PROJECT-BASED LEARNING AND THE ACQUISITION OF 21ST CENTURY SKILLS

IN THE ELEMENTARY CLASSROOM

A Record of Study

by

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ABSTRACT

Since the beginning of public education, the skills and instructional methods have been connected to the needs of the workforce. Over time, these skills and needs have changed. In the early 19th century, during the industrial revolution, public education was focused on basic memorization and rote skills. In the 20th and now, 21st centuries, the need for these skills is no longer necessary. Today's workforce demands require creativity, flexibility, problem solving, and communication and therefore, today's educational landscape must also change. The need for student-centered learning environments is strong now than ever before.

Project-based learning (PBL) is a student-centered learning environment that requires students to solve a problem that connects to their life and/or the real world. These problems must be connected to the educational standards in place so students are learning the necessary academic skills while also learning 21st century skills related to communication, collaboration, creative thinking, and critical problem solving.

This sequential mixed methods research study looked at the attitudes, beliefs, perceptions, and experiences of elementary school teachers regarding their use of PBL strategies and the integration of 21st century skill instruction in their classrooms. The study revealed three major findings. 1. Teachers can define what PBL instruction is and explain its effectiveness in the classroom. 2. Teachers did not express difficult in integrating the state standards in PBL activities but are not effectively incorporating this instructional method. 3. Teachers have not been provided quality professional development on how to implement PBL strategies.

This record of study concludes with a discussion of these findings and recommendations for a quality professional development opportunity for the teachers at Casis Elementary.

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<div align="center">**CONTRIBUTORS**</div>

Contributors

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CHAPTER 1

INTRODUCTION

Context

Throughout the history of public education, curriculum and skills taught have been linked to the needs of the workplace. In the 19th and 20th centuries, the focus was on skills needed for manual tasks and centered around memorization of facts, rote tasks, and basic math. As we progress through the 21st century, it has become evident that these skills are not what students need most. Students need to be able to solve problems and communicate with people of various cultures and in different mediums. They must develop skills such as communication, collaboration, critical thinking, and creativity to be successful in the workplaces of today and the future (Alismail & McGuire, 2015; Partnership for 21st Century Skills, 2007). Teacher centered instruction where students soak in and memorize knowledge is not effective for today's technology driven students. Student-centered learning strategies are necessary to put students at the forefront of their educational experience. To successfully prepare our students for their future, we must transition instructional practices to a more student-centered learning model, incorporating project-based learning (PBL) experiences that teach curriculum and help students develop the 21st century skills of communication, collaboration, critical thinking, and creativity (Gut, 2011).

National Context

According to the U.S. Bureau of Statistics, more than 17 million service-sector jobs were created between 1995 and 2005, while 3 million manufacturing jobs were eliminated. Additionally, many of the fasted growing occupations are in the service industry, including high-end jobs like doctors, lawyers, and engineers (Kay & Greenhill, 2011). This change in the global

workforce is the result of a shift from an industrial based economy "to a service economy driven by information, knowledge, innovation, and creativity" (Kay & Greenhill, 2011, p. 42). In the Industrial Age of the early 1900s, workplace needs were manual labor, low skilled and required a basic knowledge skill set (Alismail & McGuire, 2015; Barron & Darling-Hammond, 2008; Care & Anderson, 2016). In the Information Age of the 21st century, a more advanced set of skills are required. "Today's employees must be able to communicate and collaborate, research ideas, and collect, synthesize, and analyze information. They need to develop new products and to be able to apply different areas of knowledge to new problems and challenges" (Barron & Darling-Hammond, 2008, p. 3). The needs of education have changed greatly over time, from the Industrial Age to the mid 1900s, to now. This continual growth means that education and the opportunities provided to students must also evolve.

To meet the changing needs of the workplace of the 21st century, education must also change. Students need more than rote memorization and knowledge accumulation to be successful learners and better prepared for their future (Alismail & McGuire, 2015). The Secretary's Commission on Achieving Necessary Skills (1991) identified the "workplace know-how" skills students need to be successful. These include the competencies of "knowing how to use resources, interpersonal skills, information, systems, and technology" (as cited in Gut, 2011, p. 138) as well as the foundational skills and qualities of thinking, individual responsibility, self-esteem, self-management, and integrity (Gut, 2011). In 2010, this need for a broader, more complex skill set led to the standardized core curriculum known as the Common Core Standards (CCSS). In addition, the Partnership for 21st Century Skills (2019) identified a set of essential skills that students must acquire along with the core curriculum. These are commonly referred to as the 4 Cs – collaboration, communication, creativity and critical thinking (Partnership for 21st

Century Skills, 2019). Multiple education organizations and consortiums believe the teaching of rote skills, core curriculum and the acquisition of 21st century skills are essential for preparing students for their future in not only the 21st century, but the 22nd century as well (Partnership for 21st Century Skills, 2019; Saavedra & Opfer, 2012).

In a literature review of 21st century skills, Chalkiadaki (2018) identified the competencies defined by multiple authors in four broad skill sets of "personal skills, interpersonal and social skills, knowledge and information management and digital literacy" (p. 6). Within these, personal skills encompass creativity, the ability to innovate, and problem-solving. Social skills include the ability to communicate, both orally and with written language, and collaborate with others, listening to and accepting ideas and solutions. Cultural awareness is also a part of this – the ability to "appreciate the value of varied cultures (Heinrichs, 2016) and construct intentional cross-cultural relationships and networks (National Council of Teachers of English, 2008)" (as cited in Chalkiadaki, 2018, p. 8). Knowledge and information management skills include the ability to assess one's own weaknesses and know how to improve upon them (Chalkiadaki, 2018). Finally, the National Council of Teachers of English (2008) and the American Association of School Librarians (2007) define digital literacy as,

> Being able not only to access and analyze data, but also to manage multiple streams of simultaneous information is deemed of high significance, as it is the basis on which the student can develop his or her skills of applying knowledge to new situations and, ultimately, create new knowledge (as cited in Chalkiadaki, 2008, p. 8).

Within these skills sets – the 4 Cs as defined by the Partnership for 21st Century Skills and the competencies defined by Chalkiadaki – must be taught along with the core curriculum defined by

the Common Core for students to gain the skills necessary to be successful in the 21st century and beyond.

Personal Context

My journey in education has been one of continuous self-growth and learning. I came to the role of an educator later than most after spending 10 years as a database programmer and computer software instructor. I received my master's degree and certification in Elementary Education in 1999 and started my career as a 3rd grade teacher in Austin, Texas. Throughout my 21-year educational career I have always been a learner, whether through earning additional certifications or independent informal learning. An early area of interest was working with gifted students where I pursued courses focused on how best to provide services for these students. I became the gifted and talented liaison for my school which meant I worked with the district gifted and talented department to educate and support the teachers on my campus about how to best serve gifted identified students. Through this role I became extremely qualified and knowledgeable about gifted students, their needs, and how we, as educators, can provide high-quality, challenging environments for them. In 2008, I obtained a state educator certification in Gifted and Talented instruction and over the past 15 years have conducted multiple professional development courses for teachers regarding gifted instruction and identification. During the first 10 years of my educational career, I taught 3rd and 4th grade students in a looping classroom environment where I gained a class of students as 3rd graders and taught them for 2 years. This required an extensive level of knowledge of multiple grade levels and student needs. I taught special education, dyslexic, and gifted students, in addition to students with severe behavioral needs. In Texas, writing instruction is extremely important for 4th grade, so when I began teaching this grade level, I started learning more about how to provide high quality writing

instruction for my students. I attended multiple professional development courses and eventually earned my New Jersey Writing Project certification. One of the advantages of looping grade levels is the ability to build community and trust within the classroom. I have always believed in developing a hands-on community of learners and began learning about student centered learning strategies during this time. I have always had my students grouped together in "teams" enabling them to work and collaborate with each other on a regular basis. Additionally, I have always provided them some level of control in the classroom and the ability to have a voice in the goings on within the classroom.

In 2009, I continued my education as a learner by obtaining my National Board of Professional Teaching Standards certification. This process was a learning experience like no other. Throughout this strenuous process, I became a master teacher, with expert knowledge not only on the content, but on strategies for instruction and reflection as a professional educator. I learned how to reflect upon my instruction, evaluate what worked and did not work, and how to set rigorous standards for my students. As I continued my educational career, I moved to a new elementary school and began teaching 5th grade. This new grade level required new learning of curriculum and content and stirred a new level of learning interest within me. I attended the Mickelson ExxonMobil Teachers Academy which enhanced my science instruction and began my continuing growth as a master science teacher. I learned about document based questioning activities and incorporated these into my social studies instruction. I continued my growth as an expert in gifted education, as well as working with students at many different academic levels. As a professional development instructor of gifted education, I also began learning more about PBL strategies to support gifted students. The more I learned about PBL instruction from the Buck Institute for Education, the more I became convinced that this was a positive student-

centered learning strategy not just for gifted students, but for all students. As I learned more about 21st century skills and the need to provide our students with opportunities to communicate, collaborate, think creatively and critically, and problem solve, the more I realized these skills could also be taught through PBL instruction. In 2018, I renewed my National Board of Professional Teaching Standards certification and my love for learning eventually led me to the pursuit of my doctoral degree in education.

Throughout my teaching career, I have always believed that students engage better in class when they are included in the learning process. I believe in teaching "with" children, as opposed to teaching "to" children. My teaching philosophy has always been that children should be given an equal opportunity to learn and grow into independent, self-responsible, life-long learners. My role as a teacher is to guide them on this quest and serve as a facilitator and supporter as they find their way. I teach my students to take ownership for their learning and to advocate for their education and needs. During the past five years I have been learning more about student-centered learning strategies like PBL instruction and how to incorporate these strategies more successfully in my classroom. My district has been focusing on providing these opportunities for students and we are required to conduct at least two PBL based scenarios each year. Additionally, there has been a district initiative to embed 21st century skill instruction into our daily classroom activities. This focus on student-centered learning strategies has been of great interest to me because it aligns with my teaching goals and philosophies and how I believe students learn best. Over the past few years, I have worked with my 5th grade team to develop several PBL lessons for our students. I have also talked with other teachers who have been enacting PBL strategies in their classrooms. In the professional development classes I have taught and in these various conversations, I have heard teachers discuss their confusion over how

to develop quality PBL lessons, frustration with how to incorporate basic skill instruction in these lessons, and the lack of support and information on how to best embed the lessons into their instruction. This is what has led me to be interested in my action research topic. I believe in the effectiveness of PBL instruction to promote student engagement and academic success, yet I understand the frustrations and concerns I have heard from other teachers. I have seen the evidence of success in my classroom. But I have also experienced hardships in the development of these lessons in the way of knowing how to efficiently incorporate these time-consuming activities in the classroom. I do not feel like I have received quality professional development in learning how to create PBL opportunities that are as effective as possible while allowing students to gain the academic skills being studied. These are the same types of frustrations I have heard from other teachers. Ultimately, this is what led me to this research topic. I want to better understand teacher experiences, perceptions and attitudes towards PBL instruction and understand what is needed to provide quality professional development to enable this to be a successful, effective learning strategy for our students.

Situational Context

The Austin Independent School District (AISD) is the fifth-largest school district in Texas. In the 2019-2020 school year, this diverse, urban district enrolled 80,900 students across 129 elementary, middle, high, early college, academy, magnet, alternative, and community schools. It is located in one of the fastest growing metroplexes in the country where the educational student needs differ greatly. Of the schools in this district, 48% are classified as Title I schools. The student demographic breakdown for 2019-2020 is 55.5% Hispanic, 29.6% White, 7.1% African American, and 7.7% defined as other ethnicities (Austin Independent School District [AISD], 2020a).

Although the district has strong elementary schools, magnet programs for middle school, and specialized high school academies for International Baccalaureate programs, Fine Art specialization, and math and science specialties, there are still a large number of schools that are not improving and continue to earn low standardized test scores. For the 2018-2019 school year, the district received an overall score of B on the Texas Academic Performance Report, but 38% of the campuses received an overall campus rating of C or below (AISD, 2020b). Additionally, even though AISD is located within Austin, Texas, a city that was ranked as America's fastest growing city in 2018, the district has lost more than 5% of its student population since 2012 (Devore, 2017). This amounts to more than 5,000 students as of 2018, and the decreases continue to happen.

To counter the loss in student population and improve test scores, AISD has positioned itself as a forward-thinking district that provides innovative instructional strategies and opportunities for all students. Of the five guiding principles in the district's master plan, two principles are aligned with my record of study. One, the district commits to ensuring "equitable access to programmatic opportunities that engage and inspire all students" (AISD, 2020c); and two, the district is working to "put more students in reimagined, 21st-century learning environments that engage and inspire" (AISD, 2020c).

One way the district has worked to address these guiding principles is through the implementation of PBL strategies and the integration of 21st century skills in the classroom – at all grade levels. In Fall 2014, AISD created a short and long-term goal plan to improve the integration and implementation of technology district wide. As part of the development of goals and a vision, a survey of teachers and librarians throughout the district was conducted. The survey focused on teacher and librarian familiarity and use of technology within the classroom,

teacher familiarity and interest in using PBL strategies, and the incorporation of 21st century skills such as collaboration, communication, and authenticity (real world problems). The combination of technology and PBL integration questions were to elicit feedback on whether incorporating PBL strategies in the classroom would increase the use and integration of technology. The results showed that a small number (34%) of teachers had actually implemented PBL strategies within the classroom in the most recent school year. When asked why they selected PBL as an instructional strategy, 17% of the teachers connected the use of PBL and the development of 21st century competencies as their main reason for implementation (AISD, 2020d). A key finding from the survey was the majority of teachers within AISD were not familiar with or utilizing PBL as a student-learning centered instructional strategy and additionally, were not fully integrating technology into their daily instruction. Another important result of the survey was the "need to initiate efforts to increase and expand the culture of technological innovation and elevate the knowledge and skills of AISD staff around instructional use of technology in student learning activities" (AISD, 2020d, para. 1). As a large, urban school district struggling to improve student retention and test scores, AISD has implemented a set of guiding principles focused on the implementation of PBL strategies in the classroom. To make this transition successful, the district needs to have stronger buy-in from the teachers.

The Problem

Since 2014, the school district has begun requiring teachers at the elementary level to implement PBL strategies in their classrooms at least once per semester. Students at the 5th grade level are given a grade on their final report card rating their success engaging in PBL activities. Additionally, 21st century skill inclusion has been expected. In the past 3 years, teachers have received minimal support and professional development training on how to effectively and

successfully implement PBL instruction and other student-centered strategies that connect to the current state standards and curriculum requirements. The problem is that the Austin Independent School District is attempting to implement PBL instruction and other student-centered learning strategies that incorporate 21st century skill acquisition, however, AISD has provided little professional development support for teachers. Currently, the district is offering 2 PBL based professional development workshops that are each one day long for the 2019-2020 school year. These can optionally be followed-up by a Part 2, two-day workshop that delves deeper into PBL lesson development. For a district that has over 5,500 classroom teachers, this is not adequate support or training. Additionally, the 2014 survey showed little coherence in reasons why 66% of the teachers were not utilizing PBL instructional strategies within their classrooms. There are minimal data to support teachers' attitudes and beliefs regarding the implementation of this student-centered learning strategy and how best to support or change these beliefs (AISD, 2020d).

Relevant History of the Problem

In 1918, William Heard Kilpatrick first introduced the idea of the "project" method in a paper he wrote while at Teachers College at Columbia University. Kilpatrick studied under Dewey at Teachers College and went on to be a professor at the college. Since this time, Kilpatrick's name has always been attached to the various definitions and discussions related to PBL (Burlbaw et al., 2013). Additionally, PBL has roots in the educational philosophy of John Dewey that relates to hands-on, experiential learning and is a result of developments in student learning that have occurred over the past 25 years (Maida, 2011). The idea of the project method of instruction began with agricultural training in the early 1900s focusing on the early grade levels but has since been expanded to include all subject areas and all grade levels. Throughout

the 1920s, the definition of project learning was manipulated so it could be applied to many different types of educational activities that motivated students to learn. Over time, PBL fell in and out of favor with educational leaders, and in the 21st century is once again gaining popularity as a method of engaging students and meeting the needs of our current educational situation (Burlbaw et al., 2013).

The Buck Institute for Education (BIE) suggests "research in neuroscience and psychology has extended cognitive and behavioral models of learning – which support traditional direct instruction – to show that knowledge, thinking, doing, and the contexts for learning are inextricably tied" (Coffey, 2010, p. 1). In the latter part of the 20th century, PBL has gained popularity because of its inherent ability to focus on community problems and culture, and the opportunity for students to engage in tasks that support global citizenship. The increase in this focus comes as a result of cognitive research and a changing educational world that recognizes the need for students to learn differently than the early days of the 18th and 19th centuries (Coffey, 2010).

John Thomas (2000) states

that project-based learning requires 'complex tasks, based on challenging questions or problems, that involve students in design, problem-solving, decision making, or investigative activities; give students the opportunity to work relatively autonomously over extended periods of time; and culminates in realistic products or presentations' (as cited in Coffey, 2010, p. 1).

Throughout the history of public education within the U.S., the focus has shifted from rote memorization and basic knowledge and skills of the 18th century to a technologically driven education where students need to collaborate, communicate, respect, and understand different

cultures, and think creatively while problem solving. This change in the education model requires students to be more engaged in producing knowledge rather than just taking in information. According to Maida (2011), PBL instruction focuses on building communities of practice where students "are engaged in sharing knowledge, developing expertise, and solving problems within the specific area" (p. 764).

Although Austin ISD has recently begun requiring PBL implementation in all elementary level grades – currently one project per semester is required – there has been little guidance or support in how to develop effective PBL lessons, how to incorporate this instructional strategy into an already full daily schedule, or how to make sure the required instructional skills are being incorporated into the lesson. The district has provided minimal professional development support or opportunities for teachers and has not made these courses mandatory. At the 5th grade, teachers are required to assess a student's growth connected to PBL instruction and assign a grade for the projects implemented, but there has been no guidance or rubric that helps teachers envision what success should look like for their students. The same is true with the newly required push to embed 21st century skill development into daily instruction and PBL opportunities. Many campuses within the district are Title I campuses with little additional funding to develop or fund campus based professional development for their staff. I am fortunate that my campus has the ability to enact this and has provided different levels of training to support our staff for this initiative. Additionally, there must be funding for materials, supplies, and instructional materials to support teachers in this change. Until the district decides to provide this level of support for teachers with training, ongoing support with implementation, information about how to assess students, and funding for instructional materials, it will be difficult for this newly required initiative to be fully and successfully implemented throughout

the district and for Austin ISD students to be exposed to these more successful student-centered learning environments.

Significance of the Problem

As the teachers within Austin ISD work to transform their instructional methods to more student-center learning environments and comply with the newly defined instructional requirements from the district, teachers need support to make this transition more successful. First, there needs to be a better understanding of what the current perspectives are regarding teachers' beliefs and attitudes towards this shifting educational landscape. How do they feel about student-centered learning and how comfortable are they with incorporating it in their classrooms? Secondly, there needs to be more information gathered to understand what their current experiences are with student-centered learning. How much of the current instructional model is student-centered and how many teachers are currently enacting PBL activities within their classrooms? Does this information vary by grade level – is it being enacted to a greater extent in intermediate elementary grades than in the primary grades? Given that in the 2018-19 school year, the average teacher tenure within the district was 10.5 years, there is a wide range in educator age and levels of experience (The Texas Tribune, 2019). Third, what types of resources and professional development support do teachers feel they need to better incorporate these new learning strategies in their classrooms. How can we develop professional development opportunities to truly enhance a teacher's ability to successfully incorporate this level of learning in their classroom? And finally, how well do teachers understand what the 21st century skills are and how to embed them into these academic models?

The significance of this problem is important in understanding teachers' beliefs and needs so a successful transition to 21st century learning models that incorporate student-centered

learning can begin to occur. The purpose of this study is designed to gather information to pinpoint these particular needs and develop professional development models that support teachers as they transition while also informing school administrators about changes they must incorporate to support their teaching staff.

Research Questions

The purpose of this research study is to learn more about teachers' attitudes, beliefs, perceptions, and experiences with student-centered learning opportunities like PBL. Additionally, through this study I have investigated how to incorporate 21st century learning skills and PBL into instruction in a way that provides student-centered learning opportunities connected to the state standards. As the teachers within AISD work to transform their instructional methods to more student-centered learning environments and comply with the newly defined instruction requirements from the district, they need support to make this transition more successful.

The research questions I am attempting to answer include

- How do teachers perceive PBL instruction as an instructional strategy?
    - What are their attitudes & beliefs towards PBL instruction?
    - What are the experiences they have with PBL instruction?
    - How would they rate their ability incorporate PBL strategies into their daily instruction?
- How do teachers perceive their abilities to teach and incorporate 21st century skills using PBL instruction?
    - What experiences do they have teaching 21st century skills?
    - What is their understanding of what the 21st century skills include?

- How would they rate their ability to improve student understanding of 21st century skills?

- How would they rate their ability to incorporate 21st century skill instruction within a PBL environment?

- To what extent are teachers able to incorporate the TEKS into their PBL opportunities?

Important Terms

Project-based learning – a constructivist, student-centered learning strategy that allows students to learn through authentic, real-world learning situations. Students apply academic content and ideas by completing complex tasks that ultimately end with a presentation and/or product presented to an audience. Teachers are facilitators, rather than direct instructors in this environment and students are more in charge of their learning environment (Barron & Darling-Hammond, 2008; Blumenfeld et al., 1991; Cubukcu, 2012; Krajcik & Blumenfeld, 2014).

21st century skills – the skills that students need to develop to be successful in the future job market. These are in addition to the academic requirements students need to learn. The 21st century skills fall under 3 categories: learning skills, literacy skills, and life skills. The focus here is on the learning skills, which include the 4 Cs of communication, collaboration, creativity, and critical thinking (Stauffer, 2020).

Student-centered learning – puts students at the center of the learning process. They become active members in their learning, use learning styles and strategies that work best for them, and along the way develop 21st century skills, like critical thinking, problem solving, collaboration, and communication (Çubukcu, 2012).

Critical thinking skills – the ability to find solutions to problems and make logical and informed decisions to solve a problem (Stauffer, 2020).

Creativity – the ability to "think outside the box" and look for non-traditional solutions to problems. An adaptive skill that leads to innovative solutions (Stauffer, 2020).

Communication skills – the ability to share information across different platforms, verbal and written, and with different types of people (Stauffer, 2020).

Collaboration – the ability to work with others, to be able to compromise, see ideas and thoughts from other people's perspectives, and to respect the ideas of others (Stauffer, 2020).

Significant Stakeholders

The primary stakeholders are the K-5th grade elementary teachers at Casis Elementary. These teachers were part of the initial survey to gather information regarding their attitudes, beliefs, and perspectives with PBL instruction and 21st century skill instruction. Additionally, the ten teachers who were part of the in-depth interview portion of the study were significant stakeholders because of the information they provided. Other key stakeholders include the administrators at Casis Elementary as they were part of the implementation of the professional development opportunities that were developed as a result of the research study.

Other stakeholders included the students at Casis Elementary. They were the ultimate beneficiaries of the improved student-centered instruction and implementation of PBL units that embed 21st century skill instruction. Secondary stakeholders included the additional campus staff and potentially parents as advocates for their children.

Conclusion

Transitioning from traditional, teacher-led instruction to student-centered learning is a process that takes time. It requires a change in teacher pedagogy, attitudes, and perspectives.

Teachers who have been working in education for some time will have a harder time transitioning to this 21st century educational style than novice teachers who are being introduced to these strategies in teacher preparation programs. Regardless, the change is necessary for preparing our students for their future.

In this action research study, I learned more about the attitudes, beliefs, perspectives, and experiences of elementary teachers regarding student-centered learning strategies such as PBL. Additionally, through in-depth interviews, I gathered information on what is necessary for teachers to gain confidence in their ability to successfully incorporate these learning strategies in their instruction.

In Chapter 2, I explained the progression of education and the reasons for this change in instruction and pedagogy. Chapter 3 examined the solutions and methods for my research. Chapter 4 allowed me to share the results from the mixed methods action research study, and Chapter 5 included an analysis of the research data, along with future needs and conclusions.

CHAPTER 2

LITERATURE REVIEW

Introduction

The implementation of student-centered learning instruction with the integration of 21st century skills in today's educational world is essential in preparing our students for success in the future. The careers currently in demand not only in the United States, but worldwide, require students to possess skills enabling them to cognitively solve problems, collaborate with people from different cultures, and be creative and critical problem-solvers. With the everchanging job market and increase in technology-based jobs, students need experience solving authentic problems while also learning important academic curriculum.

Through this literature review, I have provided a context for the progression of education over the past 100 years and the reasons for an educational change that focuses more on these skills, while also teaching students a set of core curriculum. Next, I explain the need for these changes due to changing workplace environments and the need for different skill sets in today's working world. Then, using prior literature, I define what 21st century learning looks like and the importance of integrating these needed skills into the core curriculum. After this, I review the literature for different student-centered learning strategies, specifically PBL. Student-centered learning models, such as PBL, have proven to be successful in this integration and the development of these skills. To successfully implement PBL strategies in the classroom, teachers must be willing to change their instructional models and sometimes their pedagogical belief systems about how students learn. Finally, if teachers must change their instructional modes of teaching, they must be provided with quality professional development opportunities that will

support them. I complete the review of the literature by discussing the traits of effective professional development for teachers.

Progression of Education

Throughout the span of the formal education system over the past 100 years, there have been many views on how students best learn. During the 20th century, education focused on content and knowledge accumulation provided to students by teacher led instruction. The development of rote tasks and manual labor were driven by the Industrial Age (Alismail & McGuire, 2015; Care & Anderson, 2016). Students were required to memorize information to build knowledge, then were given tests to see how well they learned and to assess their intelligence (Alismail & McGuire, 2015). Today, educational leaders and curriculum writers understand the need for educational goals and standardized curriculum so that all students receive a more equitable education and are prepared for college and future careers. This has led to the development of the Common Core State Standards (CCSS) in 2010 (Alismail & McGuire, 2015). But that is not enough. The "Information Age", the 21st century, requires a broader set of skills in addition to core curriculum and as we move further into the 22nd century the development of these skills will prove to be even more important. Education systems and learning strategies today need to provide for a breadth of skills that encompass core curriculum and 21st century skill development (Care & Anderson, 2016). "By integrating cognitive learning and skills into the curriculum, students can obtain deeper understanding of the subject and try to solve complex problems in the real world" (Alismail & McGuire, 2015, p. 150). This requires a need for a change in our educational system. How we address student learning comes from the change in the needs of the workplace now and in the future.

Needs of the Workplace

From the Industrial Age of the past, to the Information Age of the future, the needs of employers in the workplace have changed tremendously. According to Levy and Murnane (2005), in today's workplace, "employers demand fewer people with basic skill sets and more people with complex thinking and communication skills" (as cited in Saavedra & Opfer, 2012, p. 8). Between the years of 1995 and 2005, 3 million manufacturing jobs were eliminated in the United States, while 17 million service-sector jobs were created. Information services account for 48% of the nation's wage bill, and information workers earn $10,000 more than material products and service workers (Gut, 2011; Kay & Greenhill, 2011). "In 1900, 95 percent of all jobs were low skills and required only that employees could follow basic procedures. . . In 2008, many jobs require specialized knowledge and skills" (Barron & Darling-Hammond, 2008, p. 3). The top 10 jobs that are in demand now did not exist in 2004. Skill sets must change (Barron & Darling-Hammond, 2008). In 1990, the Secretary's Commission on Achieving Necessary Skills (SCANS) outlined the "workplace know-how" skills that are necessary for students to be successful in the future workplace (Gut, 2011; Jacobson-Lundeberg, 2016). According to Jacobson-Lundeberg (2016),

> Americans will do well *if* they produce knowledge workers who create idea-based goods and can connect 'knowledge pools' (Friedman, 2005, p.10) all around the world. This work, then demands high-tech skills (hard skills) as well as teaming, collaboration, and communication (soft) skills. (p. 85)

The Assessment and Teaching of 21st-century Consortium (AT21CS), along with the Partnership for 21st Century Skills, recognize the need for 21st century learning that will allow for the development of these essential skills (Saavedra & Opfer, 2012). They, along with other groups,

believe these skills are just as important as the teaching of rote skills (Partnership for 21st Century Skills, 2019; Saavedra & Opfer, 2012). To meet the needs of the changing workplace and to prepare students for success in their future, the incorporation of 21st century learning skills must be embedded into education.

21st Century Learning

Over the past several years, 21st century learning has become an important topic of discussion in education. Today's students will need a different skill set to be successful in the working world of their future (Alismail & McGuire, 2015; Partnership for 21st Century Skills, 2019). This partnership has advocated for students to learn the 4C's of critical thinking, communication, collaboration, and creativity, in addition to learning the 3R's of reading, writing, and arithmetic (Alismail & McGuire, 2015; Andrade, 2016). To provide these skills to students, education must change from traditional practices that impart students with knowledge to more student-centered learning practices that engage students and place them in charge of their learning (Andrade, 2016). The archaic transmission model of education where factual information is fed to students by teachers is outdated, but yet it remains the model of education in most of the world (Organization of Economic Cooperation and Development [OECD], 2009). "Achieving 21st century skills requires that the educational experiences prepare learners to innovate, create, and contribute to the knowledge economy" (Andrade, 2016, p. 145) to be successful as adults. In addition to 21st century skills, students need to have the 21st century themes woven into their academic content (Partnership for 21st Century Skills, 2019). "In addition, schools must promote an understanding of academic content at much higher levels by weaving 21st century interdisciplinary themes into key subjects: global awareness; financial, economic, business, and entrepreneurial literacy; civic literacy; health literacy; environmental

literacy" (Partnership for 21st Century Skills, 2019, para. 5). For students to gain this knowledge, these skills must be effectively embedded into the curriculum.

Although most experts agree that students need to gain 21st century skills in order to be successful in the future, many concerns have been expressed about how to assess these skills if they are built into the core curriculum. Some critics claim that emphasizing these skills will water down the standards and curriculum. They also claim that higher order thinking skills cannot be measured or assessed (Silva, 2009). Even so, more than 10 states revised, or plan to revise, their state standards to include assessments that reflect mastery of these skills. The idea of measuring 21st century skill acquisition is understanding how students use the new knowledge they have gained and how they can apply it to real world situations (Silva, 2009). Several organizations, such as the National Research Council, Organization of Economic Cooperation and Development, and the International Society of Technology in Education, have shown that "complex thinking and analytical skills are an integral part of learning at every stage of development" (Silva, 2009, p. 632). Students cannot develop these skills without also having a core base of knowledge (Silva, 2009). The combination of academic knowledge and 21st century skills, including the 4 Cs, is essential for our students to be successful in the future workplace. As Barron and Darling-Hammond (2008) stated,

> To develop these higher-order skills, students need to take part in complex, meaningful projects that require sustained engagement, collaboration, research, management of resources, and the development of an ambitious performance or product (p. 2).

This means that education must move away from the traditional form of teacher fed instruction to a more student-centered learning environment that focuses on inquiry and cooperative learning.

Student-Centered Learning Strategies

      The idea of teaching with a student-centered learning environment is not a new concept in education. Educational philosophers such as Dewey, Vygotsky, Piaget, Gardner, Montessori, and many others have long spoken and written about "the benefits of experiential, hands-on, student-centered learning" (Çubukcu, 2012, p. 50) and "that students should be able to discover answers themselves through active engagement with new experiences" (Ireland et al., 2012, p. 159). Over a 100 years ago, "Dewey argued that students will develop personal investment in the material if they engage in real, meaningful tasks and problems that emulate what experts do in real-world situations" (Krajcik & Blumenfeld, 2014, p. 318). Student-centered learning puts students at the center of the learning process. They become active members in their learning, use learning styles and strategies that work best for them, and along the way develop 21st century skills, like critical thinking, problem solving, collaboration, and communication (Çubukcu, 2012). Educational science researchers have found that children learn through four learning science ideas. First, active construction – meaning they build understanding based upon their "experiences and interaction with the world" (Krajcik & Blumenfeld, 2014, p. 318) rather than through information fed to them from a teacher; second, situated learning – problems or issues that are "situated in an authentic, real-world context" (Krajcik & Blumenfeld, 2014, p. 318); third, social interactions – collaborating and interacting with peers to problem solve, debate, and plan solutions; and finally, cognitive tools – using technological tools to help build meaning, explore, plan, and present solutions (Krajcik & Blumenfeld, 2014). As education professionals investigate different student-centered learning models and ways to provide better student engagement, there are many inquiry-based strategies to choose from.

A rising trend in student-centered educational strategies that incorporate 21st century skill development while also teaching the standards of the core curriculum is an inquiry-based learning model known as PBL. As defined by Barron and Darling-Hammond (2008), "Project-based learning involved completing complex tasks that typically result in a realistic product, event, or presentation to an audience" (p. 2). It allows students to learn via authentic learning situations by applying academic content and ideas to real world problems (Barron & Darling-Hammond, 2008; Blumenfeld et al., 1991; Çubukcu, 2012; Krajcik & Blumenfeld, 2014). "It is based on the constructivist finding that students gain a deeper understanding of material when they actively construct their understand[ing] by working with and using ideas" (Krajcik & Blumenfeld, 2014, p. 318). Bell (2010) defined PBL instruction as "a student-driven, teacher-facilitated approach to learning" (p. 39). Project-based learning has five key components: a driving question; authentic inquiry that is connected to the curriculum requirements; a collaborative, constructive investigation that requires inquiry and scaffolding techniques to build academic growth; student-driven; and the development of an authentic, tangible product that addresses the question and shows student learning (Krajcik & Blumenfeld, 2014; Thomas, 2000). According to Thomas (2000), "students who engage in this approach benefit from gains in factual learning that are equivalent or superior to those of students who engage in traditional forms of instruction" (as cited in Barron & Darling-Hammond, 2008, p. 2). Multiple studies show that students who have participated in PBL opportunities have shown "a significant increase in scores on a critical-thinking test" (Barron & Darling-Hammond, 2008, p. 2), performed better on conceptual items on a mathematics national exam, and in general show an increase in the ability to explain reasoning, define problems, and plan a project (Barron & Darling-Hammond, 2008; Bell, 2010). Additionally, more studies have documented "positive

changes for teachers and students in motivation, attitude toward learning, and skills, including work habits, critical thinking skills, and problem-solving abilities" (Barron & Darling-Hammond, 2008, p. 2). Three important outcomes of PBL activities include "learning responsibility, independence, and discipline" (Bell, 2010, p. 40). These are not academic measures but are measures of growth as students and learners. Students learn accountability, setting goals, meeting expectations of peers, active listening skills, and working collaboratively (Bell, 2010). These skills – academic growth, 21st century learning, and growth as learners – cannot happen without a change in teacher perspective and a change in how teachers approach instructional methods in the classroom.

Change in Teacher Pedagogy

Today's 21st century educational world requires teachers to think about how they teach differently than in the past. 20th century education, education for the Industrial Age, was focused on skill, content and knowledge acquisition. Literacy and numeracy were considered important because they allowed for better access to content and knowledge (Alismail & McGuire, 2015; Care & Anderson, 2016). Teaching for the "Information Age" requires a shift in pedagogy from teacher focused instruction that delivers content, to a more student-centered approach where the students will communicate, collaborate, and engage in creative thinking and problem solving (Care & Anderson, 2016). Because students today are digital natives, while most teachers are digital immigrants, teachers must find a way to balance the use of technology the students are used to engaging with outside of school, with "the demands of assessment-driven accountability and high-stakes testing" (Gut, 2011, p. 140) that is required today. Teachers should become "managers of students' talents, time, and productivity who can articulate standards of quality and provide feedback that students can use to meet the standards" (Gut, 2011, p. 140). Jacobson-

Lundeberg (2016) stated that "Twenty-first century skills can easily be taught and embedded into core curriculum" (p. 83) without sacrificing the standards. Multiple education groups, such as the National Council of Mathematics, National Council of Teachers of English, National Council of Social Studies, and the National Science Teachers Association, all support the need to develop core curriculum that also incorporates 21st century skills. (Johnson, 2009). "To successfully face rigorous higher-education coursework and a globally competitive work environment, schools must align classroom environments and core subjects with 21st century skills" (Johnson, 2009, p. 11). This incorporation of core curriculum and 21st century skill development requires teachers to shift their pedagogical thinking and their role in the classroom.

Teachers must be willing to change their instructional models away from teacher driven instruction to more student-centered, student-engaged instruction. Throughout study after study, it has been shown that students who are engaged in PBL activities "find learning more stimulating, build critical and creative thinking skills, become more self-directed learners, and make meaningful connections between school learning and learning for life" (Sage & Torp, 1997, p. 2). To be a teacher of student-centered learning, teachers must provide meaningful, authentic experiences where students can immerse themselves in the learning (Sage & Torp, 1997). Teacher pedagogical practices are directly related to their beliefs about how students learn and exist on a continuum of instruction that ranges from no inquiry (completely teacher led) to an environment where inquiry is integrated with instruction. Teachers who want to change their instructional style must also change their pedagogical beliefs around how students learn and must be willing to become learners themselves (Ireland et al., 2012). According to Sage and Torp (1997), becoming a teacher of student-centered instruction "requires a personal disposition toward learning" (p. 2). Teachers cannot be expected to immediately change their belief systems

about student learning from what they have been taught or used in practice over the years. According to Tamim and Grant (2013), it takes time and training for teachers to transition towards a more constructivist pedagogical practice that includes student-centered learning practices such a PBL. Thomas (2000) stated that it brings conflict "to the deep-seated beliefs of teachers in their approach to teaching and the degree of balance needed between student control and teacher control over the activities" (as cited in Tamim & Grant, 2013, p. 74). According to Ravitz (2008), teachers who have successfully implemented PBL strategies in their classrooms report that it provides for "the teaching of skills beyond the content, making learning more personalized and more varied, as well as teaching academic content more effectively" (as cited in Tamim & Grant, 2013, p. 74). As part of changing their teaching pedagogy towards a more constructivist approach, teachers must also learn new skills to make the implementation of PBL successful in their classroom.

There are many skills that must be incorporated, and challenges faced when implementing PBL strategies, including collaboration, classroom management, and curriculum expertise. These can often feel overwhelming and undoable for teachers. Collaboration is an essential part of PBL, and teachers must develop the skills to not only teach students how to collaborate productively, but the confidence to let it occur in a way that creates learning content and builds collaboration skills (Barron & Darling-Hammond, 2008; Tamim & Grant, 2013). Managing projects within the classroom, maintaining student engagement, providing support, troubleshooting issues, all play into the role of classroom management (Tamim & Grant, 2013). This can affect how much and how well teachers implement PBL instruction within their classrooms. Another challenge for successful implementation of PBL is having an in-depth knowledge of the subject to allow for student exploration into areas teachers may not be familiar

with or finding suitable topics that can be easily investigated through a PBL opportunity (Tamim & Grant, 2013). It is not enough to just provide students with an interesting problem to solve and supplies to build something. Students need guidance and support in understanding the problem, knowing how to apply the academic knowledge, learning how to cooperate and collaborate, and using technology resources (Barron & Darling-Hammond, 2008). To help teachers overcome these challenges and learn more about the constructivist approach to student-centered learning, appropriate professional development opportunities need to be created.

Professional Development Needs

There has been much research conducted regarding what constitutes effective professional development opportunities for teachers. Multiple studies (Walton, 2014, p. 70): show there are five key features to quality professional development "(a) content focus, (b) active learning, (c) coherence, (d) duration, and (e) collective participation." Desimone et al. (2002) added reform type to this list and separated the features into two categories: "three structural features: (reform type, duration of PD, and collective participation) and three core features (opportunities for active learning, coherence, and content focus)" (as cited in Capraro et al., 2016, p. 182). When these features are part of a professional development opportunity, teachers' beliefs and knowledge change, teachers implement new pedagogies, and there is positive student learning outcomes (Walton, 2014). To successfully educate teachers about the benefits and effectiveness of PBL and to help change their pedagogical beliefs, they must be exposed to effective professional development opportunities that incorporate the five essential features (National Research Council, 2012). Other researchers (Loucks-Horsley et al., 2003) suggested that effective professional development should serve "as a clear model of what classroom teaching and learning looks like, including the use of a constructivist approach to

facilitation (as cited in Owens et al., 2018, p. 371). Professional development should treat teachers as adult learners and professionals, while providing opportunities for a "high level of cognitive dissonance" (Owens et al., 2018, p. 371). The professional development should build on teachers' content and pedagogical knowledge and provide collaborative experiences with peers (Owens et al., 2018). If teachers are expected to successfully implement PBL experiences in their classrooms, professional development opportunities must be developed that will help teachers learn how to create the experience while also holding students accountable for learning the core curriculum.

Conclusion

In summary, the implementation of student-centered learning instructional models like PBL are a well-researched and well documented instructional strategy for better preparing our students for the 21st century and beyond. Educational philosophers have long advocated for the use of student-centered learning strategies that engage students and create active learning environments and today's educational system is finally catching on to this need. The Industrial Age of the early 20th century required manual labor and the need for rote tasks and memorization to building knowledge. Today's Information Age requires a different skill set that incorporates 21st century skills, such as the ability to collaborate, problem solve, and communicate more effectively (Alismail & McGuire, 2015; Care & Anderson, 2016). Many educational and economic groups, including the National Research Council, the Organization of Economic Cooperation and Development, and the International Society of Technology in Education, believe core curriculum must integrate complex thinking and the ability to critically analyze for students to gain these skills (Barron & Darling-Hammond, 2008; Silva, 2009). Project-based learning is a successful student-centered learning strategy that is gaining popularity. It allows

students to utilize 21st century skills to solve an authentic real-world problem, while also learning required core curriculum in math, science, or social studies (Barron & Darling-Hammond, 2008; Blumenfeld et al., 1991; Çubukcu, 2012; Krajcik & Blumenfeld, 2014). For the transition from teacher-focused instruction to student-centered learning to be successful, teachers must adjust their pedagogical belief systems about how students learn and they must become more active learners in the classroom. Teachers must be willing to "let go" of control and allow students to engage in critical and creative thinking strategies that focus on solving a problem (Care & Anderson, 2016). Finally, professional development designers must take note of this need and develop quality professional development opportunities that will help teachers create successful student-centered learning environments and allow for the development of 21st century skills in their students.

Based on the literature I have reviewed, I found that there are many different misconceptions and beliefs held by teachers regarding the effectiveness of PBL instruction in the classroom as well as the ability to incorporate the core curriculum into this learning strategy. My research study will focus on addressing this issue and learning more about these beliefs and how teachers can more effectively make this transition. One area of research that is weak is evidence of how teachers at the elementary level have effectively incorporated 21st century learning and the Common Core required curriculum into PBL situations and how these environments have affected student learning. This is definitely an area for further research and study.

CHAPTER 3

SOLUTION AND METHOD

Solution

The solution for my problem of practice is to gather information and learn more about elementary teachers' attitudes, beliefs, perceptions, and experiences regarding student-centered learning environments, like PBL and the incorporation of 21st century skills in elementary classrooms.

Solution Outline

The solution began with administering surveys to approximately 30 elementary teachers in grades 1-5 to learn more about their experiences and perspectives with PBL instruction and the incorporation of 21st century skills in their classrooms. Based on the survey results, 10 teachers were identified for more in-depth teacher interviews to gather further information about their experiences and perspectives. I chose two teachers from each grade level based on those who scored highest and lowest on the different survey sub-scales.

Justification of Solution

The purpose of this study was to understand elementary teachers' perspectives and experiences regarding the use of PBL strategies as well as 21st century skills instruction in a student-centered classroom using a sequential Quantitative → Qualitative mixed methods design. The results of the quantitative strand informed the selection of participants for the follow-up qualitative strand. In the quantitative portion of the study, teachers in grades 1-5 completed a survey to obtain data about their experiences and perspectives with PBL and the incorporation of 21st century skills in their instruction. Additionally, the survey collected information regarding the frequency in which teachers use PBL strategies within their classrooms. The follow-up qualitative strand included in depth interviews and discussions with teachers who scored highest

and lowest on the different survey subscales regarding their experiences and perspectives with PBL and the incorporation of 21st century skills. These interviews allowed me to better understand the factors which influenced their perspectives and experiences, as well as identify potential professional development needs.

Study Context and Participants

The sequential mixed methods study was conducted at an upper middle class elementary school in the Austin Independent School District. The quantitative study participants were 30 elementary teachers in grades 1-5. Ten teachers, two from each grade level, were selected for the qualitative study based on their survey results. The teachers who scored both the highest and lowest on the survey subscales were interviewed to gain more information about their experiences and perspectives.

Proposed Research Paradigm

This mixed methods action research study was based on a constructivist worldview where meaning is constructed from the realities around us. The study was an explanatory sequential Quantitative → Qualitative study and the results from each study were mixed during the data collection phase (Creswell & Plano Clark, 2011). There was one quantitative and one qualitative strand. The strands were quantitative informing qualitative, with the quantitative strand given priority.

The results of the quantitative strand helped identify the sampling results for the qualitative data collection and analysis. At each grade level, the teachers who identified with the most positive and least positive experiences and perspectives were selected to participate in interviews and were observed for the qualitative study. These interviews provided more in-depth information to better understand what factors influenced a teacher's perspective regarding

student-centered instructional methods, both positive and negatively. The purpose of the interviews was to gain a greater depth of understanding concerning the factors which influenced their perceptions and experiences with PBL and the incorporation of 21st century skills, as well as to identify potential professional development needs. Thus, a combination of results from both studies allowed for conclusions that were more meaningful and complete. By understanding not just the perspective and experiences score from a survey, but how and why teachers have a particular perspective, a more successful plan of action was developed.

Data Collection Methods

The instrument I employed for the quantitative study was a modified version of the long form of the Teachers' Sense of Efficacy Scale (TSES) developed by Tschannen-Moran and Woolfolk Hoy (2001), and is in Appendix B. This Likert scale was developed to measure the three correlated factors of *efficacy in student engagement, efficacy in instructional practices,* and *efficacy in classroom management* (Tschannen-Moran & Woolfolk Hoy, 2001). The modified version of the TSES I used focused on the use of PBL strategies to measure these efficacies as well as an additional subscale to measure the frequency in which teachers incorporated PBL strategies and 21st century instruction in their instructional practices.

The results of the quantitative strand were used to identify the sampling results for the qualitative data collection and analysis. The subscale related to instructional practices was the primary determinant in the selection of teachers for the qualitative survey. The teachers with the highest and lowest instructional practice subscale results were selected. As a secondary determinant, the student engagement subscales were evaluated to further distinguish teachers who had more positive and less positive perspectives.

The selected teachers participated in iterative interviews and discussions that provided more in-depth information to better understand the factors which influenced a teacher's perspective regarding student-centered instructional methods, both positively and negatively.

The inferences at the conclusion of the quantitative strand helped to identify patterns and trends in teacher experiences and perspectives by and within grade levels. Additionally, the data results were evaluated between primary (K-2) and secondary (3-5) grade levels to determine if there were trends there. Central tendencies were used to infer and understand the data within grade levels and variability to evaluate the differences between grade levels.

Data Analysis Strategy

The results at the conclusion of the quantitative strand helped to identify patterns and trends in teacher experiences and perspectives by and within grade levels. "When using Likert-type scales it is imperative to calculate and report Cronbach's alpha coefficient for internal consistency reliability for any scale or subscales one may be using" (Gliem & Gliem, 2003, p. 88). A coefficient alpha value of at least .80 is considered acceptable (Gliem & Gliem, 2003). If the subscales on the modified TSES did not meet this threshold, I examined the correlation matrix of the items within a subscale to determine which items did not correlate as strongly and removed those items from the scale to improve the reliability of the scale. The subscales of *efficacy in student engagement, efficacy in instructional practices,* and *efficacy in classroom management* make up the majority of the survey with rating options ranging from 1-9 for each question, allowing for a survey score range of 7 - 63 for student engagement, 7 - 63 for instructional practices, and 2 - 18 for classroom management. The fourth subscale evaluating frequency of use of PBL strategies made up the final portion of the survey. It consisted of three additional questions with ratings from 1-9. The data results were also evaluated descriptively between primary (K-2) and secondary (3-5) grade levels to determine if trends existed. Prior to

running any inferential tests, means and standard deviations were examined to look for patterns in perspectives and beliefs between primary and intermediate grade levels.

The data analysis method used to analyze the results collected from the TSES survey was descriptive statistics, using measures of central tendency and measures of variability to evaluate the mean scores within grade levels related to specific questions and the range when evaluating individual score differences. These methods were used to evaluate potential differences in scores between K-2 (primary) and 3-5 (secondary) teachers and groups. When deciding upon the teachers for the qualitative study, descriptive statistics were used to evaluate the efficacy ratings.

The results of the quantitative strand will help identify the teachers selected for the qualitative data collection and analysis. The teachers at each grade level with the greatest and least instructional practice efficacy scores were selected for the qualitative portion of the study. As mentioned above, if the instructional practice efficacy subscale scores were inconclusive, a secondary determinant for selection for the interviews would be the student engagement subscale scores. The selected teachers participated in formal semi-structured interviews that contained an initial set of scripted descriptive questions (see Appendix C). Through a series of iterative interviews, additional questions were used to probe deeper into the responses (Bhattacharya, 2017). The interview responses provided more in-depth information to better understand the factors which influence a teacher's perspective regarding student-centered instructional methods, both positively and negatively. The methodological approach in the qualitative study was phenomenological inquiry. Van Maanen (1988) explained that when conducting inquiry with a phenomenological point of view, the focus is not on the actual experience of the phenomenon (in this case PBL), but instead "the essence of that experience, what lies in the core of the experience, the invariant pattern" (Bhattacharya, 2017, p. 98). By understanding not just the

efficacy scores, but how and why teachers have a particular perspective of PBL, I gained greater

knowledge about their beliefs and a more successful plan of action. To analyze the data from the

interviews and observations, I used inductive, descriptive analysis. Bhattacharya (2017) defined

inductive analysis as,

> the process through which a qualitative researcher might look at all the raw data, chunk
>
> them into small analytical units of meaning for further analysis (usually called codes),
>
> cluster similar analytical units and label them as categories, and identify salient patterns
>
> after looking within and across categories (usually called themes) (p. 150).

After each interview I transcribed the information, looking for and coding small ideas that stood

out. I also kept a journal to record themes and any potential biases that occurred during the

interviews. As themes began to emerge from the coding, I asked follow up questions that delved

deeper to learn more about specific ideas and themes that allowed for a better understanding of

the teachers' perspectives related to student-centered learning. The resulting data from the

qualitative study was presented in a thematic description based on the information gathered. The

quantitative data analysis results were interpreted individually at the completion of the strand to

identify trends and to identify the participants for the qualitative study. The qualitative results

were also interpreted individually to identify themes and categories related to the reasons for the

quantitative trends. Finally, the results were then jointly interpreted at the conclusion of both

studies to create meta-inferences about teachers' perspectives and experiences regarding student-

centered instructional methods and the factors that influenced the formation of these

perspectives.

Timeline

Survey data were collected during the early part of the Fall 2021 semester. The data

analysis and identification of teachers for the qualitative study were conducted in September.

The interviews and observations were conducted during October, with the conclusion of the completed study by the end of the 2021 calendar year.

Reliability and Validity Concerns

According to Tschannen-Moran and Woolfolk Hoy (2001), a "teacher's efficacy believe is a judgment of his or her capabilities to bring about desired outcomes of student engagement and learning" (p. 783). A teacher with a greater sense of efficacy is going to be more willing to try new instructional strategies to meet the needs of their students, they are typically more organized and better at planning, and they show a higher enthusiasm for teaching and going above and beyond for their students (Tschannen-Moran & Woolfolk Hoy, 2001).These methodologists tested the reliability of the scores on the TSES during development across three different studies and found a high level of reliability - .91 for instruction, .90 for classroom management, and .87 for student engagement. Additionally, they also tested the validity of the inferences by measuring the TSES against two other efficacy surveys and found a positive correlation between the three scales (Tschannen-Moran & Woolfolk Hoy, 2001).

Closing Thoughts

The mixed methods action research study I conducted evaluated the perspectives, beliefs, and experiences elementary teachers have had with PBL instructional methods. Additionally, it examined the perspectives and experiences teachers have with the incorporation of 21st century skills into regular classroom instruction. In a recent survey conducted by the Austin Independent School District (2020d), only 17% of teachers connected the use of PBL instruction and the development of 21st century skill competencies as their primary reason for implementing PBL as an instructional strategy. This study examined the reasons behind this low number. With the results of the study, and in collaboration with the principal at Casis Elementary, I developed professional development opportunities with the objective of improving teachers' perceptions

regarding PBL and providing opportunities for growth in implementing student-centered learning instruction into their daily instruction. My focus was the improvement in both the use of student-centered learning strategies at Casis Elementary and the academic growth of the students.

CHAPTER 4

RESULTS AND ANALYSIS

Introduction

The mixed method action research study I conducted took place during the fall semester of 2021 at Casis Elementary. Due to the time constraints for completion of the research study and the ongoing CoVID-19 pandemic, access to the teaching staff was restricted early in the semester. During the qualitative portion of the study, in mid-October, I was able to actively interview teachers in person. Overall, the study was completed as expected, with minor modifications due to lack of participation.

Quantitative Survey Results

The quantitative survey administered was a modified version of the *Teachers' Sense of Efficacy Scale* (TSES) developed by Tschannen-Moran and Woolfolk Hoy (2001), and is included in Appendix B. It was distributed via email to the teachers of Casis Elementary during their professional development prior to the start of the 2021-2022 school year. Because of pandemic restrictions, I was not able to introduce and explain the survey and research study in person but was able to do so over a Zoom call. The survey was converted into an electronic survey using Qualtrics software and sent to 27 teachers in grades K-5. Of the 27 surveys distributed, 18 were returned, resulting in a 67% return rate. Upon receiving the survey results, the survey data was exported to a Microsoft Excel spreadsheet for analysis. The teacher names were replaced with unique identifiers to protect any potential bias because I know and have worked with the teachers for many years. The survey used a Likert scale to measure the three correlated factors of *efficacy in student engagement*, *efficacy in instructional practices*, and *efficacy in classroom management*. The fourth subscale measured the frequency in which

39

teachers incorporated PBL strategies and 21st century instruction into their teaching. The Cronbach alpha reliability factor for the survey subscales was calculated using the ANOVA function within Microsoft Excel. As can be seen in Table 1, three of the four subscales had acceptable reliability indices. The *efficacy in classroom management* subscale did not meet the required standard of at least .80 and was not used in the analysis of the data. One reason for the low reliability factor could be the limited number of questions for this subscale within the survey. Since only two of the 19 questions addressed this subscale, there was just one correlation, thus no way to improve the reliability. Because the primary objective of this research study was to understand teachers' experiences and perspectives with PBL instruction and 21st century learning, I decided to exclude these two questions from further analysis.

Table 1

Cronbach's Alpha Reliability Indices

	Cronbach Alpha	
Efficacy in Student Engagement	0.9279	Excellent
Efficacy in Classroom Management	0.1520	Unacceptable
Efficacy in Instructional Strategies	0.832	Good
Frequency	0.952	Excellent

The primary purpose of the quantitative survey was to identify the teachers who would be included in the qualitative portion of the study. The individual teachers with the highest and lowest scores in the *efficacy in student engagement* and *efficacy in instructional strategies* were chosen for the survey. I had planned to choose two teachers from each grade level, 1st-5th, for the qualitative portion of the study, for a total of 10 teachers. In the end, I modified the study to interview four teachers instead – two from the primary grade levels (1st-2nd), and two from the intermediate levels (3rd-5th) because of the lower than expected return rate of the quantitative

survey and the ongoing restrictions due to the CoVID-19 pandemic. Table 2 illustrates the

subscale survey scores and total survey scores by individual teacher, where teacher name was

replaced with a unique identifier to limit bias.

Table 2

Survey and Subscale Totals by Unique Identifier

Unique Identifier	Grade	Efficacy in Student Engagement	Efficacy in Instructional Strategies	Survey Total
4	0	37	42	99
5	1	44	42	123
15	1	63	63	171
16	1	35	47	108
17	1	52	51	135
1	2	40	45	111
3	2	34	40	102
6	2	49	50	126
14	2	47	42	114
11	3	40	41	107
18	3	54	46	128
2	4	45	45	121
7	4	57	54	144
8	5	48	49	124
9	5	44	51	121
10	5	37	43	104
12	5	56	56	141
13	5	35	48	105

The subscale scores boxed in red represent the highest scores for the teachers selected and the

subscale scores boxed in black represent the lowest scores for the teachers selected in both the

primary and intermediate grades. Although teacher 15 had the highest subscale scores, I

eliminated this survey as a possible outlier since the teacher selected the highest level for each

question in the survey. In the end, the selected teachers were a representative sample of the 1st-5th grade levels as I was able to interview one teacher from each of the grade levels.

A secondary purpose of the quantitative survey was to understand how the perspectives of teachers regarding PBL instruction and 21st century learning strategies differed between the primary and intermediate grade educators. In Table 3, I have listed the means and standard deviations for each subscale broken down by primary and intermediate grades.

Table 3

Mean and Standard Deviation Totals

	All M (SD)	Primary (K-2) M (SD)	Intermediate (3-5) M (SD)
Efficacy in Student Engagement	6.48 (1.52)	6.37 (1.66)	6.60 (1.36)
Efficacy in Instructional Strategies	6.79 (1.23)	6.70 (1.39)	6.87 (1.05)
Frequency	4.78 (1.57)	5.00 (1.94)	4.56 (1.03)

Based on the standard deviations and means for each subscale, there is little difference in teacher perceptions regarding PBL instruction between the primary and intermediate grade levels. Upon further analysis using a non-paired, two-tailed *t*-test, the average scores for each subscale were found to be not significantly different between the primary and intermediate grade levels ($p >$ .05).

Qualitative Survey Results

Based on the results of the quantitative survey conducted in August 2021, four teachers were selected for the qualitative portion of the study, two from the primary grades and two from the intermediate grades. Throughout this section, teachers will be referred to by the unique identifier assigned during the quantitative survey. Their survey results can be found in Table 2.

The teaching experience for the selected teachers ranged from five to more than 20 years, so the teachers were mostly well experienced, with all having taught at various schools within and outside of Texas, except for one. The teachers had obtained various certifications in addition to their elementary education degrees including National Board and Montessori certifications, as well as special education and gifted and talented certifications. All the teachers have experience working with students in different elementary grade levels, and one has middle school teaching experience. Most importantly, these teachers talked at length during our interviews about the additional trainings and involvement with various district and school level programs they have been involved with, including a district level Literacy Pathway program, a Leadership Pathway program, and serving on the campus level gifted and talented committee.

On the TSES survey, Teacher 17 scored a 52 on the *efficacy in student engagement* subscale and a 51 on the *efficacy in instructional strategies* subscale, making her average per question score 7.43 and 7.29, respectively on the two subscales. This identifies her as reporting an above average perception with regards to how PBL instructional strategies and 21st century learning influences her teaching practice in these areas.

Teacher 3 scored a 34 on the *efficacy in student engagement* subscale and a 40 on the *efficacy in instructional strategies* subscale on the TSES survey, making her average per question score 4.86 and 5.71, respectively on the two subscales. This identifies her as reporting an average perception with regards to how PBL instructional strategies and 21st century learning influences her teaching practice in these areas.

Teacher 7 scored 57 on the *efficacy in student engagement* subscale and 54 on the *efficacy in instructional strategies* subscale, making her average per question score 8.14 and

7.71, respectively on the two subscales. This put her at the above average range for how PBL instruction and 21st century skill learning influences her teaching practices.

Finally, on the TSES survey, Teacher 10 scored 37 on the *efficacy in student engagement* subscale, and 43 on the *efficacy in instructional strategies* subscale, making her per question score 5.29 and 6.14, respectively.

These four teachers are representative of the classroom teachers at Casis Elementary as they represent the 1st through 5th grades as well as different areas of instruction and expertise.

Research Question Discussion

In analyzing the information from the teacher interviews, I found that the teacher responses aligned with their quantitative perceptions quite well. Teachers who scored high on the TSES survey tended to express a higher agreement with a stronger belief system with regards to the implementation of PBL instructional strategies than the teachers who had scored low on the survey. I evaluated the teacher responses using inductive, descriptive analysis, creating a coding scheme to expose the themes. There were 6 major themes that emerged through the analysis: teaching experience/background, defining PBL, effectiveness of PBL as an instructional method, PBL project examples, integration of 21st century skills, and ability to integrate the Texas Essential Knowledge and Skills (TEKS) into PBL instruction. In this section, I will look at the themes and teacher responses as they relate to each individual research question.

How do teachers perceive PBL instruction as an instructional strategy. When asked to define PBL instruction and its effectiveness as an instructional method, the responses from each teacher varied, but coincided with their scores on the TSES survey of their perceptions.

Teacher 17 felt PBL could mean different things and could take the form of planned activities and instruction or spontaneous events. She shared an example of what she considered

PBL that had recently occurred when her students were problem solving how to retrieve a ball that had gone over the chain link fence during morning recess. She discussed how they spent 15 minutes trying to engineer a way to configure sticks and other "creations" to reach for the ball under the fence and then lift it above the fence. When pressed on describing how this was a PBL activity, she said, "well, they're using some academic science skills on how to make that work". She further described PBL as a "kind of process where the kids are figuring out how to solve a problem or how to create something new, how to and often, not always, but often they're working together". She went on to say that having a special product does not make an activity PBL based.

Teacher 17 views PBL instruction as an effective instructional strategy, she believes it can be used with students, and she also mentioned how much more engaging it is. "[I]t's not even comparable…it's so much more exciting and memorable, if you think about what a child at the end of the school year will say they did or what happened in first grade, or what they'll talk about when they get home from school." She made connections to real world learning and how giving students choices in the project makes it more engaging and interesting for them, causing it to be "stickier in their brain".

Teacher 17 discussed several different types of projects she has incorporated in her daily instruction that uses PBL as a learning strategy, and it became clear that she is confident with PBL as an instructional method. She told about how her students currently have metaphorically adopted animals they are interested in, and she has embedded life science instruction (life cycle, food chains, and habitats) into their learning about a topic that already interests them. Each year the entire first-grade team conducts a store where the students sell handmade items, and the first graders are responsible for collecting money and counting change (with an adult supervising).

The students then donate their money collectively per class to a community need they have discussed in social studies.

When comparing Teacher 17's TSES survey scores regarding her attitudes, beliefs, and experiences towards PBL instruction with her interview responses, it became clear that she is a confident believer in PBL as an effective learning strategy and believes it is the best way to motivate and engage students in learning. On the TSES survey, her *efficacy in student engagement* score was 52 with scores of 8 on questions related to motivating students, helping students value learning, and fostering student creativity. On the *efficacy in instructional strategies*, her score was 51 with scores of 8 on her confidence level with regards to responding to difficult student questions and evaluating student comprehension and mastery. Her lowest score on the TSES was a 6, which is above average – level of influence between "somewhat" and "quite a bit". When looking at the frequency subscale of the TSES, she professes to use PBL strategies between once a month and once a week.

Teacher 3, on the other hand, shows much less confidence in both her TSES survey score and interview responses. When asked to define what PBL means to her, Teacher 3 stated "project-based learning would be a project where you're not necessarily focused on the product, but you're focusing a little more on the process and you're hoping that the kids are really establishing ownership." She felt that in the primary grades, which she teaches, PBL needs to be more teacher guided. Because Teacher 3 has spent most of her teaching career working with gifted and talented students, she feels it fits better with these students because of their "higher critical thinking skills".

She does believe PBL is an effective learning method because the students are more engaged, and "if they are engaged, they will take risks." In our conversation, Teacher 3 continued to focus mostly on the use of PBL instruction with gifted students,

> who are not your typical learner who might not want to sit down and fill out a bunch of paperwork and do rote practice. They need something more and often times that means you having to put a little trust in them and letting them run with something a little more open-ended, which can be scary.

As we discussed the types of PBL activities she has incorporated in her classroom, Teacher 3 struggled to provide some specific examples, but she feels like instruction related to social studies and reading are the easiest areas to use PBL instruction. She stated that "I still feel like even after all these years, I'm still such a learner because I haven't always done project-based learning and sometimes it ebbs and flows" depending on whether she has a gifted identified group of students. The best example she gave related to science and the study of caterpillars and their anatomy. "How could you create something using these supplies that teaches us and other kids about caterpillars, their anatomy, the functions of their anatomy, and their life cycles. Here you go. Here's a bunch of recyclables. What could you do?" She goes on to say the students then "have to collaborate, brainstorm, and problem solve." In this example she reiterated again the need for teacher guidance at this age rather than just "setting them free".

Teacher 3's lack of confidence during our interview aligned with her TSES survey scores. She scored 34 on the *efficacy in student engagement* subscale, with a 4 regarding motivating students using PBL strategies and a 5 on the remaining questions related to student engagement. Her score of 40 on the *efficacy in instructional strategies* subscale breaks down into individual ratings of 5 for confidence in responding to student questions during PBL activities, gauging student comprehension and mastery, crafting good questions for students, and the ability to adjust PBL activities to the proper level for individual students. This last question correlates

strongly with Teacher 3's interview responses related to PBL instruction working best with gifted students. She scored 7 on the questions related to her ability to implement alternative instructional strategies within the classroom and how well she provides appropriate challenges for very capable students, which both align with her gifted focus. On the frequency subscale she chose "once a month" for how often she uses PBL strategies in her daily instruction to help students think critically, and motivate students, which I found surprising given her responses during our interview.

Teacher 7 is an intermediate teacher who, like Teacher 17, showed a high level of confidence in her ability to incorporate PBL activities in her daily instruction. Her TSES survey score and interview responses were closely correlated. One unique note about Teacher 17 was that her student teaching experience in 1997 took place in a fully integrated project-based learning environment, so unlike the other teachers interviewed she began her teaching career with PBL as her baseline experience rather than traditional instructional methods. Being able to teach in this integrated environment again would be her dream job. In our discussion she noted that over the years she has used (and heard) both the terms project-based and problem-based used interchangeably because they are both rooted in a problem to be solved. She defined PBL "as students immersed in multiple ways of engaging in their learning . . . with an understanding of it being rooted in some sort of problem that has application to student lives and the real world." She goes further in describing it as having "an understood process for how students engage in that cycle of investigation or research and then revising and editing" and that it is not a linear process but instead one that has "lots of iterations".

When discussing PBL as an effective learning method, Teacher 7 considers it to be "ideal in many ways" because "there is no false sense of motivating kids". She believes it to be an

organic way of teaching where "you're able to get more bang for your buck with respect to what you're teaching kids to do." Because her teaching experience began with PBL she feels extremely confident teaching in this environment and is not afraid of it like many of her colleagues. "I've never been afraid of it…in all of my work with colleagues, it's something people fear. It seems like there isn't a script for it. You know, not a curriculum that you can turn the page, and I just feel like that's people's perception of it." Ultimately, she believes strongly in PBL as the best way to teach students in every subject area and has a good deal of experience integrating it into her daily instruction.

I found it interesting that when I asked Teacher 7 to provide some examples of PBL activities she had completed in her classroom, she had a hard time coming up with examples at first. After further discussion and questions, she realized that part of the reason was because it is so embedded in her instruction that she does not see them as "projects". She recalled a project from last school year, which was the first year Teacher 7 had taught science in her classroom (previously her team was organized in partner teams and she had been responsible for Language Arts and Social Studies),

> [L]ast year when things were so crazy, I found myself finding great comfort in, 'let's make a sundial and go make some observations' and then let's talk content. It was a really simplistic way of taking that process, but I found myself doing that because A. I had never taught science before, and B. I was like, this is kind of what you're supposed to do, like go actually observe.

She described in detail the process she took with her students in building an individual sundial, going outside, making observations at different times of day, and pointing the sundial in different directions by changing their body position all while allowing the students to develop questions and observations related to the science content she was teaching. Another example she gave included watching plants grow in different types of soil and how that project took on a life of its

own during the "snowpocalypse" last February when campus was shut down for a week with no electricity and their plants were left in unheated rooms for an extended period of time. Lastly, she talked about conducting social studies related PBL activities, but how difficult that has become lately in Austin ISD – "it's getting harder here to close your door and feel like, you know, you could be as successful because of some of the Title One punitive types of behaviors that you're seeing as the standard and norm."

As expected, Teacher 7's TSES survey scores positively correspond with her interview responses regarding her confident attitude, belief, and experiences with PBL instruction. Her *efficacy in student engagement* subscale score was high at 57. Individually, she scored 9 on questions related to using PBL strategies to help students think critically, believe they can do well in school, and value learning; and 8 on questions related to using PBL strategies to motivate students who show low interest and fostering student creativity. Her *efficacy in instructional strategies* subscale was a 54, with individual scores of 8 on five of the seven questions related to her confidence related to answering difficult student questions, gauging student comprehension and mastery, crafting good questions, her ability to use a variety of assessment strategies, and her ability to implement alternate instructional strategies. Finally, her frequency subscale score was "once a week" for using PBL strategies to help students think critically and "between once a month and once a week" for incorporating PBL strategies within her daily instruction. Overall, Teacher 7 demonstrated a strong level of confidence in her use of PBL instructional strategies based on both her TSES survey score and her interview responses.

The fourth teacher interviewed, Teacher 10, was the newest of the teachers I interviewed. I came into the interview with a preconceived notion that she might have been better prepared during her teacher preparation program since she was the most recent out of college. Her

interview responses negated this notion, as it became clear she has little confidence in her ability to easily incorporate PBL strategies in her classroom. She defined PBL as,

> trying to connect learning to the real world of something they're curious about and kind of letting them solve some sort of problem connected to it, but it's hard. I think the hard part is trying to make it driven by the students more.

When I pressed her to talk about what made it hard, she mentioned the constraints of school, like pacing, especially this year because of the loss of academic time during remote learning last year, and "coming up with ideas that bring it all together." For example, she mentioned trying to find "some sort of PBL that incorporates them sort of taking more of a global awareness for the gifted students" as part of a Leadership Pathway she is completing.

When we discussed her thoughts on PBL as an effective instructional strategy, she noted three important ideas. With the first, she stated "I feel like it's good for all learners to kind of meet them where they are. I think that's really helpful in a mixed ability classroom." Secondly, "it provides, you know, the extension or different modalities for the kids to learn." Teacher 10 has typically been assigned a very mixed group of students ranging from inclusion special education students to gifted identified students, which explains these ideas. Finally, she said "it's more like the real world of being problem solvers. It meets the standards, but it also is preparing them for real life." She struggles with finding ways to incorporate PBL instruction on her own, which was evident with this statement, "I would love to do way more of it than I do, but you know, time and all the effort it takes to get it and I think it would be easier if you were collaborating more with other people to plan. It's more brains together to come up with an idea." When I continued to ask about student engagement regarding PBL versus traditional learning methods, she did agree that it is more engaging, and that she has a goal to learn how to better use PBL to better assess their knowledge,

[I]t's easier to tell along the way where their needs are like if they're not getting something and then having a reteach or lesson focused on that, but at the end you've spent all this time and besides them reflecting, how do you know what they learned without giving them a test.

Teacher 10 understands what PBL is and its purpose, but she struggles to find ways to incorporate it and see it as an effective learning strategy.

As we discussed different PBL activities she has incorporated in her classroom, Teacher 10 focused mainly on projects that had been developed and used by her team, not individual projects she had incorporated. One such project she mentioned was connected to a novel the students read called The Wild Robot, and the team connected it to their study of forms of energy in science by asking the students to work in teams to build a robot that used the various forms of energy they had studied. At the completion, each team had to create a marketing slogan and presented their robot to a group of investors (parents). She talked about how last year, during remote learning, it was difficult to impossible to use PBL instruction because she was a remote teacher for the entire school year.

Teacher 10's lack of confidence in her ability to develop and incorporate PBL activities was evident in her interview responses as well as her TSES survey scores. She scored a 37 on the *efficacy of student engagement* subscale with her highest individual score being a 6 on four of the seven questions. She scored 4 on questions related to her ability to use PBL strategies to motivate students and improving the understanding of a student who is failing. Her score on the *efficacy of instructional strategies* subscale was a 43 with a 6 on four of the seven questions. These responses were related to her confidence related to responding to difficult questions from students, using PBL strategies to adjust her lessons for individual students, implementing alternative instructional strategies, and providing appropriate challengers for very capable students. She scored a 7 on the question related to her ability to gauge student comprehension

and mastery after a PBL activity which was surprising given her interview response related to needing to work on assessing students' knowledge at the completion of a PBL activity. Her frequency subscale of "more than once a semester but less than once a month" for each question correlated with the rest of her survey responses demonstrating her inability to implement PBL activities in her classroom instruction.

How do teachers perceive their abilities to teach and incorporate 21st century skills using PBL instruction. On the TSES survey, three of the questions were related to using PBL instruction to teach students the 21st century skills of creative thinking, critical thinking, communication, and collaboration. During the teacher interviews, I asked the teachers more specifically about their experiences incorporating 21st century skills in their daily instruction and how confident they felt in embedding these skills in PBL instruction.

Teacher 17 talked about the need for students to acquire these skills as early as possible to provide them more time for practice and to refine them, especially communication. Her students are first graders, so they are only six and seven and as she said, "have only been talking in sentences for three or four years", so the need for them to learn to communicate is essential. "I feel like most of the day should be them practicing their speaking and listening skills." She goes on to talk about the correlation between reading and talking – "being able to read better just comes from being able to listen and speak better, that will build their vocabulary and their comprehension fluency." Additionally, she connects collaboration with the need to communicate effectively by stating that "they can become better collaborators when they can communicate what they're trying to clearly and efficiently say." When I asked her about how she teaches these skills in her daily instruction, she said at this age problem solving is best taught explicitly during their social emotional learning (SEL) lessons using puppets for role playing so students

understand how to problem solve a situation and how others might be feeling. She did not discuss how she incorporates these skills in her PBL instruction, but she talked about just letting students talk during class and work together – "work with the other kids is just a huge part of being a successful person in life. Work is more exciting when they get to work with other people." On the TSES survey questions related to 21st century skills, Teacher 17 rated herself as 6 implementing PBL strategies to help the students think critically, as well as how often she uses the strategies to build critical thinking, and an 8 on using PBL strategies to help students build creativity. It was clear from our interview that she possesses a firm understanding of what the 21st century skills are and how to help her young students develop these skills, although her focus is on explicitly teaching these skills at this age and using PBL activities for them to practice the skills.

Teacher 3 really focused on the need to build community in the classroom from day one of the school year to start fostering these 21st century skills,

> But really that kind of stuff to be really frank has to start, as you know, day one. If you are not immediately from the minute they arrive, building community and creating that important positive learning environment, you know, that kind of classroom culture where they realize that, I'm in a place where I'm going to be expected to push myself, take risks and grow and learn, then you're making a mistake.

She believes you must build "trust between you and the kids, and between the kids and each other" before you can start expecting them to collaborate, problem solve, and communicate effectively. She stated that once that is done then "that kind of stuff can be embedded in the project", referring to embedding 21st century skills into PBL instruction. The need for students to build these 21st century skills is "crucial now more than ever" in her opinion. She believes we should be "cultivating the kind of humans that can go out and collaborate" and problem solve with their groups. Teacher 3 uses 21st century skills and PBL instruction as a way for students to

"think about the world on a bigger scale, think outside of their lives, their house, their classroom, the curriculum. What's out there? What can I do?" Although she clearly understands the importance of students building these 21st century skills, Teacher 3 does not rate her ability and confidence in helping students think critically and creatively very high. She scored a 5 on the questions related to implementing PBL strategies to help students think critically, how often she uses these strategies for critical thinking, and how she uses PBL strategies to foster creativity. These ratings are consistent with her other responses related to her confidence level regarding PBL instruction in general.

In my interview with Teacher 7, she spoke at length about how 21st century skills are a "core piece of it" with regards to how they fit within PBL instruction. "[S]tudents need to not only have that skill set in terms of working among the others, but I think that self-advocacy of knowing how to do that for themselves and their own learning is a huge part of it and I feel like building in some of that explicit instruction is also really helpful." She goes on to talk about the need to have self-evaluation or self-assessments within a project where students learn to ask themselves 'how am I doing?'. Interestingly, she talked about how students right now are stunted in their emotional growth and with these skills because of the lack of in person school last year due to the pandemic. Students were more isolated and working independently, not being required to communicate or collaborate, and she is seeing a deficit in the students' ability to work together this year. When I asked her about teaching these skills, Teacher 7 said that this year she is "way more structured and doing it through SEL class time" than in past years and then allowing students an opportunity to practice during their PBL activities. Because of her literacy background she has always focused on student conversation and engaging discussion. Teacher 7 believes she has always valued how that looks in the classroom and fostered the development of

these "soft skills" in her class community. Teacher 7's responses on the TSES survey questions related to 21st century skills coincided with her interview comments regarding the importance she places on these skills in her classroom instruction since she rated herself as 9 on the extent she uses PBL strategies to help students think critically and "once a week" on how often she uses these strategies to build critical thinking; additionally, she rated an 8 on the extent in which she uses PBL strategies to foster student creativity. Overall, as with her responses related to PBL instruction, she is clearly confident in her ability to embed the use of these 21st century skills in her daily instruction and she values the importance of students obtaining these skills.

Finally, Teacher 10 made similar statements as Teacher 7 regarding the students' stunted growth in the areas of collaboration and communication because of the previous school year's learning restrictions. Regarding the importance of students learning these skills, she believes they are important, "especially this year. I mean, the last regular school year these fifth graders had was second grade and you can tell their collaboration skills just haven't had time to develop as much as their communication skills." She went on to say that "all the standards and you know, that's the foundation, but when they go into the real world, that's what's really going to help them be successful." As we continued discussing the needs for these skills Teacher 10 said,

> I think that they would really enjoy some sort of problem based learning and that would help them too, they would be motivated to work on those skills, but it's just figuring out how to logistically do that with the constraints.

Her reference to these "constraints" include the recently opened building Casis Elementary moved into this school year and ongoing construction, as well as the limited ability to "commingle with each other" because of the distancing restrictions. The new campus has been built for 21st century learning with open, collaborative spaces, but Teacher 10 does not "feel like they're really being used to their full potential." I asked her about how she teaches these 21st

century skills in her classroom and she gave some examples of PBL activities that she had not talked about earlier in our interview when we discussed different PBL experiences she has incorporated. One example was how the students use communication during "a wax museum project where they basically give a monologue as a famous person and, you know, think about conveying a message with more than just their words but their body language." She gave a few other examples of where students use communication and collaboration during presentations either individually or with small groups. When asked about the other skills, she said,

> I feel like it's harder to guide some of the other parts like critical thinking, which is somewhat, it's figuring out how to approach it developmentally because some of them are like 'oh, yeah' and others are not there yet and meeting them where they're at.

From this response, it seems Teacher 10 does not think that all the students are developmentally able to use critical thinking skills independently. Her lack of confidence in incorporating and teaching these skills coincides with her confidence level with the use of PBL strategies in her daily instruction. On the TSES survey questions related to 21st century skills, Teacher 10 rated a 6 on the two questions related to the extent she uses PBL strategies to help her students think critically and help foster creativity. She rated "more than once a semester but less than once a month" on how often she uses PBL strategies to help students think critically. Teacher 10's level of confidence is low in her ability to incorporate 21st century learning in the classroom as well as her understanding of the importance of students developing these skills.

To what extent are teachers able to incorporate the TEKS into their PBL opportunities. Throughout our interviews, the teachers talked about how they incorporate the state standards, the Texas Essential Knowledge and Skills (TEKS), into their PBL instruction. Their responses positively correlate with their use of PBL instruction in their classroom and how confident they are implementing PBL teaching strategies.

During our discussion, Teacher 17 talked fluidly about how she incorporates the standards within her PBL activities. She stated, "I feel like we go above and beyond the TEKS regularly and so the TEKS are good to have around and to know and to be aware of … but I feel like they are a starting point." With regards to a project related to animals the students "adopted", she taught the science standards related to food chains, habitats, and life cycles by allowing the students to conduct research on their animals learning about these different science topics. At the end of the year, the students create a store where they sell hand made goods and must practice math skills related to counting money. During this project, Teacher 17 also covers social studies standards related to "the whole supply and demand, the buying and selling, consumers producers, the needs versus wants … so it very much incorporates all the academic areas when you think about it." Teacher 17 spoke confidently about her ability to fully integrate the TEKS in her PBL instruction.

When Teacher 3 discussed how she incorporates the TEKS in her PBL instruction, she talked about it linearly,

> we will look at the TEKS and talk just a basic outline of how we could cover that the next year … so for instance, caterpillars, for example, and say, okay well here's what we're covering, here are the exact TEKS across the curriculum that we would be covering studying caterpillars and then what, how could we turn that into a project-based learning situation.

Interestingly, she then went on to say that many of the TEKS are taught outside of the PBL activity and instead it is used as a culminating activity at the end of instruction for the students to showcase what they learned. She realizes that this is not how true PBL instruction should look but says this is how she will be doing it this year. She admitted that she needs to "seize those moments and think about how I could have turned that into a research situation." This statement shows a lack of confidence – she knows what she should be doing but is not enacting it.

Teacher 7 believes strongly that the TEKS can be embedded in PBL instruction and when I asked her if there were any specific subject areas she felt could not be taught effectively, she laughingly said math – mostly because this is the academic area she has the least experience teaching and because math tends to be taught in isolation, not in the context of real world examples. She commented that, "part of the iterative process is stepping back and teaching them what they need to know" referring to the need to teach the standards within a project and looping back around when students have questions or misunderstandings to reteach needed concepts. In discussing how she has incorporated PBL instruction in her classroom, Teacher 7 gave examples of teaching the science standards related to earth's rotation using a human sundial project the students conducted. She always discussed how some of her PBL projects are very organic and are built off student questions. For example, when studying soil, the students asked whether plants would grow in one type of soil versus another, so they pulled together a project to collect soils and test their theories. This was not a planned project, but one that was initiated from student interest and questions – all related to their science study. When discussing how she incorporated the TEKS in PBL instruction in her classroom, Teacher 7 confidently said, "it wasn't difficult to embed the standards at all" and throughout our interview she was able to talk about different projects she had conducted and how they had connected to the state standards.

Lastly, Teacher 10 did not believe it was very difficult to incorporate the TEKS into PBL instruction. For her, the issue is more about incorporating multiple standards at one time to make the time investment worthwhile.

> It's just trying to figure out because it's a big-time investment, how to incorporate standards from more than one subject into that time. You might have an hour and a half for math, but you need three hours to work it so it's more of just a creative challenge of figuring out how to do it a little bit at a time because it takes a little bit longer. So you have to really find multiple standards to incorporate.

This message of time and the effort it takes to set up projects was consistent with her responses to other questions throughout the interview. When I pushed a little harder on academic areas she believed were not suited for PBL instruction she noted grammar and math, especially math fluency, as two topics. To her, PBL activities are "a better place to synthesize or analyze, but when they're just at the beginning of learning a concept, it's not really appropriate because they don't have the background knowledge." Teacher 10's low confidence level with PBL implementation of instruction seems to stem not from the difficulties of embedding the standards within a project, but with the issue of allocating time and understanding what needs to be taught and how it could be integrated into a PBL learning situation.

Closing Thoughts

After analyzing the TSES survey scores and conducting the qualitative interviews for the four teachers identified, I found that the interview responses correlated very closely with the high and low attitudes and behaviors towards PBL instruction the teachers rated on the survey. Their interview responses allowed me to delve deeper into understanding the reasons behind the perceptions that these four teachers held in conjunction with their survey responses. In the following chapter, I will look more closely and specifically discuss what I learned from both the survey scores and their descriptive interview answers.

CHAPTER 5

SUMMARY AND CONCLUSIONS

Introduction

The purpose of this mixed methods action research study was to better understand the attitudes, beliefs, perceptions, and experiences of elementary school teachers regarding the implementation of PBL strategies and integration of 21st century skills in the classroom. The study took place at Casis Elementary, an urban elementary school within Austin ISD. Eighteen teachers in grades 1-5 completed the quantitative portion of the study, which included a modified version of the TSES. From this group, four teachers were selected for the qualitative portion of the survey – two from the primary grades of 1st-2nd and two from the intermediate grades 3rd-5th. These teachers had the highest and lowest sub-scale scores on the TSES survey and participated in semi-structured interviews to allow me to better understand the reasons behind their beliefs, attitudes, and perceptions regarding PBL instruction and 21st century skill integration.

From the TSES survey scores and interviews, three major findings came to light. One, teachers have a solid understanding of what PBL instruction looks like and its effectiveness as a student-centered learning method in the classroom. Two, teachers do not find it difficult to integrate the state standards within PBL instruction, but they are not using it to its full extent in the classroom. Finally, teachers do not feel they have been adequately taught how to best implement PBL instruction in the classroom.

PBL Instruction and its Effectiveness

Most of the teachers I interviewed were able to clearly define what PBL instruction was and its purpose in the classroom. They saw it as an effective learning strategy, although not

everyone interviewed is currently implementing it to its fullest extent for various reasons. Additionally, on the TSES survey teachers rated their ability to use PBL strategies as a way to foster student creativity quite positively. According to Tamim and Grant (2013), PBL has many advantages as a learning strategy including the ability to "foster intrinsic motivation" (p. 73). Ravitz (2008) surveyed teachers regarding their use of PBL in the classroom and found that the greatest reasons teachers use PBL was to provide more personalized learning while also teaching students skills they need to know beyond the required academic content. As was noted by the teachers I interviewed, Ravitz (2008) also found that some of the challenges teachers identified for their lack of PBL instruction was related to the not having enough time for planning and implementing PBL activities as well as the "lack of student experience or skills" (p. 7) which relates to the primary teachers discussions regarding their need to explicitly teach student skills early in the year before allowing the students to use the skills when working together on PBL activities.

Multiple researchers have defined PBL similarly as a student-centered instructional method that begins with an overarching problem rooted in a real-world situation, centers around student collaboration and control, and ultimately ends with some type of artifact or project (Barron & Darling-Hammond, 2008; Blumenfeld et al., 1991; Cubukcu, 2012; Krajcik & Blumenfeld, 2014). The teachers I interviewed defined it this way as well. Teacher 17 and Teacher 3 both used words like "process" and "kids are figuring out how to solve a problem"; while Teacher 7 noted it being rooted in "some sort of problem that has application to student lives and the real world" and being where students are "immersed in multiple ways of engaging in their learning".

Use of PBL Instruction in the Classroom

When I asked teachers about their ability to integrate the state standards, the TEKS, into a PBL activity, they uniformly said it was not difficult. Teacher 10 noted that it was not difficult to include individual standards or concepts into an activity but incorporating multiple standards across the curriculum was more difficult. PBL instruction is meant to be integrated, especially in the STEM based fields. According to Capraro and Jones (2013), real world problems do not become solved in isolation, but overlap the different academic areas of science, math, and engineering (the STEM fields). So, teaching students how to solve problems within this context is much more realistic than isolated instruction and problem solving. Additionally, Stinson et al. (2009) report that the integration of math and science concepts in a PBL environment improves student motivation, achievement, and interest in the subject matters. Teacher 7 considers PBL instruction as a very organic method of teaching. "It's not ignoring the fact that they need content and they need skills … it's just the way that you're able to integrate."

Even though the teachers agreed it was not difficult to incorporate the standards in PBL instruction, they are still not utilizing it effectively in their classrooms. On the TSES survey, when asked how often they incorporate PBL strategies into their daily instruction, on average the teachers reported more than once a semester, but less than once a month. I believe one of the reasons this rating was even this high is because the principal at Casis Elementary requires one PBL based instructional activity be completed once a semester. The teachers have reported that this tends to be a grade level project that all the classes within the grade participate in. Teacher 10 discussed a PBL activity all the 5th grade classes participated in related to forms of energy, while Teacher 17 shared information about the "1st grade store" where all the 1st graders create homemade objects they sell to other students on the campus as a culmination to learning about

money in math and supply versus demand in social studies. Tamim and Grant (2013) found that some of the challenges teachers expressed with incorporating PBL instruction in their classrooms include adapting to a constructivist approach to teaching, the use of new instructional strategies, the ability to assess student knowledge within the context of a PBL environment, and the management of PBL activities (becoming more of an observer and manager rather than a teacher). Interestingly, the teachers I interviewed did not cite these reasons as obstacles to why they are not incorporating PBL instruction more regularly in their classrooms. Instead, some of the reasons teachers reported during the interviews include the need to teach the individual tools before the kids can be released to "put it all together", time to collaborate and design projects that incorporate multiple standards, and time to complete the projects within the confines of a daily schedule and pacing requirements. When I asked Teacher 7 about having to release some level of control in the classroom to allow the students the freedom to engage in these activities, she laughed and said, "but yeah, that's strange because it's not a release of control." She went on to discuss how it is more about the culture you create in expecting the students to do and behave in a way that you expect them to. This was also noted by Teacher 3 when she discussed the need to build trust within the classroom community to make it effective. Teacher 7 also talked about the lack of a script with PBL activities and that it is not a curriculum to be followed. So, although the teachers did not feel the lack of a constructivist approach to teaching applied to them directly, they did discuss this as a reason why more teachers are not engaging in this type of instruction.

Teacher Preparation

One important finding from my study was the lack of preparation teachers feel they have received with regards to incorporating PBL instruction in their classrooms. The teachers I spoke with were mostly experienced teachers with decades of teaching experience, but even Teacher

10, the least experienced of them did not feel she received the necessary preparation during college to teach in a PBL environment. Teacher 7, the most senior of the four teachers, had the best background and preparation for PBL instruction because she spent her student teaching semester working with a 4th grade teacher who structured all her instruction around PBL activities. For teachers to be successful in implementing PBL strategies in their classroom, they must have the proper professional development and support. Teachers must become learners along with their students. The professional development offerings must address multiple areas including helping the teacher learn to be a facilitator and expert learner, develop new ideas regarding pedagogy and practice, and understand the complexity of PBL as an instructional strategy (Walton, 2014).

In addition to the need for quality professional development to support teachers in gaining the knowledge to transform their teaching environment, teachers also need ongoing administrative support in the formation of PBL activities. According to Blumenfeld et al. (1991), "[i]n order to realize the potential of project-based instruction, projects must be designed that sustain student motivation and teachers must be supported in creating this type of instruction" (p. 374). Without these changes to professional development and administrative support, PBL will continue to exist only in classrooms where teachers proactively seek out their own professional learning. As Teacher 3 best summarized it, "I literally learned it just kind of through the school of hard knocks like everything else."

Finally, the biggest area in which teachers need professional support in learning to integrate PBL instruction is through our university level preservice education programs. Changes must be made to these higher education programs so that preservice teachers begin their careers with a constructivist pedagogy that recognizes student centered learning strategies as the basis

for what quality teaching should look like. Walton (2014) states that PBL has been used in the field of medical education since the 1970s, replacing lecture-based instruction. The same must be done in teacher preparation programs to better prepare our preservice teachers for life in a 21st and 22nd century classroom. Johnson and Templeton (2011) expand upon the idea of providing an intern-like experience for our preservice teachers where they work alongside a master teacher, becoming an "active" member of the team in Professional Development Schools (PDS). We must "transition from traditional approaches to teaching best practices and to creating opportunities where preservice teachers not only observe the modeling of best practices but actively and consistently participate in demonstrating and studying best practices" (Johnson & Templeton, 2011, p. 115). These PDS programs are partnerships between university education programs and public schools where preservice teachers have synchronized coursework, ongoing classroom practice, and time for reflection and learning with their mentor teacher that extends beyond the traditional one semester of student teaching, lasting as long as four years. This type of ground level change is necessary to provide future teachers with the proper foundation to fully understand how to structure their classroom environment around student centered learning strategies. Over time, through PDS partnerships we can move public education into the 21st and 22nd century of learning, providing stronger learning environments for our students and preparing them for a more successful future.

ROS Artifact

The purpose of this record of study was to evaluate the teacher perspectives regarding PBL instruction for the purposes of understanding teachers' needs for professional development opportunities in support of PBL. One of the primary findings from the research study was that teachers do not believe they have received enough training to fully incorporate PBL instruction

in their classroom. The artifact for this record of study was to define professional development opportunities that would help teachers become more confident with implementing PBL strategies.

Effective professional development is based on several factors including the design and context of the PD, and characteristics of the participants (Al Salami et al., 2017). The conceptual framework proposed by Al Salami et al. (2017) shows that effective professional development leads to a change in classroom practices, which then leads to more positive student outcomes. After time and success, this ultimately leads to a change in teachers' beliefs and attitudes towards the subject matter. Owens, et al. (2018) explain that effective professional development should mimic a classroom environment, including the "use of a constructivist approach to facilitation" (p. 371). Additionally, it should treat teachers as professionals and create a collaborative environment to build trust for open discussions (Owens, et al., 2018). One of the most important elements regarding the implementation of effective professional development is providing teachers with enough time to "develop pedagogical content knowledge and time to reflect on their PD experience" (Owens, et al., 2018, p. 372), especially with their teammates.

Based on the information gathered in this research study, I propose a professional development program for PBL instruction for teachers at Casis Elementary. This program will last an entire school year, beginning in August prior to school beginning. Based on the results I gathered, the teachers have a good understanding of what PBL instruction looks like. They have received training on PBL previously and have been conducting PBL activities on campus at the requirement of their principal. Therefore, the professional development will be able to streamline this portion saving valuable time. The program will begin with two full days where teachers will be allowed to work within their grade level teams to plan and create at least two meaningful PBL

activities centered around a set of TEKS – preferably cross curriculum, covering TEKS in multiple subject areas. The PBL activities should be planned to be conducted in different parts of the fall semester, possibly first nine weeks and second nine weeks (assuming an 18 week fall semester). The teachers will present detailed plans for their PBL activity, including the TEKS covered during the activity, an estimated timeline for conducting the activity, and the plan for assessing students for mastery of the covered TEKS, to their administrative team and the professional development instructor. The PBL plan should include how the TEKS will be covered within the context of the activity and lessons, not in isolation prior to using the PBL activity as a culminating event. This extensive professional development opportunity will continue through the fall semester, meeting with each grade level team after they have conducted each of their PBL activities to reflect on and review what they learned, what went well, what needs to be changed for the next set of PBL activities. The administrative team will be expected to make classroom observations throughout the fall semester to see these PBL activities in action.

During the professional development days prior to the start of the spring semester, the classroom teachers will again participate in a full day of planning where they will briefly reflect on and share what they learned while conducting their PBL activities in the fall and will plan two more activities for the spring semester. Based on the experience they have gained, developing these new activities should be much easier. Again, plans will be developed and given to the administrative team and instructor for the spring PBL activities. The same meetings will occur during the spring semester after each activity for reflection and learning. The administrative team will also make classroom observations throughout the semester to observe these activities in action.

Structuring the professional development opportunity in this way – offering it as an extended, year-long activity that includes collaboration and time for reflection meets the professional development needs most recommended by many researchers. It also meets the needs expressed by the teachers I interviewed regarding the lack of time to collaborate and ways to assess student mastery.

Limitations

This research study focused on the attitudes, beliefs, and perceptions of elementary teachers regarding PBL instruction and 21st century skills. The modified TSES survey distributed to the teachers at Casis Elementary focused on the extent to which teachers use PBL strategies in their classrooms as well as the frequency with which they employ these strategies. One limitation to the study was that it took place within an upper middle class, urban elementary school so the views were limited to a small group of teachers rather than a broad group with diverse teaching backgrounds, experiences, and subject areas. Due to the time constraints surrounding the study, along with the ongoing CoVID-19 pandemic, the number of teachers interviewed was minimal. This again limits the number of viewpoints presented and evaluated.

Another limitation to the study was the survey response rate of the teachers. The modified TSES survey was distributed to the 27 teachers at Casis Elementary. Only 67% of the respondents returned the survey. A higher return rate would have provided more data and a larger group for interview selection.

Future Research

Future research should focus on the specific professional development needs for teachers with regards to PBL instruction. Some of the questions should be related to the type of PBL professional development teachers are currently receiving and the areas they believe are lacking.

Additional research should expand upon the current study to include the perspectives of teachers from middle and high school as well as from schools with different socio-economic backgrounds.

NOT HUMAN RESEARCH DETERMINATION

February 18, 2020

Type of Review:	Initial Review Submission Form
Title:	Understanding the perspectives and experiences related to student-centered learning strategies and 21st century skills among elementary school teachers
Investigator:	Mary Margaret Capraro
IRB ID:	IRB2020-0101
Reference Number:	105881
Funding:	
Documents Received:	IRB Application (Human Research) - (Version 1.0)

Dear Mary Margaret Capraro:

The Institution determined that the proposed activity is not research involving human subjects as defined by DHHS and FDA regulations. Data gathering efforts are intended only for the student's record of study and will not yield generalizable data.

Further IRB review and approval by this organization is not required because this is not human research. This determination applies only to the activities described in this IRB submission and does not apply should any changes be made. If changes are made you must immediately contact the IRB about whether these activities are research involving humans in which the organization is engaged. You will also be required to submit a new request to the IRB for a determination.

Please be aware that receiving a 'Not Human Research Determination' is not the same as IRB review and approval of the activity. IRB consent forms or templates for the activities described in the determination are not to be used and references to TAMU IRB approval must be removed from study documents.

If you have any questions, please contact the IRB Administrative Office at 1-979-458-4067, toll free at 1-855795-8636.

Sincerely
, IRB
Administ
ration

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Teacher Perspective Scale for Project-Based Learning

Teacher Beliefs	Indicate your level of influence								
Directions: This questionnaire is designed to help us gain a better understanding of how teachers feel about project-based learning (PBL) activities. Please indicate your rating regarding each of the statements below. Your answers are confidential.	Not at all		Very Little		Somewhat		Quite a Bit		A Great Deal
1. How well do you use PBL strategies to get through to the most difficult students?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
2. To what extent can you use PBL strategies to help your students think critically?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
3. How well do you believe you can use PBL strategies can help control disruptive behavior in the classroom?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
4. To what extent do you use PBL strategies to motivate students who show low interest in school work?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
5. To what extent can you make your expectations clear about student behavior?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
6. How confident are you in using PBL strategies to get students to believe they can do well in school?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
7. If students ask difficult questions while engaged in PBL, how confident are you in responding to those questions?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
8. How confident are you in using PBL strategies to help students value learning?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
9. To what extent can you gauge student comprehension and mastery after a PBL activity?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
10. To what extent can you craft good questions for your students?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
11. To what extent can you use PBL strategies to foster student creativity?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
12. To what extent can you use PBL strategies can improve the understanding of a student who is failing?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
13. To what extent can you use PBL strategies to adjust your lessons to the proper level for individual students?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
14. How much can you use a variety of assessment strategies?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
15. How well can you implement alternative *instructional* strategies in your classroom?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
16. How well can you provide appropriate challenges for very capable students?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Never	Less than once a semester	Once a semester	More than once a semester but less	Once a month	Between once a month and one a	Once a week	2-3 times per week	Every day
17. How often do you use PBL strategies to help students think critically?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
18. How often do you use PBL strategies to motivate a student who shows low interest in schools?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
19. How often do you incorporate PBL strategies within your daily instruction?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)

APPENDIX C

Interview Questions:

1. Tell me about your teaching experiences and background.

2. What is project-based learning to you?

3. Describe and share your belief system regarding project-based learning as an effective learning method for elementary students.

4. Do you believe that project-based learning is effective for student engagement (versus traditional learning methods)?

5. Describe your experiences with project-based learning in your classroom.

6. What are your beliefs regarding the need for students to acquire 21st century skills such as collaboration, communication, creativity, and critical thinking to be successful?

7. What experiences do you have teaching 21st century skills?

8. How do you teach these skills in your classroom?

9. When using project-based learning, how do you make sure the TEKS are incorporated into your instruction?

10. In what instances do you think project-based learning is not best for instruction?

11. Do you feel you have been adequately prepared to teach project-based learning?

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