in-depth interview questions in approximately the same manner used in the study. Field-test participants also responded to feedback questions to allow for modifications where and if needed to provide a better instrument (see Appendix I). In like manner, the observation process was field tested using participants characteristic to those in the study. These procedures were administered to ensure development of the best instruments for collecting data for the study. The field test validated the use of the interview questions in addressing the central research purpose.

Reliability

Patten (2012) asserted that reliability is defined as the consistency of results using different methods of measurement. All study participants were interviewed by the researcher using the same standardized set of questions to support the reliability of the study. In accordance with Patton (2015), observations were also conducted that provided the researcher insight into the feelings and thoughts of the participants that could not be obtained by the interview process alone. The coalescence of information obtained using both methods helped to increase the reliability of the data. To avoid misconceptions, participants were provided with the definitions of terms that were used in the interview (McMillan & Schumacher, 2010).

The researcher collected and compared data from multiple sources to help establish the reliability of the study. Data were collected through the process of interviewing, listening, observing, recording, and analyzing participants' responses to strengthen the reliability of the data. In addition, triangulation of the data was accomplished through comparison and cross-checking of information gathered through various methods, sources, and times to ascertain consistencies or inconsistencies of facts (Patton, 2015). Information recorded from respondent interviews was compared with artifacts and observational notes to corroborate the reliability of the findings.

Intercoder Reliability

According to McMillan and Schumacher (2010), the use of a trained, independent coder increases the reliability of the study. The extent to which there is agreement between the findings of the intercoder and those of the researcher will strengthen the reliability of the study. Therefore, the researcher employed multiple strategies, including the use of an intercoder, to minimize the margin of error in the research.

The independent coder selected to cross-check data for this study was a peer in the educational field with a doctorate in education. The researcher and intercoder agreed upon the analytical technique and processes to be used. In addition, the percentage of the degree of agreement between the data of the intercoder and the researcher was established prior to the start of the data analysis.

Human Subjects Consideration

The researcher took the following measures to protect the rights and welfare of human subjects who participated in the study in accordance with McMillan and Schumacher (2010). All coursework requirements were satisfied, and a certificate to carry out research with a human subject was obtained from the National Institutes of Health Clearance (see Appendix J) before starting the research project. The Brandman

University Institutional Review Board (BUIRB) also approved the study design and interview script prior to the start of the data collection.

Data Collection

Patton (2015) stated, “Qualitative findings are based on three kinds of data: (1) in-depth, open-ended interviews; (2) direct observations; and (3) written communications” (p. 14). The researcher utilized all three methods of data collection in conducting the study. Through in-depth interviews, firsthand information regarding the experiences, feelings, knowledge, and perspectives of participants was acquired. Lesson observations provided insight into how technology was used to enhance content. In addition, observations enabled the researcher to observe student-to-student and student-to-teacher interaction as it related to the effectiveness of the use of technology. Collecting written communication also allowed the researcher to obtain artifacts such as lesson plans and printed PowerPoint lessons and compare them to information recorded from respondents in order to corroborate facts.

Data Collection Process

Triangulation of data was accomplished in this study through multimethod data collection strategies (McMillian & Schumacher, 2010). As stated by McMillian and Schumacher (2010), “Multimethod strategies permits triangulation of data across inquiry techniques” (p. 331). The researcher completed mandatory coursework and obtained the National Institutes of Health Clearance certificate to conduct research on a human subject prior to the start of data collection (see Appendix J). After receiving approval from the Institutional Review Board (IRB), the researcher implemented the following data collection procedures:

1. The researcher used the recommendations of site administrators and sample criteria to identify the target sample.
2. The researcher obtained potential participants' contact information from school site and district offices.
3. The researcher sent an introductory e-mail to potential participants requesting to schedule an interview and observation appointment. Also included in the e-mail was a request to collect documents to corroborate data collected from the interviews and observations. Confidentiality assurances and a consent form were also included in the e-mail.
4. The researcher followed up the initial e-mail with a phone call to each prospective participant to schedule a time and location for an interview and an observation. Each participant signed an informed consent form before the start of the interview or observation. In addition, a research participant's bill of rights was given to each participant (see Appendix C).
5. The researcher confirmed both the time and location for the interview or observation with participants 3 days prior to the event.
6. The researcher conducted in-depth interviews that lasted approximately 45 minutes in person or by phone. All interviews were audio recorded with participant consent.
7. The researcher conducted observations of six participants using a field note guide to record data. The observations were from 40 to 60 minutes long. Following guidelines set forth by McMillan and Schumacher (2010), the researcher also penned reflex records to assist in synthesizing and assessing the quality of the data.

8. Participants also provided lesson plans, and printed copies of PowerPoint lessons and other documents pertinent to the study to assist in triangulation of the data.
9. Then the researcher sent the interview recordings to a professional for transcription service to be processed. Once the transcription was complete, the transcripts were returned to the researcher who shared them with the participants for verification of their accuracy.
10. The researcher and inter-coder analyzed and coded the data using themes that aligned with the study's research questions. An analysis and coding of the artifacts and observational notes were also used to help validate themes identified in the interviews.
11. Following the coding process, the researcher and an intercoder worked independently analyzing the data to support the credibility of findings. The results were then compared to determine if an 80% equivalency existed between the researcher and the intercoder. An 80% equivalency was needed to establish reliability of findings.
12. A transparent reporting of the findings was completed and made available.

The data collection method responded to the study's purpose in that it elicited the teachers' perceptions on the study's purpose and research questions and provided them a platform from which to share their stories. Information-rich data were provided through the verbal accounts and artifacts shared by the participants.

Data Analysis

The researcher used an inductive analysis process in this study to organize data into categories and identify patterns and relationships within categories. This method supported the emergence of general themes and conclusions from the data, as asserted by McMillan and Schumacher (2010). Moreover, inductive analysis is an effective way of discovering new themes in new or under researched areas through generating new concepts, theories, or explanations (Patton, 2015). Thus, an inductive analysis was used in this study to elucidate the impact of instructional technology on teachers' perceptions of lesson effectiveness and on teachers' perceptions of obstacles to incorporating instructional technology into the lesson design.

The researcher collected data through listening, observing, and recording, and ensured that it was systematically documented. As stated by Patton (2015), "Systematic documentation of what is observed, heard, and experienced is what field work is all about" (p. 376). According to McMillan and Schumacher (2010), the data then needed to be coded, placed into categories, and have patterns identified. The final step in the process would be to transparently report the findings.

In-depth interviews, observations, and artifacts were used to collect data for this study. Once the accuracy of the interview transcripts and observation documentation were validated by participants, the data analysis ensued. McMillan and Schumacher (2010) stated, "The ultimate goal of qualitative research is to make general statements about relationships among categories by discovering patterns in the data" (p. 378). A manual process was used to analyze the data. The researcher worked with an inter-coder in the triangulation process—organizing themes or categories to discover patterns in the data and determine frequencies. The findings of the data analysis are discussed in Chapter IV.

Limitations

In qualitative research, the investigator must strive to identify any potential area of bias and note it. As Patton (2015) reported, "Qualitative inquiry, because the human being is the instrument of data collection, requires that the investigator carefully reflect on, deal with, and report potential sources of bias and error" (p. 58). Thus, the researcher endeavored to recognize possible areas of bias in the study that might be considered limitations. The investigator identified several possible limitations to the study that could influence the outcome of the study:

1. Researcher bias may have been created because of possible outcomes anticipated by the researcher. In accordance with McMillan and Schumacher (2010), the presence of researcher bias had to be considered.
2. Interview data limitation caused by possible inaccurate responses or withholding of information by the participants, as noted by Patton (2015), may have existed. Therefore, human bias was a potential limitation to the study.
3. The small sample size was nonrandomly selected. Therefore, it may have been a limitation because findings cannot be generalized to the general population.

The researcher made a conscious effort throughout the data collection process to be cognizant of any biases (including personal ones) that might exist and appropriately addressed them to support the study's credibility. The following safeguards were used in the study:

1. Providing confidentiality assurance before the interviews helped in curtailing bias.
2. The researcher journaled biases during the interview.
3. Open-ended, nonleading interview questions were used.
4. The sample population mirrored the criteria of the general population.

Summary

The methodology, purpose of the study, research questions, and study design were presented in this chapter. First, the purpose of the study and research questions were presented to establish the rationale for the study. Next, the researcher substantiated why the chosen design was best suited for the study. Then, the study design included the population and sample, instrumentation, reliability, and validity. This chapter also discussed data collection procedures and data analysis. The final section of the chapter considered the limitations and safeguards of the study. The results of the data collected are presented in Chapter IV.

CHAPTER IV: RESEARCH, DATA COLLECTION, AND FINDINGS

This qualitative study identified and described the impact of instructional technology on lesson effectiveness and obstacles to incorporating instructional technology into lesson design as perceived by elementary school teachers in the southern part of California's San Juaquin Valley. The researcher accomplished this by gathering data in face-to-face interviews, direct observations, and artifacts from 13 elementary school teachers. Chapter IV presents a review of the purpose of the study, research questions, methodology, population, and sample. This chapter also includes the presentation of data and a summarization of the findings.

Purpose

The purpose of this qualitative ethnographic study was to identify and describe the impact of instructional technology on lesson effectiveness and obstacles to incorporating instructional technology into lesson design as perceived by elementary school teachers.

Research Question

The study was guided by one central research question and two subquestions that were used as a basis for addressing the purpose of the study.

Central Question

What is the impact of instructional technology on lesson effectiveness and obstacles to incorporating technology into lesson design as perceived by elementary school teachers?

Subquestions

1. What is the impact of instructional technology on lesson effectiveness as perceived by elementary school teachers?
2. What are the obstacles to incorporating instructional technology into lesson design as perceived by elementary school teachers?

Methodology

A qualitative ethnographic method was selected to identify and describe the impact of instructional technology on lesson effectiveness and obstacles to incorporating technology into lesson design as perceived by elementary school teachers. The selected qualitative method supported the researcher's desire to journal the lived experiences of people in their own words, from their perspective, and from their setting (Patton, 2015). Additionally, the ethnographic approach allowed the researcher to observe, detail, document, and analyze the interactions of student to student and student to teacher within the framework of the school culture (Leininger, 1985). The results of this study will provide instructors with greater insight into effective methods of integrating technology into their lesson design and overcoming obstacles in the technology integration process that will support increased educational dividends.

The researcher utilized various methods of measurement to provide consistency of results to ensure reliability of the data (Patten, 2012). The researcher employed an alignment table (Appendix G) to develop 10 semistructured, in-depth interview questions based on the review of literature and the theoretical framework (TPACK) to research the experiences, feelings, and perspectives of the participants on instructional technology's impact on lesson effectiveness. To safeguard the quality of the interviews, the researcher field tested two participants—characteristic of the study participants (McMillan & Schumacher, 2010) in approximately the same manner used in the study.

To launch the data collection process, e-mails were sent to administrators requesting permission to conduct research and asking for recommendations of instructors who met the criteria. Upon receipt of administrator recommendation, an invitation packet containing a consent form and confidentiality assurance was e-mailed to prospective participants. Additionally, interviews were scheduled at the convenience of the participant. Thirteen teachers were scheduled to participate in an in-person interview with four also participating in an observation. Participants were also to provide printed PowerPoints, lesson plans, or any other pertinent printed material. All interviews were audio recorded and transcribed, and participants were invited to review their transcription for accuracy. Then the researcher started the data analysis process. An intercoder was involved in the data analysis to establish intercoder reliability. The 80% agreement between the data of the intercoder and the researcher (established prior to the start of the data analysis) was satisfied.

In qualitative research, the investigator must strive to identify any potential area of bias and note it because he/she is the instrument of collecting data. Therefore, the study's validity is congruous to the methodology, scrutiny, and integrity of the researcher. Researcher bias can pose a great threat to the validity of the research. For this reason, the researcher provided confidentiality assurance to participants; journaled possible biases noticed during the interview; carefully and accurately documented proceedings; used open-ended, nonleading interview questions; and used nonintimidating speech and posture during interviews. The aforementioned procedures were key in assuring the validity of the study.

Population and Sample

This study's population was comprised of teachers in elementary schools in California. California has 524 elementary school districts situated within the 1,026 school districts in California. The target population for this study was comprised of kindergarten through eighth-grade elementary school teachers from the south San Joaquin Valley. The five districts used for gathering data for this study were Earlimart, Palo Verde, Sunnyside, Terra Bella, and Visalia. These districts were selected because of their daily use of technology and their proximity, which provided easy and convenient access for conducting observations in a timely, cost-efficient manner. Each district included in the study also had a high English language learner population. Purposeful sampling was used to select 13 participants from the target population.

Purposeful sampling was used in the selection of participants congruent to the sample criteria set by the researcher. The sample for this study consisted of educators from five elementary K-8 schools within the southern San Joaquin section of California's Central Valley, where staff and students have continuous access to instructional technology, and instructors use digital teaching practices routinely as part of their lesson design. Patton (2015) asserted that small information-rich cases can yield valuable in-depth information; and in qualitative research, saturation can be used as a guideline to help establish the size of a sample. Saturation is a yardstick that can be used to determine sample size. The researcher put in place a minimum target sample size of 13 based on criteria set forth by McMillian and Schumacher (2010) for sample size. The following criteria were used to select the 13 instructors who participated in the target sample for the study; the participant

1. had one or more years teaching using instructional technology at the elementary K-8 school level;
2. had one or more years teaching, integrating instructional technology into lesson design;
3. participated in professional development training on the use of instructional technology; and
4. had a site administrator recommendation as being an outstanding instructor who met the above criteria.

The sampling method used in this study was purposeful sampling. Patton (2015) stated, “Purposeful sampling focuses on selecting information-rich cases whose study will illuminate the questions under study” (p. 264). Participants for the purposeful sample included elementary K-8 school instructors from Earlimart, Palo Verde, Sunnyside, Terra Bella, and Visalia schools.

The researcher started the study by contacting the administrators of schools within the four selected school districts. The administrators were given an overview of the study’s purpose and asked for recommendations for teachers who met the study’s criteria. Upon administrator recommendation, 13 participants were identified to participate in the study. In compliance with the anonymity stipulation for participants, the researcher set guidelines to conceal each participant’s identity. Thus, names and other forms of participant identification are excluded from the findings. The 13 participants are numerically identified ranging from 1 through 13 (for example, Participant 1, Participant 2, etc.; see Table 2).

Table 2

Teacher Participants

Participant	Gender	District	Years/experience	Grade level
1	Female	Earlimart	6	Sixth
2	Male	Earlimart	30	Sixth
3	Female	Visalia	32	Third
4	Female	Earlimart	6	Eighth
5	Female	Visalia	16	First
6	Female	Earlimart	12	Seventh
7	Female	Visalia	5	Sixth
8	Female	Earlimart	4	Sixth
9	Female	Earlimart	12	Sixth
10	Male	Palo Verde	6	Fifth
11	Female	Palo Verde	5	Fourth
12	Male	Sunnyside	15	Eighth
13	Male	Terra Bella	12	Eighth

Presentation of Data

Research Subquestion 1

The first subquestion of this study looked to answer, "What is the impact of instructional technology on lesson effectiveness as perceived by elementary school teachers?" Six themes were established from 13 participants. The frequency ranged from 8 to 39. The major themes along with corresponding data and research are listed in the following section. Table 3 displays the identified themes with references and artifacts included in the frequency counts of the impact of technology on lesson effectiveness as perceived by educators.

Table 3

The Impact of Technology on Lesson Effectiveness

Theme	Reference	Frequency
Student engagement	13	39
Convenience/facilitates ease of lesson design	7	21
Enhances level of comfort/familiarity with the subject	4	17
Maximizes students' strength	5	9
Provides technical skills needed for the future	6	8
Helps meet needs of all students/different levels	6	8

Student engagement. A major theme that emerged in this study regarding the impact of instructional technology on lesson effectiveness was student engagement. Student engagement produced the highest frequency count with all 13 participants referencing it. Triangulation of data was accomplished through the 13 interviews producing 27 references to the theme and six artifacts producing 12 references to the theme. All 13 participants stated that the biggest impact of instructional technology in the classroom was student engagement. For example, Participant 12 stated, "I think you have a lot more student engagement and it's one of the biggest things you get out of having technology in the classroom." Student engagement being the greatest impact of instructional technology was expressed in numerous ways. Participant 9 selected the student engagement choice voicing, "It has made a huge difference. The students enjoy learning and are more engaged." Similarly, Participant 6 affirmed,

> I have found that just the engagement piece is huge as far as getting the students to be engaged in the lesson because then you can implement videos. Like when we create PowerPoints for our lessons, it's just a huge difference than what we used to do with just writing on our whiteboards. So, the engagement piece is what I found most.

Additionally, Participant 5 agreed, “Technology has positively impacted the classroom learning environment by helping students be more engaged in lessons and motivated to work.” Conclusively Participant 3 demonstrated the impact of instructional technology on student engagement in her astonishing declaration, “The students are more engaged with technology. We have a no homework policy . . . and the kids with the technology we’re using—they’re asking me if they can do it at home.” Blissfully, Participant 7 recounted how technology kept her students engaged:

> We do a people on the planet project and our kids research a different national park all around the world. They do the research. Then on the computer they make a brochure where they’re like little tour guides to teach the kids about their national park. It gives endless opportunities of what you can do, it makes class exciting, and kids want to be here!

The participants unanimously agreed that technology had a positive impact on student engagement. This outcome supports the assertion of Williams et al. (2008) in which teachers report that the use of technology increases student engagement.

Convenience—facilitates ease of lesson design. Another theme that frequently surfaced was the convenience and ease experienced in lesson design using technology. Teacher participants felt that technology provided them with easier and more convenient methods of creating lessons. There was a frequency count of 21 for this theme. The theme was referenced 15 times in seven interviews and 6 times in four artifacts establishing triangulation of the data. Participant 9 conveyed that technology provides convenience for teacher collaboration on lesson design as reflected in this statement:

> Our PLC is able to work together because we can share documents through drive, and we work on our PowerPoints together—like live. So, I think that's good for planning for sure and preparing as a grade level to be on the same page when it comes to teaching our math lessons.

Participant 8 also lauded the convenience and ease experienced using technology commenting, "I don't have to take piles of essays home. I can actually assign something, take my laptop home and grade everything online, and students have immediate access to those grades." Another point emphasized by Participant 5, "Having facts at your fingertips is a wonderful factor which contributes to the impact of technology in the classroom. You can also say it brings global learning to students." Adding to the instructional perks offered by technology, Participant 2 exuberantly proclaimed, "Think about our monitor compared to just a screen, it's easier to see! It's easier for me to load it up, and I can use different forms of media to enhance teaching and student learning."

As evidenced by teacher responses, instructional technology is a tool that provides convenience and facilitates ease in their designing of lessons to enhance student learning. Consequently, technology makes it easy for teachers to design lessons using digital tools to enhance student learning (Flair, 2013).

Enhances level of comfort/familiarity with the subject. This was an emergent theme in which four participants noted how technology enhanced the level of comfort and familiarity for students with the subject matter. The frequency count for this theme was 17. Triangulation of the data was provided through the theme being referenced 10 times in four interviews and 7 times in three artifacts. Technology boosts students' comfort level and familiarity with content because it presents it in a way they can relate. Teacher 1 commented,

> One positive impact I feel is that students are able to utilize the strength they have with using technology—they're into social media, gaming. So, the student you have that probably wouldn't feel comfortable doing paper/pencil would actually have the opportunity to shine when they're using technology.

Teacher 3 expressed it this way, "They seem like they are more involved, and they internalize what they're doing. It's not just something they go through, it's something they're interested in and they take ownership of it." Subsequently, Teacher 2 noted,

> The way I use technology is I teach my lesson by using different forms of media. All students have a Chromebook. In my lesson, I use PowerPoints, media, and video to enhance student learning. They all understand technology because they all use it in some form at home.

Teacher responses illustrate how technology enhances the level of comfort and familiarity with the subject matter. Research agrees with the teachers' opinions. Flair (2013) emphasized that using electronics and digital tools enhance student learning.

Maximizes students' strength. This theme had a frequency count of nine. There were five participants who commented on this theme. Triangulation took place through the theme being noted 7 times in five interviews and 2 times in two artifacts. Participant 12 expressed his views on how technology maximizes students' strength by commenting, "It's something the students can relate to and be effective with and it gives the students an opportunity to express their knowledge in different ways." Another essential point made by Teacher 7 was,

> Anytime you use technology whether it's something kids use all the time or not, it adds a layer of problem-solving because not only are they having to use their brain to work on the standard, but they're also having to use their problem-solving skills to do the other half of the project.

Participant 4 shared her experience of how she used technology to have her students review for a test online using Google slides. She related,

> Students clicked on a hyperlink that took them to another site where they could read the component and answer questions. I made it like digital breakouts. They had to go to another point, find the correct answer and type it in before they could move on to the next step. They'd have to really think about what they were reading and use their critical thinking skills.

Teachers' views of how technology maximizes students' strength are echoed by researchers. According to Hsu (2016), expansive use of technology will augment students' experiences in learning throughout the curriculum, fostering intellectual growth of students instead of just supporting solitary technological skills.

Technology skills students need for the future. The frequency count for this theme was eight. The theme was noted 6 times in six interviews and 2 times in two artifacts, thereby triangulating the data. In sharing views on technology skills needed for the future, Participant 12 expressed, "In the long-term picture, it gives students experience with technology in a lot of different ways that will help them out in the future." Participant 5 added to the conversation regarding technology skills by stating, "I see more students are learning global skills that will help them as they head into the workforce after high school." Teacher 1 expressed, "It gives them the typing skills they will need in the future."

Research agrees that there is a global need for a workforce with digital skills. Support for this theme is shown by Metcalf and Fenwick's (2009) assertion that technology has brought the world digitally closer together, creating a globally accepted need for a digitally literate workforce.

Helps meet the needs of all students. There were six educators who engaged in discussing technology helps meet the needs of all students. The frequency count for this theme was eight. Triangulation was experienced by the theme being referenced 6 times in six interviews and 2 times in two artifacts. Speaking on the subject of technology helps meet the needs of all students, Teacher 10 shared,

> We are reading *The Prince and the Pauper*. My students will not know anything about that. So, I might use technology to go on Pinterest and show some pictures from that period or paintings, art pieces and paintings. I could use something like that to get them interested and increase their prior knowledge.

Participant 11 concurred that technology can be used to help reach students at different levels in the statement, "Technology provides a way to reach all learners, because I can do all kinds of different presentations and activities online that can reach different kids' interest levels." Similarly, Participant 4 expressed, "You're able to scaffold a little better. You have visual representations of whatever lesson you're teaching the students. Since students are at different levels, you might need visual cues such as pictures or highlighting."

The participants agreed that instructional technology is a tool that gives them the capability to meet the needs of students with different learning abilities in the classroom. In congruence with the teachers' report, Rance-Roney (2010), in addressing the use of technology to meet the needs of all students, emphasized that an engaging way to assist ELLs in English language acquisition in the class is to combine telling stories with any of a number of multimedia tools such as audio, video, and animation.

Research Subquestion 2

The second subquestion of this study sought to answer, "What are the obstacles to incorporating technology into lesson design as perceived by elementary school teachers?" There were four themes identified that ranged from a frequency of three to 19. The four themes along with correlating data and research support follow. Table 4 displays the identified themes with frequency counts of the obstacles to incorporating instructional technology into lesson design.

Table 4

Obstacles to Incorporating Technology Into Lesson Design

Theme	Reference	Frequency
Needs to be purposeful	9	21
Unavailability of Internet/Chromebooks	6	15
Students' off-task behavior	8	11
Fear of technology/lack of knowledge	9	11

Needs to be purposeful. Nine participants expressed the need for technology use in the classroom to have a purpose rather than to be used in a babysitting function. The frequency of the theme was 21. Triangulation was apparent with the theme being mentioned 17 times in nine interviews and 4 times in four artifacts. Participant 7 admonished the use of technology in instruction for nonpurposeful reasons in this way:

> The biggest thing that I realize is that a lot of teachers—and I don't know if it's that they don't know their content or if they don't know technology. I don't know which piece it is, but it's making sure whatever you're using is being used for a purpose and not just to say you used technology in your classroom.

Participant 3 agreed that technology use should have a purpose in her statement, "When teachers designs a lesson, they should reflect on what technology would be most useful in the delivery of the lesson and not use technology for the sake of technology." Adding to the conversation of purposeful use of instructional technology, Participant 12 articulated,

> If they have a strong view that technology will be a positive factor, they will use it more and in engaging ways. If the teacher doesn't have that mindset, there's a chance it will be used just to say they used technology rather than using it for certain outcomes.

Participant 11 summarized the purposeful technology use issue in the following way, "You have to know what you're teaching to know what technology to use. You can't expect the computer to teach for you because you still have to make it an engaging learning experience for them." Research findings corroborate the observance of the participants; Ertmer (2005) asserted that teachers make the decision regarding whether and how technology is used in their classroom.

Unavailability of Internet/Chromebooks. Six teachers identified unavailability of Internet/Chromebooks as an obstacle to technology integration in lesson design. There was a frequency count of 15. Triangulation of data was evidenced by this theme being selected 11times in six interviews and 4 times in three artifacts. The effects of the obstacle posed by the unavailability of Internet/Chromebooks in the technology integration process in the classroom were vividly shared by Participant 13 in this manner:

> Just up-to-date technology. We acquired Chromebooks from another school. They were more or less like hand me downs to us. We were 4 or 5 years behind other schools because of lack of technology access and funds to purchase technology, but now we are pretty much caught up.

Participant 7 conveyed, "You know you show up to work and all the Internet is down, and all your entire lesson was on the Chromebook. You're just like, Oh my gosh! What am I going to do? Similarly, Participant 6 reported,

> If our wi-fi goes out, that's a huge negative part of it and it's actually happened twice this year. So, if we don't have our wi-fi working, we don't have access to our lessons, and students can't log into their Chromebooks. So, that's the big drawback of technology when we don't have it.

Research also bears out the participants' claims that unavailability is an obstacle encountered in technology integration. For example, unavailability is listed by Hew and Brush (2007) as an obstacle to technology integration.

Students' off-task behavior. Eight teachers discussed students' off-task behavior as an obstacle of integrating technology into the lesson. The frequency for this theme was 11. Triangulation of data was accomplished by the theme being referenced 9 times in eight interviews and 2 times in three interviews. Speaking about students' off-task behavior, Participant 9 stated, "The negative impact is that it is hard to monitor. Students are going on other websites and not focusing or completing lessons." Participant 2 contributed to the conversation stating, “Making sure students are not on other sites and they are staying on task.” Participant 5 stated, “Technology can sometimes be a distraction. Students might be on websites or game sites they shouldn’t be on while working on their Chromebooks or tablets because it’s so easy to access those things.” Participant 10 expressed it in this way: “Technology can be incredibly powerful, but can also be incredibly distracting.” Participant 7’s summation and proposed solution went as follows:

> That’s another obstacle just keeping everyone on task. I think that we have asked for a screen monitoring software—it has all the computers up on your screen at once. So, there is no hiding. You know what everyone is doing. That is a huge obstacle that we’re trying to overcome by getting either some sort of screen monitoring software or an air secure browser.

Researchers agree with the teachers’ observations concerning students’ off-task behavior being an obstacle to integrating technology into the lesson. Hew and Brush (2007) found that skills and difficulty in handling classroom management relative to technology are significant obstacles to integrating technology into the classroom.

Fear of technology/lack of knowledge. Nine participants discussed how the fear of technology/lack of knowledge is an obstacle to technology integration. The frequency count was 11. Triangulation was accomplished with the theme being noted 9 times in six interviews and 2 times in three artifacts. In addressing lack of knowledge being an obstacle to technology integration, Participant 9 shared a personal experience for overcoming a lack of technology prowess: “I handled it by getting familiar with the programs. I have also looked for help and learned from others." Participant 3 offered encouraging support for veteran teachers voicing an opinion in this manner:

> I think sometimes an obstacle could be fear of technology. A lot of teachers that have been teaching for quite a while are not used to technology. It can be a little overwhelming as first, but I think the teacher needs to be able to meet that head-on and just start moving with the times.

Adding to input on fear of technology/lack of knowledge when integrating technology into the lesson design, Participant 6 had this to say:

> Just transitioning at the beginning of it was an obstacle—and just getting everybody on the same page—and just trying it trying it out and believing that it could work. That was huge when we first started using Chromebooks. It was kind of hard to think like—I'm just going to have them work on their assignments on their own—can I trust the kids to do that?

The final word on fear of technology/lack of knowledge came from Participant 10: "One factor that I think contributes to the impact of technology in my classroom is not being afraid to try it—not being afraid to fail and stepping outside my comfort zone." Research validates points made in the teachers' discussion. According to Hew and Brush (2007), some teachers lack the expertise to use instructional technology.

Most Frequent Codes

Table 5 reviews the top three most frequent codes that emerged from the study. The table contains the theme, frequency count, and correlated research questions.

Table 5

Top Three Most Frequent Codes

Theme	Frequency	Research question
Student engagement	39	RSQ1
Convenience/facilitates ease of lesson design	21	RSQ1
Needs to be purposeful	21	RSQ2

Note. RSQ = Research subquestion.

The most prevalent theme in this study was student engagement with all 13 participants emphasizing the positive impact instructional technology had on student engagement. This theme had a frequency count of 39. Subsequent to student engagement, convenience/facilitates ease of lesson design attained the next highest frequency count with a total of 21. Educators noted the convenience and ease of lesson design afforded them through technology. The theme needs to be purposeful shared the number two spot with convenience/facilitates ease of lesson design by also garnering a frequency count of 21. Respondents admonished that the use of technology should be done carefully, with a purpose, and with the end product in mind, rather than using it randomly to fill a space.

Summary

This chapter presented the data and findings of this qualitative ethnographic study. The study sought to identify and describe the impact of instructional technology on lesson effectiveness and obstacles to incorporating instructional technology into lesson design as perceived by middle school teachers. The study's population was comprised of teachers in K-8 elementary school districts in California. There was a total of 13 participants from five school districts (Earlimart, Palo Verde, Strathmore, Terra Bella, and Visalia) in the South San Joaquin Valley who participated in the study.

One central research question guided the study: "What is the impact of instructional technology on lesson effectiveness and obstacles to incorporating technology into lesson design as perceived by middle school teachers?" Two subquestions helped to elucidate the lived experience of teachers and students in their familiar environment to provide a deeper understanding of how teachers perceive technology's impact on lesson effectiveness and obstacles to incorporating technology into lesson design. The theoretical framework and the subquestions guided the development of the 10 interview questions. The individual, in-depth interviews of the 13 participants were recorded and transcribed verbatim. Subsequently, the participants had an opportunity to review them for accuracy. Data coding followed verification of the transcripts. Artifacts were also collected, and direct observations performed. Although information from the observations was not used in the formal coding process, it was used to corroborate the data from interviews and artifacts. Observing the participants in their own environment provided the researcher with a window into nonverbalized, rich, theme-supporting information. In accordance with Patten (2012), the direct observations supplied the researcher with data that were important to the study. The interview transcripts and artifacts were coded to identify common themes. Findings from the two types of data were used to establish consistency in the findings to ensure triangulation. To increase the reliability of the study, an intercoder assisted in reviewing the data, looking for themes and assigning codes. The researcher and the intercoder examined the data and decided upon appropriate themes.

There were several themes that emerged in relationship to teachers' perceptions of the impact of instructional on lesson effectiveness. The most prevalent theme of student engagement attested to the participants' belief of the positive influence of instructional technology in the classroom. All 13 teachers in the study commented on the improvement in student engagement because students were adept at technology use and preferred it over paper/pencil. Participants reported that students were able to use creative and collaborative skills to complete elaborate projects with minimal instructor assistance. Teachers also talked about the more productive atmosphere created in the classroom through the use of technology.

A second predominant area showing a positive impact of instructional technology was the convenience and ease of design afforded by technology. Teachers remarked about the convenience access to digital tools provided not only in teacher collaboration for designing lessons but also in student interactions. Assignments or grades posted by instructors could be accessed by both students and parents electronically from home to monitor academic progress. An additional aspect that teachers lauded was the ease in which a video and different forms of media could be loaded to the Smart TV to enhance teaching and student learning. Participants praised the positive impact of convenience /facilitate ease of lesson design on lesson effectiveness for students as well for teachers.

Conversely, participants found the needs to be purposeful theme to be an obstacle to incorporating instructional technology. Teachers stated that technology should be used with a purpose—it should be designed to produce an expected outcome. Educators admonished that technology should not be used just for the sake of saying they used technology or as a babysitter. Participants also expressed the necessity for teachers to have content knowledge to effectively correlate the correct technology or digital tools to design engaging lessons. In other words, they felt that a teacher had to know where he or she was going instructionally to know the right tools to get him or her there.

Artifacts obtained in this study were lesson plans and printed PowerPoints of lessons. Observational notes were also taken during direct observation by the researcher.

Chapter V presents conclusions based on the study's findings. Recommendations for further research on this topic are also presented in Chapter V.

CHAPTER V: SUMMARY, CONCLUSIONS, IMPLICATIONS, AND RECOMMENDATIONS

This qualitative ethnographical study sought to identify and describe the impact of instructional technology on lesson effectiveness and obstacles to incorporating instructional technology into lesson design as perceived by elementary school teachers. The study was guided by the following central question: "What is the impact of instructional technology on lesson effectiveness and obstacles to incorporating technology into lesson design as perceived by elementary school teachers?" Two subquestions were crafted to facilitate delving into the lived experience of elementary school teachers in their environment to illuminate their perspective of how technology impacted lesson effectiveness and obstacles they encountered in integrating technology into their lesson.

A qualitative methodology was used to enable the researcher to thoroughly explore the experiences of elementary school teachers who used technology in their daily instructional practices. A collage of information collected from interviews and artifacts, framed by direct observations, captured a vivid picture of instructional technology use within the school culture. Triangulation of data was established through the consistency found in the different forms of information gathered. The target population was elementary school teachers in California. The study's sample was comprised of 13 participants from elementary school districts within California's Southern San Joaquin Valley. This chapter contains the major findings, conclusions, implications for actions, and recommendations for future research.

Major Findings

The major findings of this qualitative research study are presented according to each research subquestion.

Research Subquestion 1

Research Subquestion 1 asked, "What is the impact of instructional technology on lesson effectiveness as perceived by elementary school teachers?" The six themes that emerged from this research question included student engagement (13 out of 13), convenience/facilitates ease of lesson design (seven out of 13), enhances level of comfort (four out of 13), maximizes students' strength (five out of 13), provides technical skills needed for the future (six out of 13), and helps meet needs of all students/different levels (six out of 13). These were the six most predominant effects of technology on lesson effectiveness. The major findings and corresponding research data follow.

Finding 1: Student engagement was high with instructional technology use. All 13 participants in the study voiced that there had been a tremendous improvement in student engagement with the use of technology. Teachers remarked that students enjoyed working on assignments both at school and at home. Educators also commented that technology provided endless learning opportunities for students and created an exciting learning environment. Teachers reported that technology enabled students to use online resources to research topics, and create and make elaborate presentations with ease and minimal instructor assistance. The participants unanimously agreed that technology impacted student engagement in a positive way. This outcome was supported by Domingo and Gargante's (2016) summation of teachers' claims on the impact of technology on student engagement: "Providing new ways to learn, increasing engagement to learning, fostering autonomous learning, facilitating access to information, and promoting collaborative learning" (p. 22).

Finding 2: Technology provides teachers with convenience and ease in lesson design. The results of the study pointed out that instructors found it convenient and easy to design lessons using technology. They remarked about the ease in which they could collaborate within their professional learning communities and communicate with students and parents through Google drive. Teachers also stated that they could easily correct assignments and assessments and provide students and parents with rapid feedback using technology. The data received from the test results provided teachers with valuable information on strengths and weaknesses in the lesson. More than half of the participants agreed that instructional technology was a tool that provided convenience and facilitated ease in designing engaging lessons to enhance student learning. Corroborating the findings in this study, Flair (2013) asserted that technology makes it easy for teachers to design lessons using digital tools to enhance student learning. According to Shirley and Irving (2014), the rapid feedback from tests assists instructors in making decisions for designing future lessons.

Finding 3: Technology enhances student's level of comfort/familiarity with the subject. Four teachers in this study commented on how the use of technology increased students' comfort level and familiarity with content because it presented material in a manner in which students could easily relate. Instructors communicated that students bring established skills of technology use gained through social media and gaming into the classroom. Therefore, they are able to build on strengths they already have when using technology in class. One teacher expressed that students who would not feel comfortable using paper and pencil would have the opportunity to excel using technology because they like and understand it. Teacher responses of how technology enhances level of comfort/familiarity with the subject for students are upheld by research. Students feel comfortable using technology because, as Flair (2013) stated, "When technology is used, we are speaking their language" (p.20).

Finding 4: Instructional technology maximizes student's strength. Teachers verbalized that instructional technology maximized students' strength because they were already adept at technology. Instructors expressed that students working on projects using technology, regardless of a student's skill level, added a layer of problem-solving skills to the assignment. In addition, teachers noted that assignments using technology where students used a hyperlink and did digital breakouts to find and solve problems assisted in development of critical thinking skills. These findings correlated with that of Hsu (2016) who maintained that students exposed to high-level technology use will have enhanced learning experiences across the curricula.

Finding 5: Technology equips students with skills needed for the future. In this study, instructors noted that the use of technology in instruction would give students experience and global skills needed as they leave school and head into the workforce. Teachers also mentioned that technology in the classroom helped students learn needed typing skills for the future. Support for this finding is shown by Metcalf and Fenwick's (2009) assertion that technology has brought the world digitally closer together, creating a globally accepted need for a digitally literate workforce that can collaborate across cultural boundaries and find creative solutions to problems.

Finding 6: Technology helps meet the needs of all students. Teachers in this study reported how technology was used to scaffold student learning and increase prior knowledge on a subject through visual representations such as pictures or highlighting. One teacher mentioned that students could travel through space and time using virtual reality technology. Participants expressed that the use of various forms of media supported learning for students with different levels of ability. In congruence with the teachers' report, Rance-Roney (2010), in addressing the use of technology to meet the needs of all students, emphasized that an engaging way to assist ELLs in English language acquisition in the class was to combine telling stories with any of a number of multimedia tools such as audio, video, and animation.

Research Subquestion 2

Research Subquestion 2 asked, "What are the obstacles to incorporating technology into the lesson design as perceived elementary school teachers?" There were four themes identified among the 13 participants. The themes were needs to be purposeful (nine out of 13), unavailability of Internet/Chromebooks (six out of 13), students' off-task behavior (eight out of 13), and fear of technology/lack of knowledge (nine out of 13).

Finding 1: Instructional technology needs to be purposeful. Teachers shared that when designing lessons using technology, instructors must know the content to understand what technology to use to bring understanding of the subject matter. Participants disclosed that some teachers used technology as a babysitter function rather than using it to present engaging lessons. Another factor pointed out by teachers was that the teacher's mindset was an important factor in when and how technology was used.

Instructors communicated that teachers who viewed technology as positive would use it in a purposeful way. The teachers' reporting is supported by Kelly's (2015) statement, "It is important for teachers to believe the technology they are bringing into the classroom is useful and will add to the knowledge and experience of their students" (p. 41).

Finding 2: Unavailability of Internet/Chromebooks breaks lesson continuity. Six teachers identified unavailability of Internet/Chromebooks as an obstacle to technology integration. Teachers conveyed that technology was key to smooth classroom operations because much of the content is online. Therefore, when there is no Internet or Chromebook access, there is a break in the continuity of the lesson. Instructors explained it was time consuming because students had to resort to the archaic, boring practice of using textbooks and workbooks. One participant reported that his school, at one time, was 2 or 3 years behind other school in the area because of lack of funding to acquire Chromebooks. Teachers said the big drawback of technology was when they did not have it. Research also bears out the claims of the teachers that unavailability is an obstacle in technology use. Unavailability (not having time and/or methods for gaining access to computer systems and inadequate system support) is listed by Hew and Brush (2007) as an obstacle to technology integration in lesson design.

Finding 3: Difficult to monitor students' off-task behavior using technology. A factor noted by teachers as contributing to students' off-task behavior was the high level of difficulty that existed in trying to monitor students using technology because students could easily click on game websites. One teacher summarized it by expressing that technology can be just as incredibly powerful as it can be incredibly distracting.

Teachers explained that some type of monitoring software would help with keeping students on proper sites and minimize or eliminating tech off-task behavior. However, lack of funds restricts the smaller school districts from purchasing a monitoring system. Researchers agree with teachers' observations concerning students' off-task behavior being an obstacle to integrating technology. Hew and Brush (2007) found technology management in the classroom to be an important barrier to technology integration.

Finding 4: Lack of digital knowledge causes teachers to fear technology. The teachers in this study reported that fear of technology existed because of lack of knowledge (particularly among the older veteran teachers) creating an obstacle to technology integration. One teacher shared that teachers who have been teaching for a long time are not familiar with technology and they tend to be afraid to try it rather than stepping out of their comfort zone and giving it a chance. Another teacher voiced that fear of trusting students to use a Chromebook and do the right thing was also an obstacle initially faced by teachers that impede their use of instructional technology. Hew and Brush (2007) agreed that some teachers lack the expertise to both use and manage instructional technology effectively in the classroom.

Unexpected Findings

There were several unsolicited findings that emerged in the study. One finding was that the curriculum for most schools was totally online, negating the need for students to carry around cumbersome book-filled backpacks. Every aspect of the instruction and assessment was technology facilitated. Although textbooks and auxiliary materials were purchased, they were in cabinets collecting dust. They were only used when a technology glitch or power outage occurred.

Another unexpected discovery was there were also some younger teachers who were initially hesitant about using technology in the classroom. When the Chromebook rollout took place, some teachers felt uncertain about how it would all work—how to get everybody on the same page. They were not sure they could trust the students to work independently and complete tasks on the Chromebooks.

Conclusions

The intent of this research study was to identify and describe the impact of instructional technology on lesson effectiveness and obstacles to incorporating technology into lesson design as perceived by elementary school teachers. This qualitative ethnographic research used semistructured, in-depth interviews to delineate the experiences, feelings, knowledge, and perspectives of the participants in identifying emergent themes. Artifacts (printed PowerPoint lessons, lesson plans, and observational notes) assisted in triangulation of the data and establishing consistency throughout the findings.

Conclusion 1: Fosters High Student Engagement

Based on this study's findings and supported by the literature, it is concluded that the use of instructional technology in the classroom will create an environment that is conducive to learning and will foster high student engagement and achievement. The findings indicate that instructional technology used purposefully will provide students with endless learning opportunities relevant to the 21st century. Students not only learn to communicate and collaborate digitally, but they also acquire creative and innovative problem-solving skills. Students enjoy and understand using technology because they were born into the digital culture. As stated by Jackson (2015), people born into the digital culture, who are familiar with technology and use it from the day they are born, are digital natives. In addition, Hsu (2016) suggested that in using high-level technology, students will have enhanced learning experiences across the curricula. Correspondingly, Holzweiss (2014) indicated that through the seamless integration of technology into lesson design, students would learn the curriculum while developing interpersonal skills coupled with technology and digital citizenship. Adding to the conversation, Bergman and Sams (2012) concluded that in a classroom where technology is used, one sees students working collaboratively as well as interacting with the instructor. Therefore, this study and the existing research conclude that the use of instructional technology does have a positive impact on student engagement.

Conclusion 2: Enhances Student Learning

Based on the findings in this study and supported by prior research, it is concluded that the use of instructional technology in the classroom will facilitate learning for all students. Teachers in this study noted that digital learning provided them with the tools to meet the needs of all learners at different levels through audio and visual representations. Digital programs also allow students to work independently at their own pace and at their own level providing the instructor with continuous and immediate feedback on each student's progress during the lesson. Thus, the teacher understands which intervention to use or how to address the individual needs of students to enable them to progress to the next level. The use of technology provides teachers with rapid feedback enabling them to make good pedagogical choices (Shirley & Irving, 2014). Similarly, Flair (2013) acknowledged that technology permitted teachers to track student progress and make needed adjustments to the instruction. Moreover, Rance-Roney

(2010) asserted that digital storytelling can be used to assist English learners to acquire literacy skills and cultural background to help them understand unfamiliar and difficult text. Flair (2013) pointed out that students can manipulate a model of an atom in science and gain a better understanding of the concept taught. Thus, instructional technology does have a positive impact on learning for all students.

Conclusion 3: Robust Network and Infrastructure Is Imperative

Based on the findings of this study and the support of prior research, it is concluded that the availability of technology is key to the effectiveness of classroom instruction. The findings suggest that the unavailability of instructional technology has an adverse effect on lesson effectiveness. Technology failure in the middle of a lesson leaves teachers scrambling to figure out how to maintain the continuity of learning, and it leaves students frustrated. This correlates with the research, which supports technology access being relevant to lesson success. Kelly (2015) expressed that many times teachers are apprehensive when planning lessons including technology because of the uncertainty of access to the equipment or infrastructure adversely affecting the lesson. Hew and Brush (2007) asserted that the inability to access digital systems and inadequate system support posed a problem in the use of instructional technology. Thus, this study and the existing research conclude that inability to access technology is an obstacle in technology integration.

Conclusion 4: Teacher Knowledge and Ability Is Crucial

Based on the findings in this study, and supported by prior research, it is concluded that teacher knowledge and/or attitude does play a big role in when and how technology is used and in its effectiveness. This study showed that the attitude of the teacher will determine how technology is used in instruction and how it will impact lesson effectiveness. Usually older instructors who are not familiar with technology are reluctant to try it because of fear based on lack of knowledge. This conclusion is substantiated by the body of research. According to Hew and Brush (2007), some instructors have neither the knowledge nor skill to use technology in instruction. Another essential point made by Ertmer (2005) was that experience is the driving force in teachers' beliefs in their ability to use technology in their classroom. Moreover, negative experiences form barriers to a teacher's ability to use instructional technology (Kelly, 2015). Ottenbreit-Leftwich and Brush (2018) also indicated that instructors should have common knowledge of how to operate software and the dynamics of instructional technology on learning. Thus, this study and the body of research conclude that teacher knowledge and attitude is an obstacle to incorporating technology into the lesson design.

Implications for Action

Implications for action were aligned with the conclusions drawn from the major findings in this study. The following actions need to be considered by teachers, administrators, and school boards to promote educational practices that support all students.

Implication 1: Diverse Assignments

Teachers need to diversify instruction to further meet the needs of all students. With the curriculum being online for most school districts now (all participants in this study used an online curriculum), teachers assign independent practice and assessments using technology. A lot of focus is on meeting the needs of the struggling student, but teachers also need to think about meeting the needs of the gifted student. First, the teacher needs to digitally present the lesson to the entire class. Next, all students will work on the independent practice piece on the digital devices. Then, as students finish the assignment, they will take an assessment on their device to measure how well they understand the concept. Students who exceed the standard will move on to the next instructional level, and the other students will continue to work independently. Once students meet or exceed the standard, they will move to the enrichment or special projects level. At this level, students will be offered more challenging, creative projects to work on. The teacher will assign a project on such topics as national parks or famous volcanoes. The students will be responsible for independently doing the research and creating a brochure with interesting facts and pictures using technology. At a specified time, the student will act as a tour guide when making the presentation to the class. The advanced student will be creatively, innovatively involved in a higher level skill activity and not bored. At the same time, the teacher will be available to work with students who need extra help on their assignment. Students on all levels will get the specialized instruction needed. All students will benefit from the diversification.

Implication 2: Increase Technology Support

The administrator needs to reach out to the school board and search out creative ways to increase the level of technology support to help teachers solve tech problems in the absence of money in the budget to provide such support. The administrator needs to schedule a workshop for the district technology technician to train teachers in minor rapid repair techniques to assist in keeping the digital tools functional. Teachers will also take responsibility for learning and performing technology repairs within their scope of expertise. Additionally, tech-savvy teachers will assist in teaching other staff members the basics of technology maintenance.

Implication 3: Digital Training Workshops

Principals need to schedule technology training for teachers during staff development on an ongoing basis depending on the need. The first step is to have the technology specialist work with staff in a workshop to provide an overview of the basic use and functions of the technical tools. Next, follow-up workshops need to be done with the technology coaches (if the school has one) explaining basic programs and responding to any teacher questions. In the absence of a technology coach, a tech-savvy teacher should conduct the workshop. Then teachers need to work within their professional learning communities to support and teach each other.

Implication 4: Alternate Instruction Plan

The teacher needs to have a back-up plan in case of any type of electronic malfunction or digital outage. Many times, the teacher's laptop still functions when the Chromebooks do not. A printed copy of a PowerPoint (if that is the medium used) needs to be available in case of technology failure. Students have access to their whiteboards and markers. The instructor can transfer information from the PowerPoint to the class whiteboard and students respond on their personal boards. The teacher and students can work from the textbook and workbooks. These must always be available in case they are needed. Whatever the case, the teacher must always be prepared to ensure student learning takes place.

Recommendations for Further Research

The following recommendations were made for further research based on the findings and conclusions of this study.

Recommendation 1: Administrators' Perspective

It is recommended that this study be replicated to discover the impact of instructional technology on lesson effectiveness and obstacles to incorporating instructional technology into lesson design as perceived by school administrators. School administrators will provide a different perspective and different insight on the subject. The administrators will provide a different type of data. The administrators will provide insight into data on student performance schoolwide and on their views of obstacles to technology integration. Understanding the administrator's perspective will help find a path to resolution of some existing problems.

Recommendation 2: Parents' Perspective

It is recommended that this study be replicated to discover the parents' perspective on the impact of instructional technology on lesson effectiveness. The study needs to be conducted with parents who have children who are instructed both with and without technology. The parents will share what difference (if any) they see in how well their child understands and completes his or her homework assignments with the use of instructional technology versus nontechnology instruction. Another indicator is the parents' observation of how technology has impacted their child's grade in a subject that was challenging for her/him. Did the parent notice any positive change in the child's grade, or did it stay the same? The perspective of the parents will provide their experience of how technology impacted lesson effectiveness for their student. The parents' perspective will provide teachers with insight into instructional strengths and instructional weaknesses illuminating areas that warrant change.

Recommendation 3: Students' Perspective

It is recommended that this study be replicated to discover the students' perspective on the impact of instructional technology on lesson effectiveness and obstacles to incorporating it into lesson design as perceived by students. The students will share their lived experience with instructional technology. They will express the difference it makes in the way they learn and process information. The will also share how they feel it has impacted lesson effectiveness for them. Additionally, students will relate the obstacles they encounter with technology integration. The students' perspective will help teachers better understand how to use technology in developing lessons to better meet their needs.

Recommendation 4: Elementary School Superintendents

It is recommended that this study be replicated to discover the impact of instructional technology on lesson effectiveness and obstacles to incorporating instructional technology into lesson design as perceived by elementary school superintendents. Superintendents are concerned about the performance of students on a larger scale than school administrators. School administrators are concerned with one school, whereas school superintendents are concerned about a complete district. Therefore, the perspective of a district superintendent will present a completely different outlook on technology effectiveness. The superintendent will provide comparative data on how technology has impacted a larger group of students. Possible variations of digital instruction's impact on lesson effectiveness and obstacles to incorporating it into the lesson design will add interesting, helpful new information to the field of research,

Recommendation 5: Comparative Study

It is recommended that a study be conducted to compare the impact of instructional technology on lesson effectiveness and obstacles to incorporating technology into the lesson design in school districts with students of lower socioeconomic status to school districts with students from a higher socioeconomic group. The data from the study will show the impact that technology has on academic achievement in the two different environments.

Recommendation 6: Gender Comparison Study

It is recommended that a study be conducted to compare the difference between male and female students in terms of engagement. This study will give teachers insight into instructional methods that best meet the needs of both genders. The data from this study will also show teachers the difference between the ways male and female students learn from instructional technology. With these data, teachers can design and implement lessons that effectively incorporate technology to enhance the learning for all students.

Concluding Remarks and Reflections

I am what is termed a digital native because I did not grow up using technology, but I embraced the use of technology as an adult. When the principal of the middle school I taught in started aggressively looking to equip students with technology, I was part of the delegation selected from our school district to attend a tech conference in Irvine, California. I was so amazed at what I saw and learned there. I came back from that conference with a vision of how technology could be used to impact classroom instruction. My passionate support for instructional technology influenced me to conduct this study on the impact of digital instruction on lesson effectiveness and obstacles encountered in integrating technology into lesson design from the teacher's perspective.

My research strongly indicates to me that instructional technology is the tool of the present. It is not just a fad that is going to disappear within a few years. This opinion is based on the fact that technology is the language this generation of students understands. I taught students with the textbook, pen, and paper way prior to teaching with technology. Just as teachers in the research explained how they saw the classroom transform from students who were bored and off task to students who were engaged and excited about learning with instructional technology, I saw the same thing. The classroom dynamics have changed so drastically over the past several years. They have gone from teacher centered to student centered. I observed teachers providing students with the tools and framework from which to work and students autonomously researching, observing, analyzing, and forming conclusions. It was no longer the "baby bird" syndrome with the teacher feeding students information and the students regurgitating; instead, the teachers were providing students with a framework from which to explore, seek out, and make their own discoveries. I saw learning taking place.

In this study, I learned of different types of obstacles teachers faced with incorporating technology into their daily lessons. The teacher responses to daily challenges demonstrated their level of creativity and resilience. When technology was not available and their complete lesson depended on it, teachers had a back-up plan and the lesson continued. Teachers operated on the philosophy of the old theatrical adage, "The show must go on." The flexibility of teachers keeps the wheels of instruction turning regardless to the situations they encounter. Revelations, such as the aforementioned, strengthen my faith in the educational system and in educators.

My biggest takeaway from this study can be summed up in one word—transformation. In the educational field, as well as in life, if we want to be on the cutting edge of things, we must be willing to transform our thinking and actions to meet the current challenge or need. Just as the world is continuously evolving, so it is with education.

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APPENDICES

APPENDIX A

Synthesis Matrix

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	SYNTHESIS MATRIX	THEMES	Technology to Enhance Learning	Teacher Training in Instructional Technology	Instructional Technology History/Purpose	Student Concerns	Framework/Theory	Barriers	Gaps in Research	Teacher Concerns	Research Methods	Theoretical Foundations
2	An & Reigeluth		X						X			
3	Banks, LaFors & Brown (2015)					X						
4	Bergmann, J. & Sams, A. (2012).		X									
5	Besnoy, Dantzler & Siders (2012).		X									
6	Blakely (1969)				X							
7	Brown & Thomas					X						
8	Brueck, J. & Lenhart, L. (2015).		X				X					
9	Burks, B., Beziat, T. , Danley, S., Davis, K., Lowery, H., & Lucas, J. (2015).					X						
10	California Department of Education, (2014)		X			X						X
11	California Department of Education, (2016).			X		X						
12	Children, N. (2015)					X						
13	Collins & Halverson (2009)				X							
14	Corbin, Strauss & Strauss (2014)										X	
15	Criswell (2007)										X	
16	Cuban (1986)				X							
17	Culp, K. M., Honey, M. & Mandinach E. (2005)				X							X
18	Cummings (2014)						X					

	SYNTHESIS MATRIX	THEMES	**Technology to Enhance Learning**	Teacher Training in Instructional Technology	Instructional Technology History/Purpose	Student Concerns	Framework/Theory	Barriers	Gaps in Research	Teacher Concerns	Research Methods	Theoretical Foundations
1												
2												
19	Dilworth, Donaldson, George, Knezek, Searson, Startweather & Robinson (2012).		X	X								
20	Dobozy, E. (2013).						X					
21	Domingo & Gargante (2016)							X		X		
22	Ertmer, Ottenbreit-Leftwich, Sadik, Sendurur & Sendurur (2012)						X			X		
23	Flair, I. (2014).		X									
24	Friedman, T. & Mandelbaum, M. (2011).					X						
25	Gliksman (2015)				X	X						
26	Gomez, M. (2015).						X					
27	Gullen (2014)					X				X		
28	Hamilton, Rosenberg & Akcaoglu (2016)						X					
29	Hastshorne, R. Ferdig, R & Dawson, K. (2005).			X								
30	Hew & Brush (2007)							X				

	SYNTHESIS MATRIX	THEMES	Technology to Enhance Learning	Teacher Training in Instructional Technology	Instructional Technology History/Purpose	Student Concerns	Framework/Theory	Barriers	Gaps in Research	Teacher Concerns	Research Methods	Theoretical Foundations
2												
31	Hew, K. & Brush, T. (2006).								X			
32	Hilton (2016)						X					
33	Holzweiss (2014)					X				X		
34	Host, E., Baynham, E., & McMaster, H. (2015)		X									
35	Hsu, P. (2016).		X					X				
36	Isaacson, W. (2014)					X						
37	Jackson, D (2015)					X		X	X			
38	Janssen, N. & Lazonder, A. W. (2016)			X						X		
39	Johnson (2003)									X		
40	Karagiori (2015)							X				
41	Katel, Peter (2011)					X						
42	Keengwe, J., Onchwari, G., & Wachira, P. (2008)		X									X
43	Kelly, D., P., (2015)			X				X				
44	Kirkland (2014)						X					
45	Kopcha (2012)			X								
46	Koretz, D. (2009)					X						
47	Leftwich & Brush (2018)						X					
48	Leininger (1985)											

	SYNTHESIS MATRIX	THEMES	Technology to Enhance Learning	Teacher Training in Instructional Technology	Instructional Technology History/Purpose	Student Concerns	Framework/Theory	Barriers	Gaps in Research	Teacher Concerns	Research Methods	Theoretical Foundations
1												
2												
49	McMillan & Schumacher (2010)										X	
50	Metcalf & Fenwick (2009)		X							X		
51	Mishra, P., & Koehler, M. (2006).						X					
52	Morrison & Lowther (2000)									X		
53	Murnane & Papay (2010)					X						
54	National Center for Education Statistics. (2013).					X						
55	Onal, N. (2016)			X			X					
56	Ottenbreit-Leftwich & Brush (2018)							X				
57	Papert, S.,(1984)											
58	Patten, M. (2012)										X	
59	Patton, M. (2015)										X	
60	Petrina (2003)				X							
61	Prensky, M. (2001)					X						
62	Rance-Rooney (2010)		X									
63	Reiser & Dempsey (2017)				X							
64	Reiser (2001)				X							

	SYNTHESIS MATRIX	THEMES	Technology to Enhance Learning	Teacher Training in Instructional Technology	Instructional Technology History/Purpose	Student Concerns	Framework/Theory	Barriers	Gaps in Research	Teacher Concerns	Research Methods	Theoretical Foundations
2												
65	Saettler (1990)				X							
66	Schmier, S. (2014)		X			X				X		
67	Shirley, M. & Irving, K. (2014)					X						
68	Shulman, L. (2013).						X					
69	Solomon (2015)				X							
70	Swanson & Piehle (2013)					X				X		
71	Thomas & Brown (2009)						X					
72	Williams, Atkins, Cate & O'Hair (2008)											
73	Williamson & Redish (2009)					X				X		
74	Young, C. A. & Brush, J. (2004)		X									X

APPENDIX B

Participant Invitation Letter for Research Study

Date:

Dear Potential Study Participant:

I am Sarah Loring, a doctoral candidate in the Organizational Leadership Program at Brandman University. The research for my dissertation focuses on the impact of instructional technology on lesson effectiveness as perceived by middle school teachers. Additionally, the study seeks to understand obstacles to incorporating instructional technology into lesson design as perceived by middle school teachers.

I am requesting your assistance in the study by participating in an interview or an observation. The interview or observation will take from 30 to 60 minutes each, and will be scheduled at a time convenient for you. Additionally, any documents such as lesson plans, e-mails or PowerPoint lessons you could provide would be helpful. If you agree to participate in the study, you may be assured that it will be completely confidential. No names will be attached to any notes or records from the interview or observation. All information will remain in locked files accessible only to the researcher. You are also free to end the interview or observation and withdraw from the study at any time.

If you have any questions, I am available to discuss the research by phone or e-mail. My dissertation chair is also available to answer any of your questions. The dissertation chair, Dr. Guadalupe Solis, can be reached at the following e-mail address: gsolis1@brandman.edu. I greatly value and appreciate your participation in this study.

Sincerely,

Sarah Loring

Doctoral Candidate, Brandman University

E-mail: sloring@mail.brandman.edu

Phone: xxx-xxx-xxxx

APPENDIX C

Brandman University Research Participant's Bill of Rights

Any person who is requested to consent to participate as a subject in an experiment, or who is requested to consent on behalf of another, has the following rights:

1. To be told what the study is attempting to discover.
2. To be told what will happen in the study and whether any of the procedures, drugs or devices are different from what would be used in standard practice.
3. To be told about the risks, side effects or discomforts of the things that may happen to him/her.
4. To be told if he/she can expect any benefit from participating and, if so, what the benefits might be.
5. To be told what other choices he/she has and how they may be better or worse than being in the study.
6. To be allowed to ask any questions concerning the study both before agreeing to be involved and during the course of the study.
7. To be told what sort of medical treatment is available if any complications arise.
8. To refuse to participate at all before or after the study is started without any adverse effects.
9. To receive a copy of the signed and dated consent form.
10. To be free of pressures when considering whether he/she wishes to agree to be in the study.

If at any time you have questions regarding a research study, you should ask the researchers to answer them. You also may contact the Brandman University Institutional Review Board, which is concerned with the protection of volunteers in research projects. The Brandman University Institutional Review Board may be contacted either by telephoning the Office of Academic Affairs at (949) 341-9937 or by writing to the Vice Chancellor of Academic Affairs, Brandman University, 16355 Laguna Canyon Road, Irvine, CA, 92618.

APPENDIX D

Informed Consent

CONSENT TO PARTIPATE IN RESEARCH

Brandman University
16355 Laguna Canyon Road
Irvine, CA 92618

TITLE: Impact of Instructional Technology on Lesson Effectiveness as Perceived by Middle School Teachers

RESPONSIBLE INVESTIGATOR: Sarah Loring

PURPOSE OF STUDY: You are being asked to participate in a research study conducted by Sarah Loring, M.A., a doctoral student of Organizational Leadership at Brandman University. The purpose of this qualitative study is to describe the impact of instructional technology on lesson effectiveness and obstacles to incorporating instructional technology into lesson design as perceived by middle school teachers. The study strives to understand the lived experience of middle school teachers germane to perceived obstacles they encountered in integrating instructional technology into their daily lesson design. The study will fill gaps in the research regarding obstacles to incorporating technology into lesson design.

PROCEDURES: By participating in this study, I agree to participate in an observation or a one-on-one interview. The one-on-one interview or observation (conducted in person by the researcher) will last between 30 to 60 minutes. The interview will be audio-recorded (privacy statement attached).

I understand that:

a) There are no reasonably foreseeable risks associated with this study.
b) The possible benefit of this study to me is that my input may help to add to the research on the impact of instructional technology on teachers’ perceptions on lesson effectiveness and teachers’ perceptions on obstacles to incorporating technology into their lesson design. Results of the study will be available and may elucidate new techniques in the use of educational technology. I understand I will not be compensated for my participation in this study.

c) I can direct any questions or concerns regarding the research to Sarah Loring at sloring@mail.brandman.edu or by phone xxx-xxx-xxxx; also, Dr. Guadalupe Solis, dissertation chair, at gsolis1@brandman.edu.

d) I can withdraw from the study at any time if I no longer want to participate. I can also choose not to answer certain questions during the interview. I further understand that I may discontinue participation in the study without negative consequences. The investigator may end the study at any time.

e) No information that identifies me will be released without my separate consent and that all identifiable information will be protected to the limits allowed by law. If the study design or the use of the data is to be changed, I will be notified, and my consent re-obtained. I understand that if I have any questions, comments, or concerns about the study or the informed consent process, I may write or call the Office of the Vice Chancellor of Academic Affairs, Brandman University, at 16355 Laguna Canyon Road, Irvine, CA 92618, (949) 341-7641.

I acknowledge that I have received a copy of this form and the Research Participant's Bill of Rights. I have read the above and completely understand the procedures outlined therein, and hereby consent to participate in the research.

____

Printed Name of Participant

____

Signature of Participant

____

Signature of Principal Investigator

____

Date

APPENDIX E

Privacy Act Statement and Consent Agreement for Audio Recording

I consent to allow audio recording during the interview, and to that information being reviewed by participants in the study. I understand that all information will be confidential and reported with anonymous identifiers. Additionally, I understand that upon completion of transcriptions of the interviews, the recordings will be erased. I further understand that I may receive a copy of the transcription to review it for correctness. I also understand that I may withdraw this consent at any time without suffering penalty.

____

Printed Name of Participant

____

Signature of Participant

☐ Please provide a copy of the transcript for my review at the following address:

____

.

____

Signature of Principal Investigator

____

Date

APPENDIX F

Interview Questions

I am Sarah Loring, a doctoral candidate in the Organizational Leadership Program at Brandman University. The research for my dissertation focuses on the impact of instructional technology on lesson effectiveness as perceived by middle school teachers. Additionally, the study seeks to understand obstacles to incorporating instructional technology into the lesson design as perceived by middle school teachers.

I am requesting your assistance in the study by participating in an interview or observation and providing me with documents such as lesson plans, PowerPoints and any other printed material that would add to the study. The interview will be recorded to ensure accuracy. You have consented to participate in a recorded interview or an observation; is that correct?

1. What do you view as positive impacts of instructional technology on lesson effectiveness in the classroom?
2. What factors contribute to the impact of instructional technology on lesson effectiveness from your perspective?
3. How does teacher understanding of content knowledge influence which technology is integrated into lesson design?
4. How is technology correlated with curriculum material in the lesson design to impact instructional effectiveness?
5. What are the negative impacts of technology on lesson effectiveness?
6. What criteria are used in determining the impact of instructional technology on lesson effectiveness?

7. Is there anything else you would like to add to the impact of instructional technology on lesson effectiveness as you perceive it?
8. What do you perceive as obstacles to incorporating instructional technology into the lesson design?
9. How have you handled obstacles you have encountered in integrating technology into your instructional practices?
10. What difference has the use of instructional technology made in lesson design and lesson effectiveness in classrooms on your campus?

APPENDIX G

Alignment Table

QUALITATIVE – ETHNOGRAPHIC			
ALIGNMENT			
PURPOSE	**Central Question**	**Research Questions**	**Theoretical Framework**
To understand and describe the impact of instructional technology on lesson effectiveness & obstacles to incorporating technology into lesson design as perceived by middle school teachers.	What is the impact of instructional technology on lesson effectiveness and obstacles to incorporating technology into lesson design as perceived by middle school teachers?	1. What is the impact of instructional technology on lesson effectiveness as perceived by middle school teachers?	Technological, Pedagogical, and Content Knowledge (TPACK)
		2. What are the obstacles to incorporating instructional technology into lesson design as perceived by middle school teachers?	

INTERVIEW QUESTION	**ALIGNMENT**
Question 1	Research Question 1
Question 2 Question 3	Research Question 1 TPACK - (CK)
Question 4 Question 5 Question 6 Question 7 Question 8 Question 9 Question 10	TPACK - (TCK) Research Question 1 TPACK - (TPCK) Research Question 1 Research Question 2 Research Question 2 Research Questions 1 & 2 and TPACK

APPENDIX H

Observation Field Note Guide

Start: _________ End: _________	Length of Observation: ______ Minutes
Observer Description of Events	Observer Reflections
Physical Setting:	
Activities Observed:	
Behaviors/Actions:	
Conversations/Interpersonal Interactions:	
Organizational Processes/Etc:	

APPENDIX I

Field Test Participant Feedback Questions

1. How did you feel about the interview? Do you think you had ample opportunities to describe what you do as a teacher when working with your team or students?

2. Do you fell the amount of time of the interview was okay?

3. Were the questions by and large clear or were there places where you were uncertain what was being asked?

4. Can you recall any words or terms being asked about during the interview that were confusing?

5. And finally, did I appear comfortable during the interview…(I'm pretty new at this)?

APPENDIX J

NIH Certification

Certificate of Completion

The National Institutes of Health (NIH) Office of Extramural Research certifies that **Sarah Loring** successfully completed the NIH Web-based training course "Protecting Human Research Participants".

Date of completion: 05/21/2016.

Certification Number: 2079611.

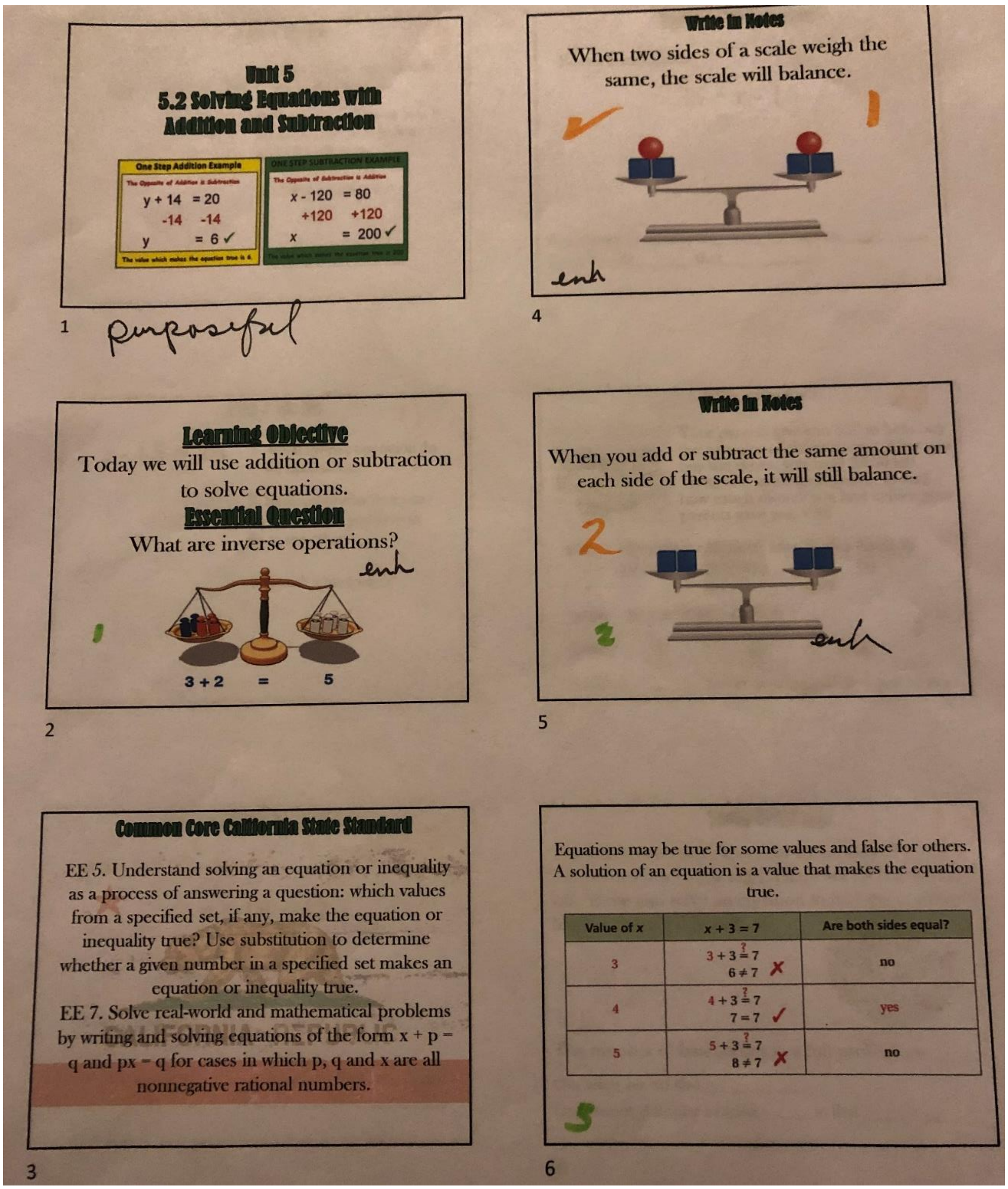
APPENDIX K

Artifacts

PowerPoint Lessons

Solving Equations

6th Grade



I Do / We Do

3

Tell whether the given value is a solution of the equation.

p + 10 = 38; p = 18

$p + 10 = 38;\ p = 18$

$18 + 10 \stackrel{?}{=} 38$ Substitute 18 for *p*.

$28 \neq 38$ ✗ Sides are *not* equal.

4

So, *p* = 18 is *not* a solution.

7

I Do / We Do

5

Tell whether the given value is a solution of the equation.

p + 10 = 38; p = 18

$p + 10 = 38;\ p = 18$

$18 + 10 \stackrel{?}{=} 38$ Substitute 18 for *p*.

$28 \neq 38$ ✗ Sides are *not* equal.

5

So, *p* = 18 is *not* a solution.

8

I Do / We Do

7

Tell whether the given value is a solution of the equation.

t - 5 = 17; t = 12

6

9

You Do (Whiteboards)

4

Tell whether the given value is a solution of the equation.

a + 6 = 17; a = 9

My answer is similar to_________in that_________.
I agree with_______that_________.

10

You Do (Face Partner B – A)

6

Tell whether the given value is a solution of the equation.

9 - g = 5; g = 3

Our answer is similar to_________in that_________.
My partner and I agree with_______that_________.

11

Write in Notes

8

You can use *inverse operations* to solve equations. **Inverse operations** "undo" each other. Addition and subtraction are inverse operations.

Addition Property of Equality

Words When you add the same number to each side of an equation, the two sides remain equal.

Numbers

$$\begin{aligned} 8 &= 8 \\ +5 \quad & \quad +5 \\ 13 &= 13 \end{aligned}$$

Algebra

$$\begin{aligned} x - 4 &= 5 \\ +4 \quad & \quad +4 \\ x &= 9 \end{aligned}$$

Subtraction Property of Equality

Words When you subtract the same number from each side of an equation, the two sides remain equal.

Numbers

$$\begin{aligned} 8 &= 8 \\ -5 \quad & \quad -5 \\ 3 &= 3 \end{aligned}$$

Algebra

$$\begin{aligned} x + 4 &= 5 \\ -4 \quad & \quad -4 \\ x &= 1 \end{aligned}$$

12

I Do / We Do

$u + 43 = 78$

1. What inverse operation do we need to use?
2. Remember whatever you do to one side, you have to do to the other.
3. Check your answer.

13

I Do / We Do

$x - 15 = 28$

1. What inverse operation do we need to use?
2. Remember whatever you do to one side, you have to do to the other.
3. Check your answer.

14

You Do (Face Partner A-B)

Solve and Check.

$x + 13 = 42$

Our answer is similar to________in that_________.
My partner and I agree with_______that_________.

15

You Do (Whiteboards)

Solve and Check.

$35 = r - 15$

My answer is similar to_________in that_________.
I agree with________that_________.

16

I Do / We Do

Your parents give you $20 to help buy the new pair of shoes shown. After you buy the shoes, you have $5.50 left. Write and solve an equation to find how much money you had before your parents gave you $20.

Words The starting amount plus the amount your parents gave you minus the cost of the shoes is the amount left.

Variable Let *s* be the starting amount.

Equation *s* + 20 − 59.95 =

You had __________ before your parents gave you money.

17

Team Challenge

You eat 8 blueberries and your friend eats 11 blueberries from a package. There are 23 blueberries left. Write and solve an equation to find the number of blueberries in a full package.

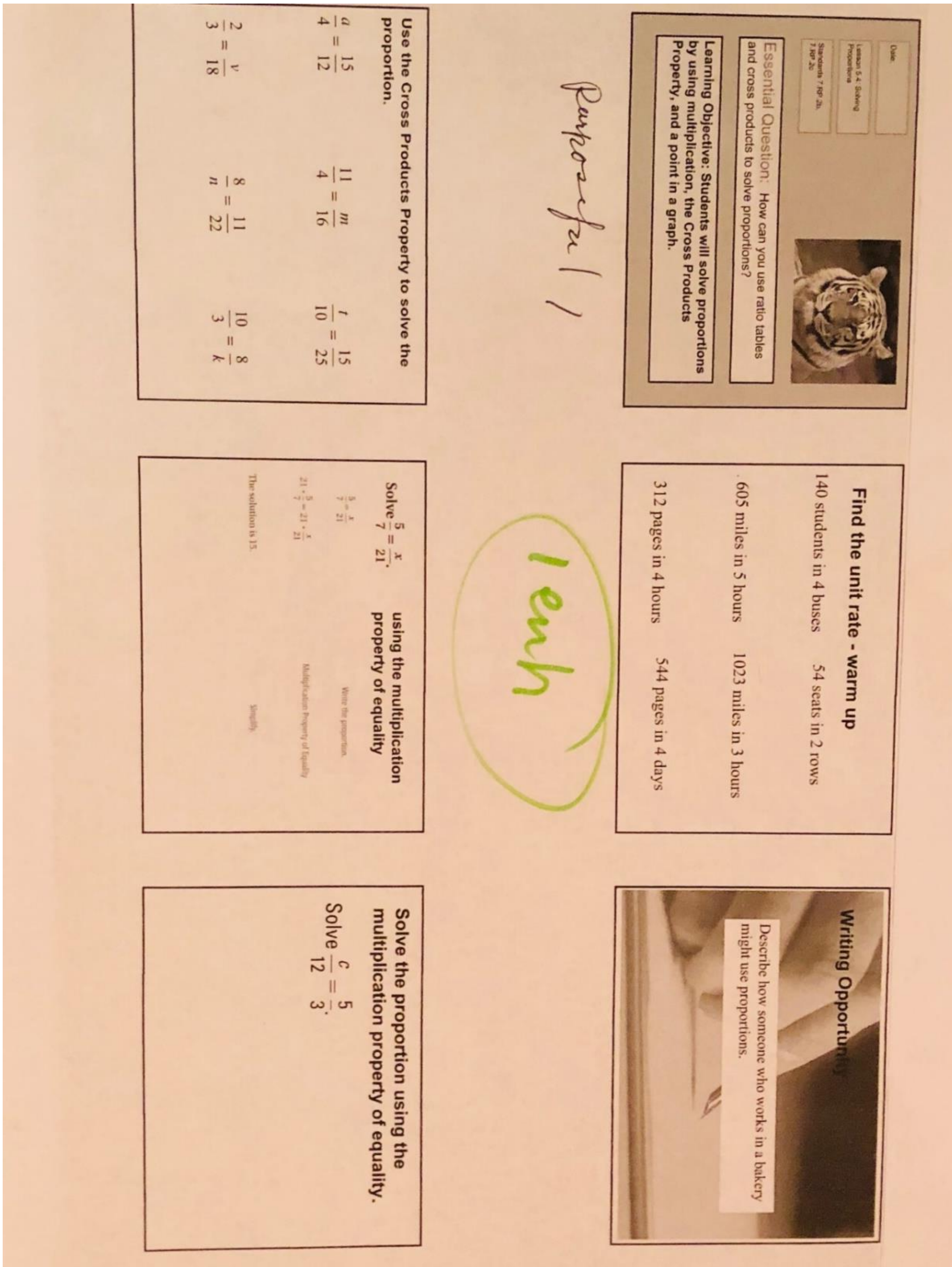
The number of blueberries in a full package are _____.

Our team agreed that ___________.
Our answer is similar to team ______in that ___________.

18

Solving Proportions

7th Grade



Use multiplication to solve the proportion.

$\frac{w}{6} = \frac{6}{9}$ $\frac{12}{10} = \frac{a}{15}$ $\frac{y}{6} = \frac{2}{4}$

Solve each proportion using the Cross Products Property

$\frac{x}{8} = \frac{7}{10}$	Cross Products Property	$\frac{9}{y} = \frac{3}{17}$
$x \cdot 10 = 8 \cdot 7$	Multiply.	$9 \cdot 17 = y \cdot 3$
$\frac{10x}{10} = \frac{56}{10}$	Divide.	$153 = 3y$
$x = 5.6$		$51 = y$
The solution is 5.6.		The solution is 51.

Solve each proportion using the Cross Products Property

$\frac{3}{4} = \frac{u}{6}$ $\frac{4}{13} = \frac{12}{h}$

$\frac{2}{7} = \frac{x}{28}$ $\frac{12}{5} = \frac{6}{y}$

$\frac{40}{z+1} = \frac{15}{6}$

Use the information in the table to solve for x.

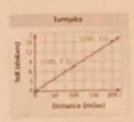
# of bracelets	3	x
Yellow twine	48 in.	80 in.

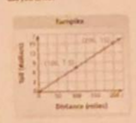
$\frac{3}{48} = \frac{x}{80}$

$x = 5$

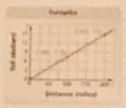
five bracelets

ehh





Your turn



If your toll is $9. How many kilometers did you drive?

Write and solve a proportion to complete the statement. Round to the nearest hundredth, if necessary.

7.5 in. ≈ ☐ cm

100 g ≈ ☐ oz

2 L ≈ ☐ qt

4 m ≈ ☐ ft

Mini-Assessment

Solve the proportion.

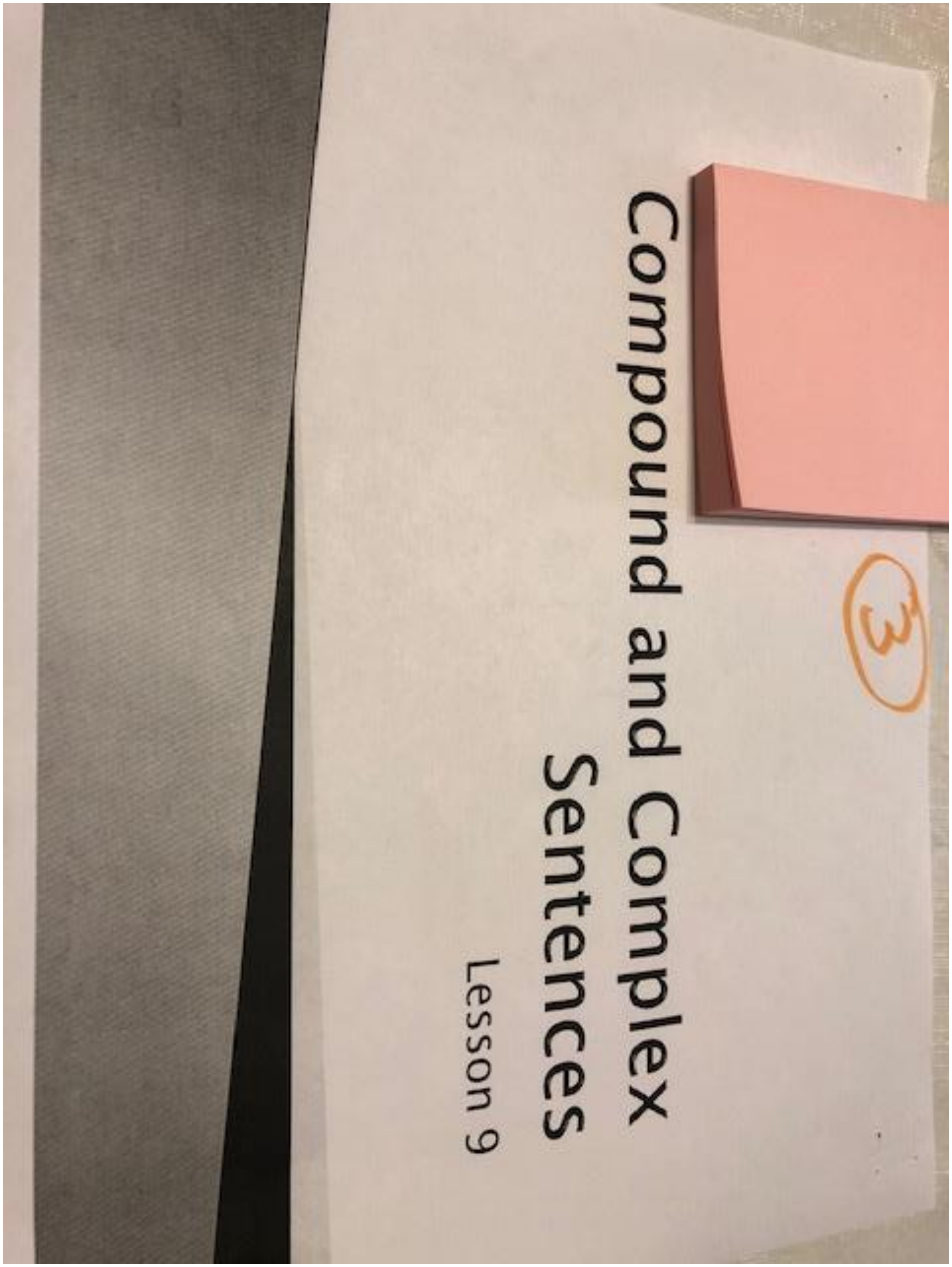
1. $\frac{x}{12} = \frac{3}{8}$
2. $\frac{6}{11} = \frac{9}{m}$
3. $\frac{6}{12} = \frac{c}{36}$
4. $\frac{18}{3} = \frac{24}{b}$
5. Thirty-six pencils are packed in three boxes. How many pencils are packed in five boxes?

Exit Ticket

Write and solve 3 proportions. One should use mental math to solve, one should use the Multiplication Property of Equality, and one should use the Cross Products Property.

Compound and Complex Sentences

4th Grade



Compound Sentences

- *A* <u>compound sentence</u> is made *up of two simple sentences joined by* coordinating conjunction.

- *A* comma is used before the *conjunction.*

Coordinating Conjunctions

- *and*

- *but*

- *or*

- *so*

Example

- *Sentence 1*: Cara entered the library.
- *Sentence 2*: She started looking for books about snakes.

- <u>*Compound Sentence:*</u>
- *Cara* entered the library, and she started looking for books about snakes.

Practice

eng.

- <u>*Underline* the simple sentences in each compound sentence. Circle the comma, and *then* circle the coordinating conjunction.</u>

- Cara found the book she needed, but she *didn't* want to sit near Mr. Winston.

- *She took the* book to a table near the window, and she put the box with her snake in front of her.

Turn to page 103 in your Readers Notebook

Complex Sentences

- A complex sentence is made up of a simple sentence and a dependent clause joined by a subordinating conjunction.
- Do not use a comma if the subordinating conjunction is in the middle of the sentence.

Subordinating Conjunctions

- because
- if
- although
- since
- until

Examples

- Simple Sentence: Cara thought nothing would happen.
- Dependent Clause: she said the box was empty.
- Subordinating Conjunction: because
- Complex Sentence: Cara thought nothing would happen because she said the box was empty.

Example

- *Simple Sentence:* Cara thought nothing would happen.
- *Dependent Clause:* she said the box was empty.
- *Subordinating Conjunction:* because
- *Complex Sentence:* Because Cara said the box was empty, she thought nothing would happen.

Practice

- For each complex sentence, underline the simple sentence and the dependent clause. Circle the subordinating conjunction. Add a comma if necessary.

- Mr. Winston walked over because he thought Cara needed help.

- Cara said she didn't need help since she wanted to be left alone.

Turn to page 104 in your Readers Notebook

Commas in Compound Sentences

- In a compound sentence, a comma is used before the **coordinating conjunction.**

Example

- Sentence 1: Cara could have run out of the library.
- Sentence 2: She could have stayed to help Mr. Winston.
- Compound Sentence:
- Cara could have run out of the library, or she could have stayed to help Mr. Winston.

Practice

- Circle the coordinating conjunction in each sentence. Then put the comma in the correct place.
- Mr. Winston fainted and Cara knew she might be in trouble.
- Cara thought about running away but she knew she should stay.

Turn to page 105 in your Readers Notebook

Review: Kinds of Nouns

- Common Nouns: a person, place, or thing
  - Ex: pencil, school, teacher, store

- Proper Nouns: The name of a person, place, or thing. Proper Nouns are always capitalized.
  - Ex: Target, Mrs. McClure

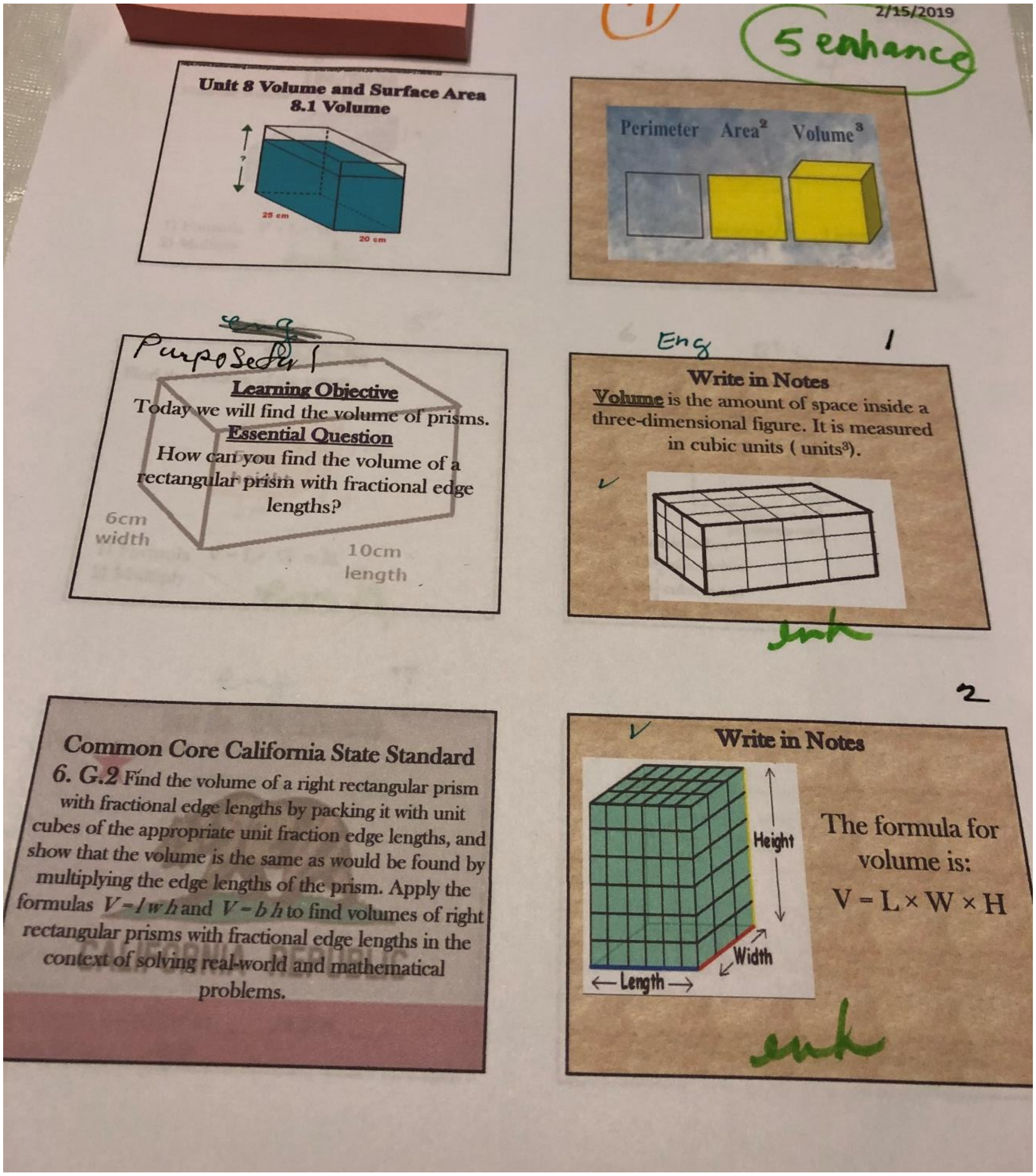
Examples:

Common Nouns	Proper Nouns	Singular Nouns	Plural Nouns
girl	Ann	apple	apples
city	Orlando	day	days
day	Thanksgivi ng	class	classes
month	June	fox	foxes

Turn to page 106–107 in your Readers Notebook

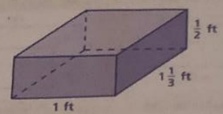
Volume and Surface Area

6th Grade



I Do/We Do

Find the volume of the prism.

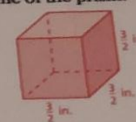


1) Formula V = L • W • H
2) Multiply

enh

You Do- Partner A – B (Face)

Find the volume of the prism.



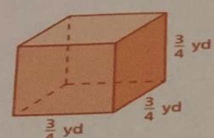
The volume of the prism is _____. I know this because____.
My answer is similar to_____in that_____.
I agree with_____that______.

enh

eng 5

I Do/We Do

Find the volume of the prism.



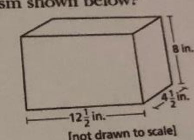
1) Formula V = L • W • H
2) Multiply

enh

6 Eng

Team Challenge

What is the volume, in cubic inches, of the right rectangular prism shown below?

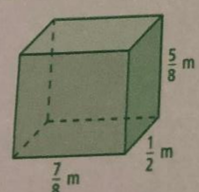


A 25 cubic inches
B $120\frac{1}{2}$ cubic inches
C $384\frac{1}{2}$ cubic inches
D 450 cubic inches

eng 7

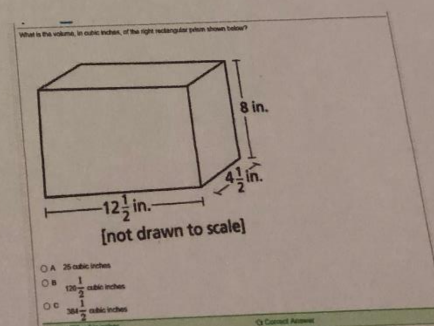
You Do- Whiteboards

Find the volume of the prism.



The volume of the prism is _____. I know this because____.
My answer is similar to_____in that_____.
I agree with_____that______.

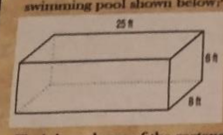
Answer



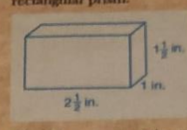
eng

Independent Practice

1. What is the volume of the swimming pool shown below?

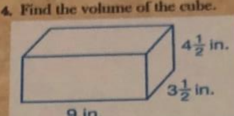


2. Find the volume of the rectangular prism.



3. Find the volume of the rectangular prism that has a length (l) of $5\frac{1}{4}$ feet, a width (w) of $2\frac{1}{2}$ feet, and a height (h) of $8\frac{1}{2}$ feet.

4. Find the volume of the cube.



Lesson Plans

6th Grade

	0 Period-ELD	1st Period-Guided Reading
Monday	**Holiday** [redacted]	**Holiday**
Tuesday	**CCSS Standard: Part 2.5** **Learning Objective:**Today we will add adjectives to expand sentences to provide detail in our writing. **Language Objective:** Students will expand sentences with a variety of adjectives to provide detail in writing. **ELD Language Objective: Part B. 5.** Students will write simple and compound sentences. **ELL Strategies:** Visuals, Technology **Engagement Strategies:** Pair Share,Choral, **Curriculum / Materials:** Powerpoint, Picture Cards **Independent Work:** **Homework:**Reading Log	**CCSS Standard: RI 6.2, P16a, P2. 2b** **Learning Objective:** Today we will use reading comprehension strategies independently to become fluent and skilled readers using level appropriate books. **Language Objective:** Students will demonstrate reading comprehension by answering questions on a quiz using technology. **ELD Language Objective:** Students will apply growing understanding of how ideas and events are linked in text to show comprehension. **ELL Strategies:** Visuals, Technology **Engagement Strategies:** Pair Share,Choral, **Curriculum / Materials:** Powerpoint, Reading Passage **Independent Work: Read Silently** **Homework:** Reading Log
Wednesday	**CCSS Standard: W.6.1-10; WHST.6.1-10; L.6.1-3, 6** **Learning Objective:**Today we will identify phonetical sounds to build words using Reading Horizons. (Chapter 1) **Language Objective:** Students will use morphology to determine the meaning of words. **ELD Language Objective:** Students will listen to letter sounds to and write words they hear. **ELL Strategies:** Visuals, Technology **Engagement Strategies:** Pair Share,Choral, **Curriculum / Materials:** Powerpoint, Reading Passage **Independent Work:** **Homework:**Reading Log	**CCSS Standard: RI 6.2, P16a, P2. 2b** **Learning Objective:** Today we will use reading comprehension strategies independently to become fluent and skilled readers using level appropriate books. **Language Objective:** Students will demonstrate reading comprehension by answering questions on a quiz using technology. **ELD Language Objective:** Students will apply growing understanding of how ideas and events are linked in text to show comprehension. **ELL Strategies:** Visuals, Technology **Engagement Strategies:** Pair Share,Choral, **Curriculum / Materials:** Powerpoint, Reading Passage **Independent Work: Read Silently** **Homework:** Reading Log
Thursday	**CCSS Standard: Part 2.5** **Learning Objective:**Today we will add adjectives to expand sentences to provide detail in our writing. **Language Objective:** Students will expand sentences with a variety of adjectives to provide detail in writing. **ELD Language Objective: Part B. 5.** Students will write simple and compound sentences. **ELL Strategies:** Visuals, Technology **Engagement Strategies:** Pair Share,Choral, **Curriculum / Materials:** Powerpoint, Picture Cards **Independent Work:** **Homework:**Reading Log	**CCSS Standard: RI 6.2, P16a, P2. 2b** **Learning Objective:** Today we will use reading comprehension strategies independently to become fluent and skilled readers using level appropriate books. **Language Objective:** Students will demonstrate reading comprehension by answering questions on a quiz using technology. **ELD Language Objective:** Students will apply growing understanding of how ideas and events are linked in text to show comprehension. **ELL Strategies:** Visuals, Technology **Engagement Strategies:** Pair Share,Choral, **Curriculum / Materials:** Powerpoint, Reading Passage **Independent Work: Read Silently** **Homework:** Reading Log
Friday	**CCSS Standard: W.6.1-10; WHST.6.1-10; L.6.1-3, 6** **Learning Objective:**Today we will identify phonetical sounds to build words using Reading Horizons. (Chapter 1) **Language Objective:** Students will use morphology to determine the meaning of words. **ELD Language Objective:** Students will listen to letter sounds to and write words they hear. **ELL Strategies:** Visuals, Technology **Engagement Strategies:** Pair Share,Choral, **Curriculum / Materials:** Powerpoint, Reading Passage **Independent Work:** **Homework:**Reading Log	**CCSS Standard: RI 6.2, P16a, P2. 2b** **Learning Objective:** Today we will use reading comprehension strategies independently to become fluent and skilled readers using level appropriate books. **Language Objective:** Students will demonstrate reading comprehension by answering questions on a quiz using technology. **ELD Language Objective:** Students will apply growing understanding of how ideas and events are linked in text to show comprehension. **ELL Strategies:** Visuals, Technology **Engagement Strategies:** Pair Share,Choral, **Curriculum / Materials:** Powerpoint, Reading Passage **Independent Work: Read Silently** **Homework:** Reading Log

2nd Period-Math Intervention	3rd Period- Math 6
Holiday	**Holiday**
CCSS RP 1, 2, 3, NS1, 2, 3, 4, 5, 6 **Learning Objective:** Today we will solve ratio, rate, percent, LCM, GCD, fractions, integers, the coordinate plane and decimal problems. **ELD Objective: C Productive-Writing 10B** Students will write in complete sentences using key math words. **Language Objective:** Students will write the answers to word problems using compound sentences sentences. **Essential Question:** How can you use positive and negative numbers to represent real-world quantities? **ELL Strategies:** Visuals, Technology **Engagement Strategies:** Pair Share,Kagan **Curriculum / Materials:** Powerpoint **Independent Work:** Spiral Review **Homework:** none **Focus Frames:** My answer is similar to in that.	**CCSS EE 1** **Learning Objective:** Today we will find values of powers involving whole number exponents. **ELD Standard:** C Productive-Writing 10B Students will write in complete sentences using key math words. **Language Objective:** Students will contribute to a discussion to create a context for writing exponents using verbs appropriate for math. **Essential Question:**How can you use exponents to write numbers? **ELL Strategies:** Visuals, Technology **Engagement Strategies:** Pair Share,Kagan **Curriculum / Materials:** Powerpoint **Independent Work: 5.3 Order of Operations** **Homework:** none **Focus Frames: My answer is similar to__in that.** **I agree with_____in that_____.**
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7th Period- Math 6	9th Period- Science
Holiday	**Holiday**
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Explicit Direct Instruction

7th Grade

DataWorks Educational Research

All Students Successfully Taught Grade-Level Work Every Day.

Explicit Direct Instruction (EDI) Lesson Template

Grade: K 1 2 3 4 5 6 ■7 8 9 10 11 12   Content Area: O ELA ■ Math O History O Science O Other

Feedback date: ___________________________ Developed by: ■ Group O Individual _7th Grade Math PLC_______
(Name—Please print)

Content Standard-indicate the specific Learning Objective addressed in this lesson. O Rewrite O Revise O Ready
Describe the Independent Work.

7.EE: Use properties of operations to generate equivalent expressions.
Students will analyze mathematical statements in order to connect algebraic equations to real life situations.

Collaborative Work:
Students work collaboratively in pairs or threes, matching equations to stories and then ordering the steps used to solve these equations. Throughout their work, students explain their reasoning to their peer(s).

Independent Work:
Students will be taking a pre-assessment prior to the lesson and then they will complete a similar task as they did in their group, but individually.

Learning Objective/Essential Question as stated to the students. O Rewrite O Revise O Ready

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LO: Student will form and solve linear equations that involve factoring and using the distributive property.
EQ: What is the difference between expressions and equations? How can we apply the properties to solve an equation?

CFU questions that will verify students can describe the **Learning Objective**. O Rewrite O Revise O Ready
How will you select students?

Random Calling (Kagan/teacher choice)

What will you do to **Activate** or provide **Prior Knowledge**? O Rewrite O Revise O Ready

-Kagan Strategy: Pairs compare (Writing prompt on powerpoint). Allow students to use a double bubble map or Venn Diagram to organize their ideas.

-What is the difference between an expressions and an equations? (2)

-Students will write a response independently and then they will compare with a partner.

-Have students share out and write their response with the class.

CFU questions that will verify students can describe/execute **Prior Knowledge.** O Rewrite O Revise O Ready
How will you select students?

-Students will be sharing out to the class by reading their responses. (3)

Describe how you will teach the **Concept**.

- **Explain** and **Elaborate** O Rewrite O Revise O Ready
- **Model** and **Elaborate** (think aloud) O Rewrite O Revise O Ready
- **Demonstrate** and **Elaborate** (physical) O Rewrite O Revise O Ready

Vocabulary:

Equation: A mathematical sentence that uses an equal sign to show that two expressions are equal.
Variable: A letter that represent a value.

CFU questions that will verify students can describe the Concept. O Rewrite O Revise O Ready
How will you select students?

Whiteboards: Writing component (4)

What do you already know about solving equations?

Describe how you will teach the **Importance**.

- **Explain** and **Elaborate** O Rewrite O Revise O Ready
- **Model** and **Elaborate** (think aloud) O Rewrite O Revise O Ready
- **Demonstrate** and **Elaborate** (physical) O Rewrite O Revise O Ready

It is important to understand how to solve equations because we can apply this in the real world. Although we may not realize it, we use equation every day! Last year in 6th grade you were introduced to equations and now this year we will further explore equations that contain positive and negative rational numbers in any form!

-Show a media clip demonstrating equations in real world (Tech enf.)

-

CFU questions that will verify students can describe the Importance. 5 O Rewrite O Revise O Ready
How will you select students?

-What are some ways we use equations in the real world?
-Why is it important that we learn how to solve equations?

Describe how you will teach the **Skill**.

- Explain and **Elaborate** O Rewrite O Revise O Ready
- **Model** and **Elaborate** (think aloud) O Rewrite O Revise O Ready
- **Demonstrate** and **Elaborate** (physical) O Rewrite O Revise O Ready

1. Students will have taken a pre-assessment the day before this activity and received a lesson on how to solve equations.
2. Students will demonstrate what they have learned by applying how to write and solve equations using real world examples.
3. Students get into pairs or groups of 3.
4. Each group receives the "Story Cards" first. Students are to read each story and write an equation they think would best fit the situation. (10 min)
5. Next students will be receiving "Equation Cards" Students will now match the story to an equation card. They can use the equations they wrote to help with the process.
6. Ask students to jot down their matched pairs
7. Discuss as a class if any misconceptions on how to select the correct equations.
8. Each group receives a poster paper:
   a. Students will use "Story Cards" E1 - E4
   b. Students receive Card Set: Steps to Solving and will match the steps with the corresponding equations. There might be two solution for each equations, so students are supposed to glue them side by side.
   c. Groups compare with other groups to jot down ideas.
   d. Students write an explanation on the poster paper on how to reach the solution.
9. Students will present their posters to the class explaining their reasoning. Follow the steps in the closure.
10. Have a class discussion as to the students' decisions.
11. Students will take a post-assessment after presentations that will be compared to the pre-test.

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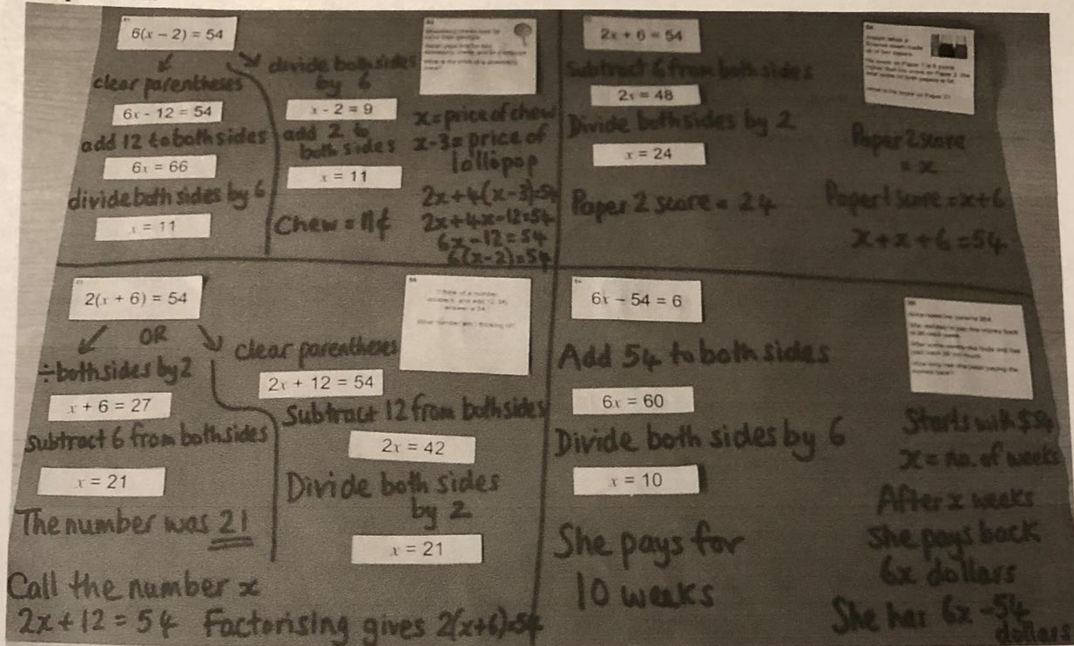
Sample Work:



2 **CFU** questions that will verify students can execute the Skill. O Rewrite O Revise O Ready

How will you select students?

Kagan Table Mats: Randomly call number or color

Describe how you will guide students during **Guided Practice** and how you will slowly release them. O Rewrite O Revise O Ready

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-Students will have an equation lesson prior to this activity.

-Following the steps above in the skills section teacher will be monitoring all groups through out the process.

CFU Describe how during **Guided Practice** you will verify that students are becoming more proficient. How will you select students? O Rewrite O Revise O Ready

-Teacher will monitor all groups throughout the process. It is important to stop and pose questions to groups they may be having a difficult time.

Closure - Describe how students will prove they can describe the Concept, describe the Importance and execute the Skill. O Rewrite O Revise O Ready

- Students will present their posters to the class. (Example shown above in skills section)
- In their presentations they will include:
  - How they identified which equation corresponded to the word problem.
  - How they would solve the equation. (Should be written in steps on their posters)
  - Explain the meaning of their answer for the value of "x" in a complete sentence.
- After presentation students will complete a post assessment on how to solve equations. (The data will be compared to their pre-test)

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Direct Observation Notes

Overview

The researcher observed the following regarding the direct observations of various classrooms. In all the classrooms various forms of instructional technology was present. Lap tops computers, Smart TV's, Smart Boards, document cameras, and LCD projectors were among the tools used by instructors. Students used one to one digital devices such as Chromebooks or iPads. Instructors presented the lesson using various forms of media including PowerPoints with video clips (sometimes with music) imbedded into the PowerPoint lesson. During the observations a very high level of student participant and interaction was observed. In each classroom there was a great degree of student engagement through individual responses as well as within groups. Conversely, off-task behavior was at a minimum; although a few students were off-task, very few students were observed that were not engaged in the learning process. During my observations, I did not detect students being on wrong sites during independent practice, and I did not observe the teacher speaking to anyone regarding being off the assigned site. Instruction was extremely fluid with instructors and students flowing from one phase of the instruction to another with ease.

Observation Note

8th Grade English Language Arts

Students were observed in analyzing their scores from an interim state assessment. They transferred their personal score from the scores projected on the screen to their own device. The scores were entered under the proper standard. The students used those scores to compare them with their 2018 California Assessment of Student Performance and Progress (CAASPP) Test scores. The teacher instructed students on the procedures to follow. Each student worked on their data chart to analyze each standard to assess how they performed. Students noted which areas were easy or difficult and what they deemed to be contributing factors. Students also listed what they thought they needed to do to improve as well as what they thought the teacher could do to help them improve. Once they completed their data charts, they transitioned into work groups with a student acting as teacher and collaboration and analysis ensued. The exercise exhibited student engagement, convenience and ease of lesson design, enhanced level of familiarity with subject and providing students skills needed for the future.

Observation Notes

7th Grade Math

The instructor was using a PowerPoint lesson to review a previously taught math lesson. Warm-up problems were projected on the screen and students solved them on their whiteboards. Students worked in pairs solving the problems, collaborating when needed. Following the warm up, the teacher presented problems on the screen and walked around helping students who were having difficulty. From time to time she had a student work the problem on the board and explain the steps to the class. During a telephone call, the instructor presented a new problem before responding to the call. Students in their groups worked on the problem. Thus, the work flow was not broken. The researcher observed student engagement and differing needs of students being met through visual representations on the screen and individualized attention.