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Elementary School Teachers' Perspectives on Project-Based Learning Implementation in Commonwealth of the Northern Mariana Islands

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This is to certify that the doctoral study by

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has been found to be complete and satisfactory in all respects,
and that any and all revisions required by
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Walden University
2025

Abstract

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by

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MA, Western Governors University, 2018

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Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Education

Educational Technology

Walden University

November 2025

Abstract

Elementary schools play an essential role in equipping students with 21st-century skills. Project-based learning (PBL) is a student-centered instructional approach that is associated with the development of these skills, yet PBL implementation in elementary schools is not well understood particularly in Saipan. The research problem addressed in this study was a lack of understanding of elementary teachers' practices in implementing PBL in Saipan. Guided by constructivist theory, the purpose of this qualitative study was to examine elementary school teachers' perspectives on the benefits of PBL, the ease or difficulty when implementing PBL, the success of PBL implementation, and the professional support needed to implement in Saipan. For this basic qualitative design, I conducted semistructured interviews with 11 elementary teachers in Saipan who were recruited through email invitations. Braun and Clarke's six-phase thematic analysis method was used to manually code the transcripts, that led to the development of the following themes: (a) PBL enhances group work and collaboration; (b) PBL requires extensive preparation; (c) PBL requires resources and professional development; and (d) teachers need collaboration and flexibility for effective PBL implementation. These findings suggest the importance of providing teachers with continued professional learning, adequate planning time, and working technology. The results of this study may contribute to positive social change by offering educational stakeholders' insights into the kinds of support teachers believe they need to strengthen instructional PBL practices in elementary classrooms and, in turn, to encourage active student learning.

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Dedication

To my parents, my sister, my husband, my mentors and friends, my two sons, and my daughter—this work is devoted to all of you.

To my parents, Tang Youjun and Liu Shujun, thank you for raising me with love, resilience, and unwavering expectations. I still remember beginning my daily diary in the second grade—a habit born from your belief that discipline and reflection mattered. Mom, your zero-tolerance approach to every homework assignment and exam, for both me and my sister, felt strict at the time, but it shaped the determination and work ethic that carried me through this journey. You often told us that, you yourself would have gone to college—an unfulfilled dream that inspired me to pursue mine with even greater purpose. Your belief in me has been a constant source of strength.

To my sister, Ming Tang, who is one year younger than me, thank you for carrying the responsibility of caring for our parents for more than twenty-five years while I lived abroad, pursued my dreams, and raised my family in Saipan. Your quiet strength, sacrifice, and devotion made it possible for me to follow my path. I am endlessly grateful for everything you have done.

To Mr. and Mrs. Gebhard and Ms. Rowena—my leaders, and friends—your encouragement and your willingness to grant me the flexibility to work and study made this achievement possible. Thank you for the flexibility and understanding you have shown throughout my years at Pacific Amusement Inc. Your willingness to accommodate my schedule allowed me to balance my responsibilities at work, my family life, and my studies. Your support made this achievement possible.

To Ms. Raena, Ms. Mendez, and Mr. Johnson, my mentors, leaders, and friends, thank you for the flexibility and understanding you have shown, allowing me to balance my work, family, and studies. To Ms. Raena, who guided and supported me throughout more than a decade of my professional growth; I am deeply grateful to Ms. Mendez, who has mentored me since the early years of my study in NMC; and to Mr. Johnson, whose support and encouragement have been invaluable as I completed the final stages of this journey. Your leadership and compassion made it possible for me to persevere and succeed.

To my husband, Gani, thank you for walking beside me every step of the way. I know that living with a doctoral student is no small feat. Through late-night writing marathons and long stretches of exhaustion, you kept the coffee warm and the children happy. Your patience and quiet strength deserve recognition far greater than I can express—an honorary doctorate of your own.

To my children, Simon, Eamon, and Erica, thank you for your love, your laughter, and your unspoken understanding. I still remember when I was working on my master's degree, asking Simon—then only 9 years—to read my research paper. Now he is eighteen. Time has moved swiftly, yet your support has remained constant. I know I missed tennis tournaments and soccer games, and that hearing me mutter research terms in my sleep may have been confusing. And to my daughter, may you always pursue your dreams with the same grace and determination that you bring to your ballet and your art.

To my beautiful family: your love, humor, and unwavering faith in me sustained my spirit. You reminded me to breathe, to smile, and to continue forward even when the path felt overwhelming. I hope this accomplishment inspires you as deeply as you have inspired me.

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I would also like to acknowledge the use of OpenAI's ChatGPT as a supporting tool during the writing process. This tool was used to assist with brainstorming research ideas, refining wording, and checking APA formatting. All interpretations, analyses, and final writing are on my own.

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Chapter 1: Introduction to the Study

Project-based learning (PBL) is a pedagogical approach that encourages students to develop real-world problem-solving strategies by applying prior knowledge (Stehle & Peters-Burton, 2019). PBL aims to enhance learning by developing students' creativity, critical thinking, problem-solving, collaboration, communication, decision-making abilities, and technology proficiency (Aidoo, 2023; Elfeky et al., 2022; P. Guo, 2021; Issa & Khataibeh, 2021). Researchers have noted that a shortage of highly skilled workers poses both regional and global workforce challenges (Kofler et al., 2020). Studies on PBL have shown that it can help students build 21st-century skills needed for future workforce success, including critical thinking skills and problem-solving skills (Bulu & Tanggur, 2021; Issa & Khataibeh, 2021; Stehle & Peters-Burton, 2019).

Since the beginning of the 21st century, students have been required to master a wide range of skills to navigate an increasingly diverse workforce and real-life challenges. Several studies have emphasized the importance of developing students' problem-solving abilities and mathematical communication skills (Ahdhianto et al., 2020; Stehle & Peters-Burton, 2019). In an era of rapid technological development, many modern industries need technically proficient personnel, problem solvers, and critical thinkers to compete in the international workforce (Suryanti & Nurhuda, 2021; Susetyarini et al., 2022). As global competition increases, possessing these skills has become essential. Consequently, education is expected to shift from memorizing basic content to preparing students for a career-ready future.

PBL offers one approach for bridging the gap between real-world problems and solutions through student experimentation and investigation. However, more

comprehensive studies are needed on teachers' perceptions of implementing PBL in elementary schools (Duke et al., 2021). Understanding teachers' perspectives may help identify how PBL is currently being implemented and what challenges may be limiting its effectiveness. This knowledge may also support efforts to better prepare students with the skills needed to meet future workforce demands.

This chapter begins with an introduction to the study and a discussion of the background, where the research gap is clearly articulated. It also includes the problem statement, purpose of the study, and research questions (RQs). In this chapter I outline the conceptual framework and describes the nature of the study, along with definitions, assumptions, scope, and delimitations. Additional sections address the study's limitations and the significance of the research. The chapter concludes with a summary of the major points presented.

Background of the Study

Research findings highlight that professional development is essential for teachers to implement PBL effectively (Farrow et al., 2022). The literature also suggests that teacher competence in applying key PBL characteristics is associated with more consistent practice (Markula & Aksela, 2022), which may contribute to improved student outcomes. Other studies have found that teachers often struggle to fully adopt PBL due to a lack of training, insufficient preparation time, and limited experience with implementation (Judijanto, 2021; Liao et al., 2021; Meng et al., 2023). Additional challenges, such as limited access to PBL resources, have also been shown to hinder implementation efforts. Research further indicates that students in PBL classrooms may demonstrate stronger academic achievement, collaboration

skills, and problem-solving abilities compared to those in traditional classrooms (Chen & Yang, 2019).

Although prior research provides valuable insights into factors influencing PBL implementation, there remains a need for more recent studies that explore teachers' perceptions of implementing PBL. This study aimed to address this gap about practice in the literature by examining teachers' perceptions of PBL implementation within the target location.

Research Problem

The research problem addressed in this study was a lack of understanding of elementary teachers' practices in implementing PBL in Saipan. Recent literature has shown that students in PBL settings may achieve better learning outcomes than those taught using conventional strategies (Chen & Yang, 2019). Other studies have highlighted the important role of PBL in supporting student achievement and problem-solving skills (Viro et al., 2020). Research has also reported positive perceptions of PBL, with findings suggesting that PBL can enhance the student assessment process (Hsin & Wu, 2023; Navy & Kaya, 2020). While many studies have focused on the usefulness and benefits of PBL (Hsin & Wu, 2023; Issa & Khataibeh, 2021; Kristianto & Harendita, 2022; Viro et al., 2020), there remains a need for more evidence on teachers' perspectives regarding PBL implementation. Most prior research has emphasized PBL outcomes rather than teachers' lived experiences of implementing the approach. Additional studies are needed on elementary teachers' perceptions of PBL implementation, particularly within Saipan. This study examined these perceptions to help address the existing research gap.

Purpose of the Study

The purpose of this qualitative study was to examine elementary teachers' perspectives on the benefits of PBL, the ease or difficulty when implementing PBL, the success of PBL implementation, and the professional support needed to implement PBL in Saipan. This purpose aligns directly with the four RQs that guided the study.

Research Questions

RQ1: How do elementary school teachers describe the importance of using PBL in their teaching?

RQ2: How do elementary school teachers describe their perspectives on the ease of using PBL in their teaching?

RQ3: How do elementary school teachers describe their successes in implementing PBL?

RQ4: How do elementary school teachers describe the support they need to implement PBL?

Conceptual Framework

Constructivist theory provided the framework for this study, as it asserts that learners construct knowledge rather than passively absorb information (Makewa, 2019). According to the theory, learners develop new understandings by connecting new information with their prior knowledge, and teachers support this process through guided experiences (Makewa, 2019). This theory helped frame the study by identifying the factors that may promote or hinder successful PBL integration and by informing recommendations to enhance its implementation.

PBL is a pedagogical technique that draws learners into constructing knowledge by engaging them in meaningful projects and creating real-world products

(Moallem, 2019). PBL is associated with improving inquiry skills, collaboration skills, and real-world problem-solving abilities, as well as promoting critical thinking, creativity, and self-directed learning (Al-Thani & Ahmad, 2025; Bartz, 2023). Under this strategy, teachers act as facilitators who provide guidance, feedback, and support to help learners complete their projects successfully.

Compared to traditional teaching techniques, PBL allows students to connect classroom learning with real-world experiences. This approach promotes deeper conceptual understanding and greater motivation to learn (Juuti et al., 2021). Research has also linked PBL to improvements in students' emotional, social, and literacy competencies (Llorent et al., 2022). Studies further show that PBL can lead to better mathematics performance than conventional instructional methods (Ramli et al., 2020). In addition, PBL has been associated with stronger problem-solving skills, higher-order thinking, innovation, and collaboration capabilities (W. Zhang et al., 2024).

PBL has significant potential to prepare learners for future real-world problems. Even when teachers are enthusiastic about supporting the approach, effective implementation requires a strong understanding of its pedagogical foundations, as teachers often hold limited or varied conceptions of PBL. For example, many of the core features that define PBL are not well understood by teachers. Educators require additional training and experience to implement PBL effectively. Viro et al. (2020) found that subject-based teaching practices and unfamiliar instructional strategies were among the factors that hindered successful PBL implementation. Teacher professional development—including ongoing training, workshops, and instructional support—can strengthen pedagogical skills, deepen

content knowledge, and enhance teachers' ability to integrate PBL into their curriculum.

Exploring teachers' perspectives regarding their beliefs, attitudes, and experiences with implementing PBL provides an effective way to understand the topic under study (Khasawneh et al., 2023). While PBL offers benefits for students, teachers' attitudes are key factors in its successful implementation. Teachers' perceptions of a new instructional strategy can influence its effectiveness and may affect student motivation in PBL settings (Tsybulsky & Oz, 2019). Therefore, Chapter 2 provides a deeper examination of teachers' attitudes toward PBL to support the advancement of PBL development and to inform recommendations for its implementation. The analysis of teachers' perspectives focuses on their perceptions of the challenges, benefits, and outcomes associated with PBL compared to conventional teaching methods.

The success of implementing PBL in elementary schools is influenced by various factors. E-learning platforms have been shown to help address some of the challenges related to resource availability, student skills and competencies, and teachers' ability to adapt to new pedagogical techniques, all of which can affect PBL implementation (Meng et al., 2023). Chapter 2 provides a comprehensive analysis of the factors that influence the implementation of PBL. Examining student engagement and learning outcomes also offers important insights into the topic. Research has shown that PBL can positively affect student engagement and learning outcomes. For example, Ghani et al. (2021) found that student engagement increased when PBL components were incorporated into classroom instruction. Similarly, L. Zhang and Ma (2023) reported that PBL enhanced students' learning outcomes and fostered

more positive attitudes, higher academic achievement, and stronger critical thinking skills compared to conventional teaching models.

Integrating PBL into the learning process is essential for understanding how the approach is implemented. Aligning educational standards and balancing content coverage with skills development are crucial for ensuring the long-term sustainability of PBL (Wilhelm et al., 2019). Elements of constructivist theory, a clear understanding of PBL, teacher professional development, teachers' perspectives, factors influencing PBL success, and student engagement and learning outcomes together provide a comprehensive framework for examining the complexities of PBL implementation. This framework guided the data collection, analysis, and interpretation in this study, allowing me to explore the interconnected factors that influence the success of PBL in elementary schools.

Nature of the Study

The study employed a basic qualitative research design to gain an in-depth understanding of the issue through firsthand accounts. This approach is effective for exploring how or why a particular phenomenon exists by allowing the researcher to gather perspectives from those with direct experience (Bazen et al., 2021). The design is also less time-consuming and supports the use of a relatively small but focused sample. Through individual interviews, I aimed to analyze teachers' perspectives to answer the RQs.

I analyzed teachers' perspectives on the benefits of PBL, the ease or difficulty when implementing PBL, and the professional support needed to implement PBL in Saipan. To understand teachers' views on PBL implementation, the study focused on the specific aspects of PBL that teachers believe contribute to enhanced student

learning, the challenges they experience while implementing PBL, and how these challenges manifest in the classroom. The analysis also examined how teachers define and recognize student engagement, how they assess performance within PBL, and the criteria they use in this process. In addition, the study explored the knowledge, skills, and support that teachers perceive as necessary to enhance their effectiveness in implementing PBL.

The data were collected through interviews that included a series of open-ended questions. I recorded the interviews to document the conversations and ensure the accuracy of the data. The target population consisted of 11 elementary school teachers in Saipan. I employed thematic analysis to identify, analyze, and interpret patterns within the qualitative data.

Definitions

The terms in this section are defined to clarify essential components of the study. These definitions are important in qualitative research because they help readers understand how specific technical terms are used within this study.

Active teachers: Active teachers are those who seek to make improvements and advancements in their instructional practice (Rechsteiner et al., 2022). Teachers were considered active in this study if they voluntarily participated in activities that promote student learning. Enthusiastic teachers are typically more open to adopting new instructional approaches.

Integrated approach: Caniglia et al. (2021) defined an integrated approach as a systematic method in which content learning is supported by drawing on multiple types of knowledge. Transformative change can occur when learners experiment with

different forms of knowledge and explore integrated, action-oriented learning experiences.

Professional learning communities (PLCs): According to Khasawneh et al. (2023), the goal of PLCs is to increase student achievement and promote teacher growth through collaborative instructional practices. Members share knowledge, provide feedback, and work together to make improvements in their classrooms.

Project-based learning (PBL): Harefa and Utami (2023) described PBL as an instructional approach that requires students to think, communicate, and develop solutions to problems encountered while designing and completing projects. PBL engages students in real-world problem-solving and incorporates collaboration, critical thinking, and the application of knowledge to produce meaningful outcomes.

Walk-throughs: Walk-throughs are short classroom visits, typically lasting five to ten minutes, during which administrators use a checklist to gather instructional data. Courtemanche (2022) defined walk-throughs as brief, unannounced visits used as an evaluation tool and as a strategy to support teacher collaboration and instructional improvement.

Assumptions

Assumptions are necessary in a research study, even though they cannot be proven true. The following assumptions were critical to the meaningfulness of this qualitative research. First, it was assumed that teachers in PBL classrooms take responsibility for facilitating students' learning. It was also assumed that students should ask questions rather than relying on others to do so, and they seek information without needing to be directed. Students are more proactive than reactive in their approach to learning, and proactive learners take responsibility for their education.

Furthermore, it was assumed that learners in a PBL classroom would be more proactive than reactive.

Another assumption was that PBL would cater to diverse student interests across a wide range of subjects. It was also assumed that integrating technology would support students in exploring ideas and developing skills in a PBL classroom (Al-Abdullatif & Gameil, 2021). Finally, it was assumed that learning centers are practical tools for teachers implementing PBL, as they enable students to manage their own pace and organize their time. The learning centers were designed to include engaging activities that support student-paced learning and contribute to the success of PBL implementation. Campbell and Francis (2024) found that PBL can engage students effectively when learning centers allow for self-selection and self-checking.

Scope and Delimitations

I investigated the elementary teachers' perspectives on the benefits of PBL, the ease or difficulty when implementing PBL, and the professional support needed to implement PBL in Saipan. To ensure a clear understanding of the research problem, the study examined several distinct angles, including the specific aspects of PBL that teachers believe contribute to enhanced student learning. Elements such as the challenges teachers experience during PBL implementation and how these challenges appear in the classroom helped provide a broader understanding of their perspectives. Additional factors included how teachers define and recognize student engagement within the context of PBL, how they assess student performance, and the criteria they consider in the evaluation process. Finally, identifying the knowledge, skills, and support teachers feel they need to implement PBL effectively was a key component of

the study. Together, these aspects provide a comprehensive framework for understanding the intricacies of teachers' perspectives on PBL implementation.

The study population consisted of 11 elementary school teachers from all grade levels within elementary schools in Saipan, a U.S. territory. Preservice teachers and teachers specializing in special education who work in the school district were excluded from this research. Additionally, factors such as the broader benefits of PBL, although related to the study topic, were not investigated in this study.

Transferability

The findings may be transferable to other educational levels where PBL is implemented. Schools that use PBL in different regions can apply these findings to examine PBL implementation within their own contexts (Cai et al., 2023; Çetin, 2020). Similar focus groups or interviews could be conducted with teachers in other regions, and this study can be applied to comparable sample contexts and populations.

Limitations

There are possible limitations to this study that were beyond my control. The three primary limitations are as follows. First, the study was limited by its sample size. The participants included 11 elementary school teachers from elementary schools in Saipan, and preservice teachers and special education teachers were not included in the data collection. Second, the personal perspectives of the teachers may have introduced response biases that I could not control. Third, the study was limited by a short data collection time frame. The interviews lasted approximately 45 minutes to 1 hour, and variations in how teachers responded may have been influenced by the available time for each interview.

Some steps were taken to address potential limitations, including reducing the possibility of selection bias. The sampling plan helped mitigate this concern by including teachers with varying levels of experience: novice teachers with 1–3 years of experience, mid-career teachers with 4–10 years of experience, and experienced teachers with more than 10 years of experience. The sample also included teachers who had specific training in PBL methods as well as those who did not, allowing for a broader range of perspectives.

Significance of the Study

The purpose of this qualitative study was to examine elementary teachers' perspectives on the benefits of PBL, the ease or difficulty when implementing PBL, the success of PBL implementation, and the professional support needed to implement PBL in Saipan. The findings provide insights into the successful implementation of PBL in elementary schools. The research examined the use of PBL in elementary school classrooms and suggested areas for further research to enhance its implementation in elementary settings.

This study may promote positive social change by contributing to the research literature with examples of elementary school classroom practices. It may also provide educational leaders with insights to better support the needs of elementary school teachers implementing PBL. As educational reforms continue to emphasize 21st-century learning, teachers will require guidance and support to implement PBL effectively and consistently. This study can offer information that helps administrators and teachers work together to strengthen and sustain PBL implementation.

Summary

In this study I examined elementary teachers' perspectives on the benefits of PBL, the ease or difficulty when implementing PBL, and the professional support needed to implement PBL in Saipan. Specifically, the study addressed how elementary school teachers describe the importance of using PBL, their perspectives on the ease of implementing it, and the challenges and support they believe are needed for effective implementation. Using a qualitative design, I interviewed 11 active teachers across all grade levels within elementary schools in Saipan. Preservice teachers and teachers specializing in special education were excluded from this research. The findings provide insights into how teachers perceive PBL implementation in elementary schools. Chapter 2 builds on this by examining existing literature on teachers' perceptions of PBL, including its impact on student learning, implementation challenges, assessment practices, and the support needed to strengthen its use in the classroom.

Chapter 2: Literature Review

The research problem addressed in this study was a lack of understanding of elementary teachers' practices in implementing PBL in Saipan. The purpose of this qualitative study was to examine elementary teachers' perspectives on the benefits of PBL, the ease or difficulty when implementing PBL, the success of PBL implementation, and the professional support needed to implement PBL in Saipan. In Chapter 2, I examine the aspects of PBL that teachers believe contribute to enhanced student learning, how they experience successes and challenges during implementation, and how these challenges appear in the classroom. It also explores how teachers define and recognize student engagement within PBL. In addition, understanding how teachers assess and evaluate student performance, as well as the criteria they use in this process, is a significant component of the study. Ultimately, this chapter highlights the knowledge, skills, and support that teachers perceive as necessary for effective PBL implementation.

As global industries continue to change rapidly, the demand for adaptable, creative, and critically minded individuals has never been greater. The modern workforce increasingly values employees who demonstrate problem-solving ability, innovation, collaboration, and strong communication skills—competencies that must be cultivated from an early age. Research indicates that when students are provided with meaningful and autonomous learning experiences, they can deepen their understanding and build long-term skills. Frameworks in higher education also highlight the importance of learner agency in competency development (Caniglia et al., 2021). PBL serves as a bridge between academic instruction and real-world

application by providing authentic opportunities for learners to collaborate, think critically, and take ownership of their education.

This chapter uses constructivist theory as the conceptual framework guiding the study. It also explains how the study benefits from this framework. In addition, the chapter provides a thorough literature review of the key variables and concepts, concluding with a summary of the major points.

Literature Search Strategy

The library databases and search engines I used for the literature review included Academic Search Complete, APA PsycINFO, ERIC, and Teacher Reference Center. I unchecked the full-text option to find indexed articles, although full-text may not be available. I checked the box that limits the results to peer-reviewed or scholarly journal articles. The key search terms and combinations of search terms were as follows: first, the search box was populated with *PBL*. "*Elementary"* or "*primary"* was entered in the second search box, while *math*science*ELA*social studies** were entered in the third. Other key search terms and combinations of search terms included *PBL* in the first search box, *achieve** in the second search box, and *success** or *outcomes* in the third box. To identify pertinent scholarship, the terms used were *project-based*, *achievement*, *success*, or *outcomes* in the ERIC database.

Additionally, there were two examples from ProQuest Central. In the first search, *21st-century skills* were in the first search box, while *PBL* was in the second search box. Second, the *Technology Acceptance Model* was in the first search box, while *PBL OR experiential learning* was in the second search box. The findings indicated that very little current research on PBL exists in elementary school settings. Therefore, while this review included resources focused on middle school and high

school levels, I noted this limitation in the literature review and recommended that future research explore PBL implementation in elementary school settings.

Conceptual Framework/Theoretical Foundation

Constructivist theory provided the framework for this study, as it asserts that learners construct knowledge rather than passively absorb information (Mitry, 2021). According to the theory, learners develop understanding through experience and social interaction, linking new information with their prior knowledge. Constructivism emphasizes that learners possess existing knowledge and experiences shaped by social and cultural influences. PBL aligns with this theory by allowing learners to actively engage in collaborative problem-solving, communication, and critical thinking.

Adopting constructivist theory as the conceptual framework for this study supported an investigation into how elementary school teachers perceive and implement PBL in their classrooms. As the foundation of the framework, it allowed the study to consider how cultural factors, social interactions, and community involvement may influence PBL implementation in elementary schools. The theory also provided a lens for identifying the factors that promote or hinder PBL integration and for considering potential recommendations to support its effective use.

Literature Review Related to Key Concepts and Variables

PBL is an instructional approach that involves students creating knowledge by working on meaningful projects and producing products with practical applications. According to Almulla (2020), the goal of PBL is to support learners not only in understanding and mastering academic content but also in developing skills necessary for success. Students engage in learning and applying their knowledge in an

interactive and engaging environment throughout the assignment (Almulla, 2020). As a result, students deepen their learning through comprehension and the application of various abilities, such as critical thinking, problem-solving, collaboration, and autonomy. Similarly, Belwal et al. (2020) noted that, beyond achieving planned learning outcomes, PBL often yields additional benefits, including improved thinking skills, teamwork, communication, and problem-solving abilities.

Researchers have established key elements that distinguish PBL from conventional teaching methods. PBL encourages students to conceptualize subjects and apply knowledge through real-world questions and challenges. A recent systematic review by Anggraeni et al. (2023) emphasized that "PBL significantly fosters creativity, collaboration, critical thinking, communication, concept understanding, innovative thinking, motivation, problem solving, and self-confidence" (p. 101334). Through inquiry and constructive investigation, students are motivated to complete authentic assignments. PBL is a learner-centered approach in which students are empowered and engaged.

Benefits of Using PBL in Classrooms

Understanding the benefits of using PBL is crucial in this study. A quantitative analysis of surveys, reports, and project plans by Viro et al. (2020) linked the use of PBL with improved revision and enhanced learning of new content among students. Approximately half of the teachers (52%) believed that PBL was appropriate for reviewing material, deepening students' knowledge of previously learned content, applying what they know, recalling earlier lessons, and providing a broader understanding of the subject. Many in-service teachers also agree that PBL is an effective approach for learning new concepts. Using questionnaires, observations, and

reviews, Anggraeni et al. (2023) found that PBL significantly fosters problem-solving, critical thinking, creativity, conceptual understanding, communication, innovation, motivation, and self-confidence. Similar findings were reported by Almulla (2020), who showed that PBL enhances student engagement by facilitating knowledge sharing, information exchange, and discussion.

The benefits of PBL extend beyond increased student engagement and contribute to positive learning outcomes. L. Zhang and Ma (2023) found that, compared to conventional teaching practices, PBL significantly improved students' learning outcomes and positively influenced academic achievement, affective attitudes, and thinking skills. Their study also showed that, from a geographical perspective, the effects of PBL in Asia—particularly in Southeast Asia—were significantly stronger than those in Western Europe and North America. There remains a need to examine the benefits of PBL implementation through qualitative approaches, as prior studies have primarily used quantitative designs. Additionally, much of the existing research has focused on regions such as Brazil and parts of Asia, with limited qualitative findings related to the benefits of PBL in Saipan. Therefore, a gap exists in understanding these benefits within the context of elementary schools in Saipan.

Susetyarini et al. (2022) investigated the effectiveness of using PBL for teachers and found that teachers use PBL to help students develop collaborative, critical thinking, creative thinking, and communication skills. PBL, particularly when integrated with STEM instruction, continues to demonstrate significant educational benefits that outweigh its challenges. Research shows that PBL encourages authentic problem-solving, creativity, and collaboration—skills essential for future academic

and professional success (Nguyen et al., 2024). Studies also highlight that PBL fosters deeper conceptual understanding by connecting knowledge to real-world contexts and allowing students to take ownership of their learning (L. Zhang & Ma, 2023). When applied within STEM frameworks, PBL supports content mastery as well as innovation and technological literacy, helping students engage more meaningfully with complex, interdisciplinary problems (Albar & Southcott, 2021).

A different assessment revealed that PBL may have similar or even less favorable outcomes when compared to traditional models. Ferrero et al. (2021) conducted a systematic review examining the effectiveness of student-centered PBL on academic achievement in K–5 settings and found mixed results among 722 students across eleven studies. In contrast, Nguyen et al. (2024) reported that students in PBL classrooms demonstrated significantly higher learning outcomes than those in traditional classrooms. They suggested that this advantage stemmed from PBL's emphasis on student interaction with real-world challenges that encourage deeper investigation in collaborative, team-based environments. Albar and Southcott (2021) also compared graduate students in traditional education programs to those in PBL programs and found that students in PBL contexts demonstrated improved creative thinking, particularly in fluency and flexibility. Despite these variations, the broader body of research suggests that, when effectively implemented, PBL can enhance student learning outcomes and support the development of 21st-century competencies (Caniglia et al., 2021).

The findings of Viro et al. (2020) examined PBL activities in fifth-grade science and found that although project-based initiatives significantly improved students' science achievement, their attitudes toward science did not change. Ngereja

et al. (2020) investigated whether adopting PBL activities enhanced students' learning experiences and found that incorporating project-based assignments positively affected student learning, motivation, and performance in both the short and long term. Susetyarini et al. (2022) reported that PBL enhances students' problem-solving, creative thinking, and communication skills in higher education settings, especially when paired with STEM instruction. Similarly, Albar and Southcott (2021) found that PBL activities led to significant gains in creative thinking behaviors. Collectively, this evidence highlights strong benefits of PBL implementation; however, a need remains for qualitative research that explores teachers' perspectives on PBL implementation, as most existing studies rely on quantitative designs.

Clayton (2023) conducted a quantitative, causal-comparative study to compare the effects of PBL and traditional learning methods on the academic performance of fifth graders. The results showed no significant differences between the experimental and control groups on posttest achievement scores. Razak et al. (2022) found that PBL enhances critical thinking by supporting collaborative, self-directed, and engaged learning activities. However, their findings also indicated that while PBL improves critical thinking, it does not significantly increase overall student engagement compared to non-PBL units.

The review of previous literature revealed that the research findings on the effectiveness of PBL are not consistent, and few studies have systematically examined factors such as optimal group size, class size, curriculum type, or subject area. Much of the existing research consists of empirical studies comparing PBL with traditional teaching using experimental or quasi-experimental designs. Although these studies quantified the benefits of PBL on student learning outcomes, there remains a

need to understand how teachers perceive the implementation of PBL in their own classrooms. Therefore, this study sought to explore teachers' perspectives on implementing PBL within the target area.

A common belief in the literature is that PBL enhances student learning outcomes, including academic achievement, improved thinking skills, and increased motivation. Ariza and Olatunde-Aiyedun (2023) investigated the feasibility of strengthening energy literacy among higher education students using a PBL approach through a case study on developing the electric vehicle EOLO. Their findings showed that students exposed to the PBL curriculum demonstrated stronger engagement, experienced meaningful and situated learning through real-world problems related to renewable energies, and showed increased motivation and improved peer collaboration. The study also revealed that students in PBL settings outperformed those taught with conventional methods in terms of energy-related attitudes, beliefs, behaviors, and knowledge. Similarly, a scoping review by Razak et al. (2022) found that PBL is a key instructional approach for fostering lifelong learning and developing abilities such as creative thinking, collaboration, and communicating.

While the study by Ariza and Olatunde-Aiyedun (2023) adopted a quasi-experimental design, the use of this method made the research more susceptible to confounding variables that could influence the relationship between the independent and dependent variables. Without random assignment, quasi-experimental designs have limited ability to establish causation, and the lack of randomization makes it difficult to rule out alternative explanations for the observed effects. Additionally, because the study was conducted at the secondary school level, its findings cannot be generalized to elementary school settings. Although the researchers examined the

impact of PBL on promoting energy literacy among secondary students, this focus does not align with the scope of the present study, which examines elementary teachers' perspectives on PBL implementation within the target area.

Challenges Affecting PBL Implementation

While PBL has many positive impacts, teachers often face challenges when implementing it in their classrooms. Rees Lewis et al. (2019) found that instructors struggled with sourcing appropriate materials, balancing program requirements with student needs, and finding sufficient preparation time. However, their study was conducted in an undergraduate engineering design program over three years, which limits the generalizability of the findings and makes it difficult to apply the results to K–12 or elementary school settings.

Several literature reviews highlight challenges associated with implementing PBL, adding to the existing body of knowledge. Vasiliene-Vasiliauskiene et al. (2020) found that teachers required additional time to implement PBL, and that the approach sometimes conflicted with deep-seated beliefs about their teaching practices. The researchers also noted that teachers struggled to develop a classroom culture that supports teamwork and to adjust to the facilitative role required in PBL.

Nonetheless, the article is a review of existing literature and therefore serves as a secondary source of information; this limits the depth and context compare to what primary research can provide (Vasiliene-Vasiliauskiene et al., 2020). Although previous studies have examined the quantity of PBL professional development hours, the present study focused on understanding teachers' perceptions and experiences with implementing PBL in Saipan. Literature reviews may also capture only select

aspects of recent developments and may overlook emerging trends that could influence current findings.

Ease of PBL Implementation

Research consistently shows that experience, resources, and contextual factors influence teachers' perceptions of the ease of implementing PBL. Cai et al. (2023) reported that teachers with 6–10 years of experience generally exhibit more positive attitudes toward PBL, whereas veteran teachers with over 20 years of service often perceive greater challenges. This may be due to veteran educators' familiarity with traditional methods and reluctance to adopt new pedagogical approaches. This finding is echoed by Anggraeni et al. (2023), who identified resistance to change as a barrier to PBL adoption. Additionally, technological adaptation difficulties have been noted as significant factors influencing teachers' readiness to implement PBL effectively. However, brief coursework alone seldom shifts preservice teachers' beliefs or confidence in using technology in lasting ways (Park & Ertmer, 2007).

In addition to experience, educational background and subject specialization also influence teachers' attitudes toward implementing PBL. Cai et al. (2023) found that differences in formal education and teaching domains shape how easily teachers integrate PBL into their curricula. This aligns with findings from Almulla (2020), who emphasized that knowledge-sharing and collaborative discussions foster more favorable perceptions of PBL. Public–private partnerships, resistance to change, and inequities in resources have also been identified as critical factors that affect PBL implementation, as researchers suggest these elements strongly correlate with successful PBL implementation (Amiri, 2025).

However, these studies primarily focus on contexts such as China or higher education, raising questions about their applicability to other regions like Saipan, where demographic, socioeconomic, and policy differences may influence outcomes (Nguyen et al., 2024). Localized research is essential to understand how factors such as global learning, cultural competency, and quality assessment of PBL uniquely affect PBL adoption in diverse educational settings (Judijanto, 2021; Xia, 2025).

Overall, the literature converges on the idea that while teacher experience and attitudes play pivotal roles in the perceived ease of PBL implementation, success also depends heavily on systemic supports such as professional development, access to resources, and cultural readiness. This underscores the ongoing need for context-specific studies to tailor PBL strategies effectively across diverse educational environments.

Positive Impact on Student Achievement

Findings from studies examining Çakici's work on PBL activities in fifth-grade science revealed that although project-based initiatives significantly improved students' science achievement, their attitudes toward science did not change (Bendlage, 2021; Bielik et al., 2022; L. Zhang & Ma, 2023). Some results also indicated that students were less motivated to adopt new learning methods such as PBL. In contrast, Bielik et al. (2022) found that implementing PBL successfully supported the integration of NGSS learning goals, as reported by students and observed by teachers.

Marsiti et al. (2023) conducted a quasi-experimental study using a pretest–posttest design with a 2×2 factorial model to examine the effects of PBL and traditional learning methods on students' learning achievement. The study involved

60 eleventh-grade students. The results showed significant differences in achievement between students taught through project-based blended learning and those taught through conventional methods. The findings indicated that project-based blended learning was effective in increasing student achievement. In addition, there was an interaction effect between PBL and creativity on student achievement. Differences were observed among students with high creativity in both the experimental and control groups, as well as among students with low creativity across the two groups.

Almulla (2020) employed a correlational analytic approach to examine whether critical thinking contributes to improvements in students' problem-solving skills and academic performance. The findings indicated that creativity and critical thinking significantly influence problem-solving and positively affect students' learning outcomes. However, there is growing recognition that the impact of PBL on teaching effectiveness and student outcomes is not consistently determined across studies. Recent reviews have also noted a lack of systematic investigation into critical variables such as optimal group size, class size, curriculum design, classroom culture, and subject area in PBL implementation (Nguyen et al., 2024).

Although many prior studies have used experimental and quasi-experimental designs to quantify the benefits of PBL on student learning outcomes, the present study focuses on exploring teachers' perspectives on PBL implementation within the target context. It is widely believed that PBL enhances learning engagement, motivation, critical thinking, creative thinking, problem-solving, and academic achievement (Almulla, 2020; Nguyen et al., 2024; Razak et al., 2022). For example, a meta-analysis by W. Zhang et al. (2024) found that PBL significantly improved K–12 students' collaboration, critical thinking, and problem-solving compared to traditional

teaching methods. However, as with all quasi-experimental designs, these findings may be influenced by confounding variables, which limit the ability to establish definitive causal relationships compared to randomized controlled trials.

The lack of randomization in many studies makes it difficult to rule out alternative explanations for observed effects, limiting the strength of causal inferences. Additionally, findings from secondary school research often cannot be generalized to elementary school contexts. For example, Nguyen et al. (2024) examined the impact of PBL on energy literacy among secondary students, but their focus differs from the current study's emphasis on elementary teachers' perspectives on PBL implementation in the target area.

While PBL has demonstrated positive impacts on student outcomes (Rizal et al., 2023), some educators continue to face significant challenges when adopting it in their classrooms. Rees Lewis et al. (2019) found that instructors often require support to monitor student progress, develop project teams, and coordinate efforts among co-instructors, clients, and students. However, the study's reliance on interview data raises concerns about potential interviewer bias, which may influence participants' responses (Lim, 2025; Rees Lewis et al., 2019). Additionally, the small sample of 47 university instructors limits the generalizability of the findings, particularly for elementary school contexts.

Several literature reviews highlight persistent challenges in PBL implementation. For example, Aidoo (2023) found that teachers encountered difficulties such as limited time allocation and conflicting beliefs, particularly when PBL challenged deeply rooted pedagogical practices. Similarly, Haatainen et al. (2021) and Aidoo (2023) noted that teachers often struggle to foster classroom

teamwork cultures and to transition into the facilitative role required in PBL. However, these reviews serve primarily as secondary sources and may lack the depth and contextual understanding that primary empirical research provides. They may also overlook emerging trends or recent studies that could influence current conclusions.

An analysis of the literature regarding the ease of PBL implementation underscores continued gaps in understanding, particularly related to elementary school teachers' perspectives on PBL adoption. More targeted, context-specific research is needed to address these gaps and to inform effective support strategies.

Resource Availability and Constraints of PBL Implementation

The availability of resources remains a critical factor influencing the successful implementation of PBL (Aidoo, 2023). Using an inductive approach, Aidoo (2023) conducted a longitudinal case study exploring teacher educators' experiences with PBL in their classrooms. The findings indicated that PBL, when combined with complementary instructional strategies, enhances students' practical skills and promotes self-directed learning. However, teachers also noted that available resources were insufficient, particularly given large class sizes. Because these results are limited to higher education settings, further investigation is needed to examine PBL implementation at the elementary level. Consequently, this study aimed to gain a deeper understanding of elementary teachers' perspectives on PBL.

Perceptions of PBL Implementation

Teachers' willingness to adopt and utilize PBL in elementary classrooms can be informed by current research on factors influencing the ease of PBL implementation. Cai et al. (2023) surveyed elementary teachers and found that those

with 6–10 years of teaching experience exhibited the most positive attitudes toward the ease of implementing PBL, whereas teachers with over 20 years of experience expressed more skepticism. This difference may stem from veteran teachers' extensive exposure to educational reforms and possible resistance to integrating new technologies. Supporting this, Aldabbus (2018) found that more than 75% of teachers were unable to implement PBL for their students. The challenges identified as significant barriers affecting teachers' perceptions of PBL were selecting the content selection, time management, assessment, and limited resources (Aldabbus, 2018).

A recent meta-analysis by Cai et al. (2023) revealed that access to adequate resources, strong social support networks, and sufficient time allocation are essential factors that positively influence teachers' perceptions of the ease of implementing PBL. While these findings provide valuable insights, they may not fully apply to contexts such as Saipan, where demographic factors—including education levels and socioeconomic conditions—differ significantly from those in China. Additionally, variations in educational policies and legal frameworks highlight the need for localized data collection and analysis to more accurately evaluate the challenges of implementing PBL in Saipan.

Support Needed to Implement PBL

Successful implementation of PBL requires strong support in both teacher skills and resources. Al-Busaidi and Al-Seyabi (2021) found that professional development helped prepare student teachers to design and implement PBL effectively, although challenges remained in certain areas. Similarly, Farrow et al. (2022) reported that teachers with prior PBL training were more confident and effective in using PBL strategies. Although these studies focus on secondary and

general teacher education, their findings suggest that elementary school teachers also require targeted professional development to integrate PBL effectively—a gap that the present study seeks to address.

Meng et al. (2023) found that many teachers recognized the importance of having time to collaborate as a crucial support structure for PBL implementation and identified cooperation as essential for successful adoption of the approach. Professional development designed to support effective PBL implementation must therefore reflect that teachers do not simply need instruction on how to use PBL; they also require dedicated collaboration and work time as part of their training. Although previous studies have examined PBL-related professional development in various ways, the present study aimed to explore elementary school teachers' perspectives regarding the implementation of PBL in Saipan.

Summary and Conclusions

The major themes in the literature include teachers' perspectives on the ease of implementing PBL, the benefits of PBL, challenges affecting PBL implementation, and the support needed to implement PBL successfully. Prior research describes PBL as an instructional approach that helps equip learners with 21st-century skills. The literature suggests that through PBL, students develop critical thinking, collaboration, communication, and problem-solving abilities (Almulla, 2020; Marsiti et al., 2023).

PBL has also been shown to foster a collaborative culture among students, although its success depends heavily on teachers' experience and familiarity with the approach. Several studies indicate that limited access to resources and insufficient professional development can hinder effective implementation. Additionally, more experienced teachers have sometimes reported negative perceptions of PBL, often due

to the demands of adopting new teaching methods. While existing research provides valuable insights into teachers' perceptions of PBL, there remains a clear need for further investigation into current perceptions of PBL implementation, particularly among elementary school teachers.

Chapter 3: Research Method

The purpose of this qualitative study was to examine elementary teachers' perspectives on the benefits of PBL, the ease or difficulty when implementing PBL, the success of PBL implementation, and the professional support needed to implement PBL in Saipan. Chapter 3 was organized into several sections, beginning with the research design and rationale, which outlined the foundational approach of the study. This chapter also described the role of the researcher and the methodology used, including participant selection, instrumentation, recruitment, participation, and data collection procedures. In addition, the chapter presented the data analysis plan, discussed strategies for ensuring trustworthiness, outlined ethical considerations, and explained how the data were handled. A summary concluded the chapter.

Research Design and Rationale

In this study, I sought to answer these questions:

RQ1: How do elementary school teachers describe the importance of using PBL in their teaching?

RQ2: How do elementary school teachers describe their perspectives on the ease of using PBL in their teaching?

RQ3: How do elementary school teachers describe their successes in implementing PBL?

RQ4: How do elementary school teachers describe the support they need to implement PBL?

In this research, I investigated elementary school teachers' perspectives on the implementation of PBL in Saipan. Addressing the RQs provided insight into teachers' views on the use of PBL in the classroom, the ease of implementing PBL, the

successes they experienced, and the support they believed was necessary for effective implementation. Teachers' perceptions of PBL were shaped by their experiences and exposure to the approach. PBL is a 21st-century instructional model intended to promote meaningful learning by engaging students in solving real-life problems (P. Guo et al., 2020). Exploring teachers' perspectives on PBL offered an important understanding of how the approach was implemented and perceived in practice.

To answer the RQs, I used a basic qualitative research design. This design was appropriate because the study focused on understanding participants' experiences and perceptions rather than measuring variables or testing hypotheses. Within the context of this study, a basic qualitative design allowed for the collection of rich, descriptive data from teachers as they engaged in and reflected on PBL implementation. Although the study aligned with the broader qualitative tradition of examining lived experiences, it is distinct from phenomenology; rather than aiming to uncover the essence of a shared experience, the study focused on teachers' descriptions and interpretations of PBL in their own classrooms.

Role of the Researcher

In this study I served as the primary data collector. My role included developing interview questions and conducting interviews with participants. Respondents were asked open-ended questions related to the research topic, and I recorded their responses while also noting relevant observations. These interview records were essential for the subsequent coding and analysis (Panasan & Nuangchalerm, 2010).

In this research, I had professional interactions with some teachers; however, I did not hold any supervisory or authoritative roles over the participants. To mitigate

potential researcher bias, I practiced bracketing by acknowledging and setting aside any preconceived assumptions or beliefs that could influence the study. Documenting these reflections helped maintain objectivity during the data analysis process. I also engaged in continual reflexivity by frequently examining my positionality, experiences, and potential biases throughout the research process.

During the informed consent process, I clearly explained the purpose and procedures of the study and ensured that each teacher understood that participation was voluntary and that they could withdraw at any time without penalty. Throughout the study, I maintained open and transparent communication with participants. The scope of the study was limited to public and private elementary schools in Saipan, and all procedures were aligned with ethical research guidelines. As a token of appreciation, participating teachers received a $20 gift card. No power differentials or conflicts of interest were present between me and the participants.

Methodology

A basic qualitative research design was used to explore elementary school teachers' perspectives on PBL implementation. This approach was appropriate because it allowed an in-depth examination of teachers' experiences and perceptions, generating rich descriptive data that could not be captured through quantitative methods (Nassaji, 2020). Using a semistructured interview protocol, I explored teachers' perspectives on the benefits of PBL, the ease or difficulty when implementing PBL, and the professional support needed to implement PBL in Saipan. The basic qualitative design was well suited for this study's aim, as it enabled a detailed understanding of teachers' interpretations of PBL in practice and provided

insight into teachers' interpretations of how implementation of PBL in elementary schools.

Participant Selection

This qualitative study was conducted in Saipan elementary schools. The target population consisted of elementary school teachers in Saipan. Purposive sampling was used to select participants who met the criteria relevant to the research objectives (Campbell et al., 2020). Purposive sampling was appropriate because the study required teachers who had experience with or exposure to PBL and could provide meaningful insights into its implementation. Teachers were invited to participate as long as they met the established criteria.

The sampling criteria were developed to ensure variation in teaching experience, educational background, and familiarity with PBL. Participants included novice teachers with 1–3 years of experience, mid-career teachers with 4–10 years of experience, and experienced teachers with more than 10 years of experience. Teachers with formal training in PBL, as well as those without such training, were included to examine how educational background shaped perceptions of PBL implementation.

A total of 11 teachers participated in the study. All participants taught in K–5 settings and met the selection criteria. To recruit participants, I contacted principals and teachers through emails and phone calls to identify individuals who had used or were familiar with PBL and were willing to participate. Teachers who volunteered and met the criteria were included until the target number was reached. The final sample reflected diversity in grade level and gender.

Instrumentation

Interviews served as the sole data source for this study. Semistructured interview protocol was used to guide each session and ensure that questions aligned with the four RQs. The semistructured format allowed flexibility to ask follow-up questions and probe for clarification when needed. Each interview lasted approximately 45-60 minutes and was conducted at an elementary school site during school hours, based on participant availability. Interview locations were arranged by participants.

The interview protocol included a series of open-ended questions designed to explore teachers' perspectives on the importance of using PBL, the ease of implementing it, the successes they experienced, and the support they believed was necessary for effective implementation. Probing questions were used to encourage deeper reflection and obtain richer descriptions. The protocol was designed to collect data aligned directly with the RQs.

Although video recording could have captured nonverbal cues, it was more time-consuming to analyze and was not necessary for the purposes of this study. Instead, consistent with qualitative research recommendations, I used audio recordings and notes to document participants' responses (Mwita, 2022). Audio recordings allowed for accurate transcription and supported the coding and analysis process. The information gathered through these interviews was essential for understanding teachers' perspectives on PBL implementation and for identifying challenges, successes, and contextual factors influencing their experiences.

Procedures for Recruitment, Participation, and Data Collection

Before recruitment began, site approval was obtained to ensure that the study adhered to institutional policies and ethical standards (White et al., 2021). After

approval, teachers who met the inclusion criteria were invited to participate. Purposive sampling was used to ensure variation in teaching experience, educational background, and familiarity with PBL. Although demographic diversity was welcomed, race or ethnicity was not used as a selection criterion.

Potential participants were contacted by email to introduce the purpose of the study and schedule an interview. No definitions or explanations of PBL were provided prior to or during recruitment, as the study aimed to capture teachers' existing perspectives. Once teachers agreed to participate, interviews were scheduled at times convenient for them.

Data collection took place in Saipan, where each interview lasted 45-60 minutes and was audio-recorded with the participant's consent. At the end of each interview, a debriefing was conducted to address any questions, clarify the purpose of the study, and ensure that participants felt comfortable with the process. Debriefing occurred either in person, by phone, or through Zoom, depending on the participant's preference.

Following the interview, participants were thanked for their contribution and informed that a summary of the study's results would be available to them upon completion. Participants were also reminded that they could contact me with any questions or concerns after their involvement in the study. No follow-up interviews were required, and participation concluded once the interview and debriefing had been completed.

Data Analysis Plan

The data analysis process was designed to ensure a clear connection between the interview data and the RQs. Semistructured interviews served as the primary data

source and provided detailed descriptions, reflections, and insights into teachers' perspectives on PBL implementation. The analysis followed a systematic plan that included transcription, data organization, and thematic analysis. I used Braun and Clarke's (2022) six-phase thematic analysis approach to identify recurring patterns and themes within the data.

Data Preparation

The first step involved preparing the data for analysis. All audio-recorded interviews were transcribed verbatim to capture participants' words accurately (Busetto et al., 2020). I reviewed each transcript while listening to the recordings to ensure accuracy and completeness. Minor verbal cues, such as pauses or notable changes in tone were noted when they contributed meaningfully to the interpretation of participants' responses.

After transcription, the data were cleaned and organized. Data cleaning involved reviewing transcripts for typographical errors, removing irrelevant content, and anonymizing identifying information to protect participant confidentiality. Organizing the transcripts into a consistent format ensured that the data were ready for coding and further analysis (Saldaña, 2021).

Once the data were prepared, the transcripts were read multiple times to support immersion in the dataset. This step allowed me to become familiar with emerging ideas and patterns before beginning formal coding.

Member Checking

To enhance the credibility of the findings, I conducted member checking by providing participants with summaries of their interview content to confirm accuracy. Participants were invited to confirm the accuracy of their transcripts (Motulsky,

2021). This process supported the accuracy of the data and contributed to the study's overall trustworthiness.

Thematic Analysis

I conducted a thematic analysis of the interview transcripts to identify common ideas and patterns across teachers' descriptions of PBL implementation. The analysis followed an inductive approach, allowing themes to emerge directly from the participants' responses rather than being shaped by predetermined categories. To guide the process, I applied the six steps of thematic analysis developed by Braun and Clarke (2022). These steps provided a structured and systematic way to engage with the data and supported the identification of recurring concepts and themes that reflected the teachers' perspectives and experiences.

Phase 1: Familiarization. According to Braun and Clarke (2022), familiarization involves immersing oneself in the data to begin recognizing patterns and meaningful ideas. During this phase, I read and reread the interview transcripts to gain a comprehensive understanding of the content. The process included transcribing the audio recordings, reviewing the transcripts carefully, taking initial notes, and examining the data as a whole to become closely acquainted with teachers' responses. This step enabled me to develop an overall sense of the data and prepared me for generating initial codes and identifying potential themes.

Phase 2: Coding. Coding was the second step of the thematic analysis process. During this phase, I highlighted meaningful sections of the transcripts—such as sentences, short phrases, or notable expressions—to generate initial codes that captured the essence of teachers' responses. For example, interview excerpts in which participants stated "not sure" or "I do not know why or how" were coded as

uncertainty. These codes reflected participants' direct language and represent a form of *in vivo* coding. As Saldaña (2021) explained, *in vivo* coding is appropriate during early stages of analysis because it preserves participants' exact words and supports a deeper understanding of their perspectives.

In addition to *in vivo* coding, I used descriptive coding to group similar segments of data into broader categories as patterns began to emerge. Braun and Clarke (2022) noted that coding can occur at a semantic level, focusing on explicit meanings, or at a latent level, focusing on underlying ideas. In this study, coding remained primarily semantic and inductive, emphasizing the teachers' expressed experiences and viewpoints. The coding process served as a foundation for identifying connections among the data that later informed theme development.

Phase 3: Generating Themes. After completing the coding process, I examined the codes to identify patterns and began developing potential themes. Coding produced analytic building blocks that were then organized into broader categories known as themes (Braun & Clarke, 2022). According to Braun and Clarke (2022), themes do not simply exist in the data waiting to be discovered; instead, they must be generated through active engagement with the coded material. Developing themes required analytical work that involved reviewing how codes related to one another and how they aligned with the researcher's interpretations and assumptions.

During this phase, I organized related codes together to form preliminary themes. For example, codes related to uncertainty, alternative explanations, and references to outside experts were examined together and grouped under the broader theme of uncertainty. Some codes were strong enough to stand alone as themes, while others were too broad, vague, or irrelevant, and were therefore set aside. These

decisions were guided by the need to create themes that were meaningful, coherent, and useful for addressing RQs.

Phase 4: Reviewing Themes. In this step, I reviewed the preliminary themes to ensure that they accurately represented the data. Because thematic analysis is theoretically flexible, the researcher's subjectivity is acknowledged as part of the analytical process and may influence how themes are interpreted and refined (Braun & Clarke, 2022). During this phase, I compared each theme against the entire dataset to check for consistency, completeness, and alignment with the coded material. This review helped identify any missing elements, overlaps, or inconsistencies. When issues arose, I refined the themes by splitting, discarding, combining, or adjusting them to improve their clarity, coherence, and relevance to the RQs.

Phase 5: Defining and Naming Themes. This step involved defining and naming the final themes. Braun and Clarke (2022) explained that themes are patterns of shared meaning that are supported by a central concept, and this idea guided the way I defined and labeled the themes in this study. Defining each theme required clearly describing what the theme represented and explaining how it contributed to understanding the data. When naming the themes, I selected concise and understandable labels that reflected the core idea of each theme and captured the meaning conveyed by the coded data.

Phase 6: Writing Results. In the final phase, I organized and wrote the research findings. I began by introducing the RQ and explaining the overall approach to the analysis. I also restated key aspects of the methodology, including how the data were collected and how the thematic analysis was conducted. In presenting the results, I addressed each theme individually and described how it was represented in

the data. I explained what each theme meant and included illustrative excerpts from the interview transcripts to support the interpretations. The conclusion of the analysis explained how the themes answered the RQ, summarized the main findings, and showed how the thematic analysis process aligned with the purpose of the study. Braun and Clarke (2022) emphasized that high-quality reflexive thematic analysis depends not only on procedural rigor but also on thoughtful engagement with the data and continual reflection on the researcher's role. The write-up reflected these principles by providing a transparent explanation of how I worked with and interpreted the data throughout the analysis process.

Trustworthiness

Trustworthiness is an essential component of qualitative research and is tied to the rigor of the research procedures used. Trustworthiness is commonly evaluated through four criteria: credibility, transferability, dependability, and confirmability (Stahl & King, 2020). In this study, several steps were taken to support these criteria. An interview protocol was used consistently during all individual interviews to promote credibility and ensure that data collection procedures were applied uniformly. Member checking was also used to enhance credibility by allowing participants to review and clarify interpretations of their responses. In addition, analytic triangulation contributed to strengthening credibility, dependability, and confirmability by requiring comparisons across different participants' responses and analytic steps. These procedures helped ensure that the findings were grounded in the data and accurately represented the perspectives of the participating teachers.

After using the interview protocol during data collection, I conducted member checking to enhance the credibility of the findings. Each participant received a copy of their interview transcript by email and was invited to review it for accuracy. The email explained that if no response was received within two weeks, the transcript would be considered accurate. Any feedback provided by participants was used to make corrections and ensure that their perspectives were represented clearly.

To support transferability, I provided detailed descriptions of the study setting and the characteristics of the participating teachers. This level of detail allows readers to determine whether the findings may be applicable to other similar contexts. Eleven teachers were willing to participate and had experience with or exposure to PBL were selected from public and private elementary schools in Saipan. All participants were general classroom teachers working in grades K–5. The findings of this study may be transferable to other elementary school settings that share similar characteristics in terms of teacher roles, school environment, and instructional practices.

Lastly, to ensure the confirmability of the study's findings, I took steps to reduce the influence of my own assumptions and perspectives on the analysis. I maintained an audit trail throughout the research process, which included detailed documentation of the RQs, data collection procedures, coding decisions, analytic steps, and the development of themes. Keeping thorough records helped demonstrate that the findings were grounded in the data rather than in researcher bias and supported the transparency and integrity of the study's methodological decisions.

Ethical Procedures

Informed consent is the first step in the ethical procedures for conducting research. Alhabsi (2024) emphasized that researchers must obtain informed consent

before beginning a study. Before data collection began, teachers were informed about the voluntary nature of the study, their rights as participants, and the confidentiality of their information. An informed consent form was provided to each teacher. Each participant received a unique code rather than being identified by name. Teachers were fully informed about the purpose of the study, its procedures, and any possible risks and benefits before signing the informed consent form. Participation was voluntary, and teachers were free to withdraw from the study at any time without penalty. A copy of the informed consent form is included in Appendix A.

Confidentiality is an essential ethical concern because breaches can compromise the integrity of the research process (Hwang & Kang, 2023; Taquette & Borges da Matta Souza, 2022). To ensure the confidentiality of the teachers, I protected all identifiable information, including names and contact details (Hwang & Kang, 2023; Taquette & Borges da Matta Souza, 2022). Each participant was assigned a code instead of using real names. I also protected teacher privacy by limiting access to the data to authorized individuals only. All data were stored on a password-protected laptop in a secure location. Before reporting any findings, the data were de-identified to remove personal information. Consistent with Nii Laryeafio and Ogbewe (2023), researchers must uphold key ethical principles, including protecting participants' anonymity, ensuring voluntary participation, maintaining confidentiality, and preventing misuse of study results.

The relationship between the researcher and the teachers is another important ethical consideration. Building a positive research participant relationship is essential because it promotes trust and respect, which are necessary for collecting high-quality data (Ortega, 2024). I treated all participating teachers with respect and dignity

throughout the study. Informed consent was obtained only after teachers were fully informed about the study's purpose and procedures. I followed the data collection plan and scheduled interviews at times that were convenient for the teachers. I respected their privacy by keeping all data confidential. Throughout the study, I maintained honesty and transparency in my communication to support a trustworthy professional relationship.

Regarding ethical concerns and the protection of teachers, information about the study was emailed to them before data collection began. The teachers were informed about their rights, the confidentiality of their information, and the protections in place to prevent harm. Before the interviews were conducted, each participant received an email explaining the study details, as outlined in Appendix A. Each participant was assigned an individual code to ensure anonymity. Interview locations were kept confidential to further protect participants from being identified.

Treatment of Data

I conducted interviews to gather data for the study. The interviews took place in scheduled, private settings to ensure comfort and confidentiality. Each interview was audio-recorded using a passcode-protected cell phone. After each interview, the audio files were transferred to a password-protected laptop for secure storage. The teachers were able to share their views in a safe and relaxed environment; therefore the length of the interviews varied. Throughout the research process, I remained committed to safeguarding the confidentiality of all interview data.

To maintain confidentiality, I assigned a code to each interview recording and transcript. After each recording, the interview questions and responses were typed and organized. Once the transcripts were checked for accuracy, the original audio

recordings were deleted in accordance with institutional guidelines. The cleaned and deidentified transcripts and notes were stored securely and will be retained only as long as needed for verification. These steps reflect the importance of limiting access to data, removing identifying information, and carefully managing stored materials to protect participants' privacy (Nii Laryeafio & Ogbewe, 2023).

In this study, there was no conflict of interest or power differential. I did not interview teachers within my own work environment, and there was no intention to do so. To show appreciation for their time, incentives were provided to the teachers who participated in the interviews. Throughout the research process, I ensured that ethical practices were upheld at all times.

Summary

The purpose of this qualitative study was to examine elementary teachers' perspectives on the benefits of PBL, the ease or difficulty when implementing PBL, the success of PBL implementation, and the professional support needed to implement PBL in Saipan. A qualitative research design was used to examine the themes that emerged from the interviews. As the primary researcher, I conducted semistructured interviews using open-ended questions to guide the discussion and collect data. The data were analyzed using an inductive thematic analysis process, beginning with in vivo coding and continuing through theme development and review. Measures such as member checking were used to support the trustworthiness of the findings. Teachers were selected from Saipan using a purposive sampling approach, and steps were taken throughout the study to reduce bias and strengthen credibility. In addition, ethical procedures were implemented to ensure that the study complied with IRB requirements. This chapter outlined the role of the researcher and

described the research methodology and design, participant selection process, data collection procedures, and data analysis steps.

ChatGPT was used only to assist with brainstorming ideas, refining wording, and ensuring alignment with APA 7th-edition guidelines. The tool also provided suggestions that helped improve the clarity and organization of tables.

In Chapter 4, I will present the data collected from individual interviews. I will also describe the data analysis process and outline the findings that emerged from the analysis. In addition to reporting the results, this chapter will address evidence of trustworthiness demonstrated throughout the research process.

Chapter 4: Results

The purpose of this qualitative study was to examine elementary teachers' perspectives on the benefits of PBL, the ease or difficulty when implementing PBL, the success of PBL implementation, and the professional support needed to implement PBL in Saipan. Through a systematic analysis of interview data and by applying the six phases of thematic analysis, I identified final themes. In this chapter I present the results of data analysis, including the development of themes and the findings that emerged from teachers' perspectives.

Research Questions

RQ1: How do elementary school teachers describe the importance of using PBL in their teaching?

RQ2: How do elementary school teachers describe their perspectives on the ease of using PBL in their teaching?

RQ3: How do elementary school teachers describe their successes in implementing PBL?

RQ4: How do elementary school teachers describe the support they need to implement PBL?

This chapter presents the findings derived from the data collected through individual interviews. The results are organized into thematic categories aligned with the study's RQs. To provide a clear and comprehensive analysis, this chapter is organized into the following sections: the setting, data analysis procedures, results, evidence of trustworthiness, and a summary.

Setting

The interviews were conducted in elementary school settings in Saipan. The findings indicated that no personal or organizational circumstances were reported that influenced teachers' participation or experiences during the study period. This suggests that external factors did not affect the interpretation of the results. Table 1 presents the demographic characteristics of the teachers, showing diversity across several attributes. The variation in teaching experience, grade levels taught, use of PBL, and ethnic backgrounds indicates that selection bias was minimal in the recruitment process.

Table 1

Demographic Characteristics of Interviewees

Characteristic	Category	n	%
Years of teaching experience	1–10 years	2	18
	More than 10 years	9	82
Grade level taught	K–2nd grade	6	55
	3rd–5th grade	5	45
Years of using PBL	0 years	2	18
	1–2 years	6	55
	More than 2 years	3	27
Subjects using PBL	All subjects	3	27
	One or two subjects	8	73
Class size while using PBL	0–14 students	5	45
	15 or more students	6	55
Ethnicity	Filipino	2	18
	Chamorro	6	55
	Chinese	1	9
	Palauan	1	9
	Other	1	9

Note. N = number of interviewees. Percentages may not sum to 100 due to rounding.

Table 1 demonstrates the diversity of participants across teaching experience, grade levels, PBL experience, and cultural backgrounds. Following this demographic

overview, the next section offers additional details about the interviewees and the information gathered during the interviews.

Data Collection

Data w collected from 11 elementary school teachers across Saipan. These teachers participated in individual interviews that explored their experiences and perspectives on implementing PBL in their classrooms. The interviews were conducted in person at the teachers' respective schools, providing a comfortable and private setting that supported open conversation. Each interview was scheduled for 20 to 60 minutes; however, several sessions extended beyond the allotted time due to teachers' willingness to share detailed descriptions of their classroom experiences.

Some participants also completed brief follow-up debriefs through email to clarify points or offer additional information after the interviews. All interviews were audio-recorded using a cell phone, with a backup recording created to prevent data loss. There were no significant deviations from the data collection plan described in Chapter 3, and all interviews followed the semistructured protocol. After conducting 11 interviews with elementary school teachers, I carefully transcribed the audio recordings verbatim. This process involved listening to the recordings multiple times to ensure accuracy, including noting pauses, intonations, and any emotional undertones present in the speakers' voices. Once the transcriptions were completed, the teachers were invited to review their respective transcripts to ensure that their views were accurately represented (McKim, 2023; Rowlands, 2021). The teachers identified no discrepancies, and therefore, no adjustments were needed to the transcripts. Through member checking, I was able to enhance the credibility of the study. This ensured that the final interpretations reflected the actual perspectives of

the interviewees regarding their experiences with implementing PBL in their classrooms (Rowlands, 2021).

There was one minor variation in the data collection process compared to the original plan described in Chapter 3. Participants were recruited primarily from public elementary schools, but one teacher from one private school also volunteered and was included." No unusual circumstances occurred during data collection.

Data Analysis

I conducted a thematic analysis of the interview data using an inductive approach guided by Braun and Clarke's (2022) six-phase framework: becoming familiar with the data, generating codes, developing initial themes, reviewing and refining themes, defining and naming themes, and producing the thematic analysis report. This approach allowed themes to emerge directly from the teachers' descriptions rather than relying on predetermined categories. The following section outlines how I worked through each of the six phases.

Phase 1: Data Familiarization

Phase 1 of Braun and Clarke's (2022) thematic analysis framework involves becoming familiar with the data through repeated and active engagement with the interview transcripts. In this step, I immersed myself in the data by listening to the recordings multiple times and reading the transcripts carefully. I took notes and began identifying initial ideas, patterns, and meanings. This familiarization process laid the foundation for subsequent coding and theme development by ensuring a thorough understanding of the teachers' experiences with implementing PBL.

During this phase, I also noted early impressions about how teachers described the benefits of PBL, the challenges they encountered, and the ways PBL influenced

student engagement and learning. This initial review helped me recognize important similarities and differences across the participants' accounts. Table 2 summarizes the interviewees and key characteristics relevant to their perspectives on PBL.

Table 2

Interviewees' Characteristics and Perspectives on PBL

Interviewee	Grade level	Years of experience	PBL experience	Key perspective on PBL
1	4th	17	1 year	Improved student confidence and creativity; shift to student-centered learning.
2	4th	19	Experienced	Effective in social studies; enhances enthusiasm and collaboration.
3	4th	13	Experienced	Promotes cognitive skills and knowledge retention.
4	1st	21	Experienced	Develops problem-solving and social-emotional learning; a structured approach with research.
5	K	5	Some Experience	Focused on PBL in math; planning challenges but tailored learning led to positive outcomes.
6	2nd (Private)	Not specified	Planned to implement	Recognized benefits in math and science; concerned about transitioning from traditional methods.
7	4th	10	Planned to implement	Viewed PBL as one of many tools; skeptical about its efficacy compared to traditional methods.
8	Not specified	16	Experienced	Emphasized student engagement and real-world connections.
9	1st	16	Experienced	Appreciated creativity and collaboration; acknowledged planning challenges but adapted.
10	1st	3	Some Experience	Found PBL essential for real-life connections; faced classroom management challenges.
11	Not specified	27	1 year	Implemented PBL in math; highlighted adaptation by experienced educators.

Note. "Experienced" refers to teachers who have used PBL extensively in their instruction.

Phase 2: Coding

When I began coding, I used Microsoft Word to document all the initial codes. I read each transcript carefully, highlighting meaningful segments, and inserting comments to assign descriptive codes. I then compiled all the codes into one section of the Word document for comparison and analysis. This allowed me to identify similarities and patterns across responses. To promote consistency, I developed a codebook that included definitions and at least one representative quote from the data

for each code. For example, the code “limited resources” was grounded in an interviewee’s comment: “There’s always a logistical issue—time, space, or getting resources.”

After organizing the codes in Word, I transferred them into an Excel spreadsheet to facilitate the identification of patterns and eventual theme development. Excel helped me sort, group, and visually cluster related codes into broader categories. For example, several teachers mentioned students “working together” or “collaborating in groups,” as in the quote, “They learn from each other more than they do from me sometimes.” These responses were coded as “collaborative learning,” “peer-to-peer learning,” and “learning from others,” which were then generated as initial themes. Similarly, the statement, “They plan their projects—they choose the topic, and I just guide them,” was coded as “ownership” and contributed to a larger theme related to ownership or self-directed learning.

In total, I generated 313 initial codes. Using constant-comparative methods—a refinement process that involves reviewing and comparing codes for similarity—I reduced the list to 92 unique codes. All 92 codes were retained to capture the full range of teacher responses, although only a portion of them were grouped into categories and organized under broader themes.

Phase 3: Generating Initial Themes

Following the merging of codes, the next phase involved conceptual clustering and the constant-comparative analysis of the data. During this phase, I organized related codes into broader thematic categories, ultimately identifying 23 categories. I clustered codes by grouping conceptually similar ideas together and systematically comparing responses across interviewees. For example, codes such as *peer reviews*

and *discussing ideas with classmates* were grouped under a broader category related to peer-to-peer learning.

This phase required revisiting the transcripts to ensure that the grouped codes accurately reflected the interviewees' intended meanings and that categories were grounded in the data. Table 3 presents a sample of eight representative categories from the complete set of 23 categories generated during this phase.

Table 3

Sample Initial Categories and Codes

Categories	Codes
Group work and communication	1. Work as a group, 2. collaborate and discuss
Utilizing technology for enhancements	3. Use technology more in the presentations
Peer-to-peer learning	4. Collaborative learning environment, 5. Deal with the problem with their peers or share their own inputs 6. Learn from each other 7. Learning from each other 8. Work together and think together 9. Grow on other people's ideas 10. Work together, learn from each other's experiences 11. Come out of their shells 12. Share ideas and work as a team

Teaching digital literacy	13. Technology and PBL should be combined
	14. Teach them how to go on Google search
	15. Type on the microphone, come up with answers
	16. Used to the traditional teaching
	17. Provide what they need
Enhanced learning through technology	18. Retain the information a lot better
	19. Remember the names better, vocabulary
Ownership of learning	20. Owner [of the project]
	21. A lot more engaged
Problem-solving skills	22. Solutions on their own
Application of knowledge	23. Relevant to them

To ensure the integrity of each category, I conducted a close review of interviewees' quotes, analyzing the language and context in which the codes appeared. This constant-comparative approach allowed me to confirm that the groupings were internally consistent and representative across multiple interviewees. When a quote aligned with more than one category, I carefully considered its context and intent to determine the most appropriate thematic category. Interviewees' quotes were central to validating these groupings, not only by illustrating them but also by confirming their consistency and prevalence across responses. For example, several teachers described their students engaging in group collaboration, which reinforced the inclusion of "group work and communication" as a distinct category. This iterative process of verification, comparison, and refinement ensured that the final categories captured the shared experiences and perspectives of the teachers.

I grouped the 23 categories into four initial themes. A total of four themes were generated: (a) PBL enhances group work and collaboration, (b) PBL requires extensive preparation, (c) PBL involves effective integration of technology, and (d) teachers need access to resources for effective PBL implementation (see Table 4). In Phase 4, I reviewed these initial themes and develop the final themes.

Table 4

Renamed Initial Themes to Align with RQs

	Initial themes	Final themes
1	Enhancing group work and collaboration	PBL promotes engagement, collaboration, and deeper learning
2	PBL requires extensive preparation	PBL implementation is valuable but requires significant time, planning, and flexibility
3	PBL involves effective technology integration	Technology, collaboration, and flexibility enhance PBL success.
4	Teachers need access to resources for effective PBL	Effective PBL implementation requires ongoing support, resources, and professional development

Phase 4: Developing and Reviewing Themes

In Phase 4, I further reviewed the themes through the lens of the study's RQs to determine their relevance and significance. Themes that directly supported the RQs were retained, while others were merged, refined, or removed. During this phase of thematic analysis, I grouped the 23 categories under four broad final themes, one aligned with each RQ.

Through conceptual clustering and constant comparison, related codes were merged and grouped into broader categories that represented recurring patterns across interviews. I reviewed these patterns in relation to RQ1, ensuring that the themes accurately reflected how teachers described the importance of PBL rather than broader issues such as challenges or support needs. Each cluster of codes was analyzed for coherence and checked against the complete data set for consistency.

To address RQ1, “How do elementary school teachers describe the importance of using PBL in their teaching?” I followed a systematic and iterative thematic analysis process to identify the theme. The first theme was enhancing group work and collaboration. The categories under this theme were revised as follows:

(1) PBL enhances group work and collaboration;

(2) PBL promotes peer-to-peer learning;

(3) PBL develops problem-solving skill;

(4) PBL enhances digital literacy among students;

(5) PBL increases student engagement and ownership of learning.

Multiple data excerpts across teachers strongly supported these themes. In addition, these themes provided rich insight into how teachers believe PBL benefits student learning and development in the classroom.

To address RQ2, “How do elementary school teachers describe their perspectives on the ease of using PBL in their teaching?” The second theme was that PBL requires extensive preparation. Three categories were included under this theme:

(6) PBL requires extensive preparation;

(7) Teachers need training for effective PBL implementation;

(8) PBL implementation relies on external experts or guidance.

To address RQ3, “How do elementary school teachers describe their successes in implementing PBL?” The third theme was that PBL involves effective technology integration. I grouped four categories under this theme:

(9) PBL involves effective technology integration;

(10) Strategic technological use enhances PBL effectiveness;

(11) PBL fosters student engagement and self-directed learning;

(12) PBL encourages peer-to-peer learning and collaboration;

(13) Success in PBL implementation often relies on improvisation and expert input.

For RQ4, “How do elementary school teachers describe the support they need to implement PBL?” I focused on portions of data where teachers expressed challenges or desired improvements. The fourth theme was that teachers need access to resources for effective PBL implementation. I grouped two categories under this theme:

(14) Teachers need access to resources for effective PBL implementation;

(15) Successful PBL implementation requires strong administrative support.

These final themes illustrate that successful PBL implementation depends not only on teacher expertise and effort but also on consistent institutional, material, and administrative support.

Phase 5: Refining, Defining, and Naming Themes

In Phase 5, I finalized the wording of the four themes aligned with each of the four RQs. This phase involved refining and clarifying the themes to ensure that each one accurately reflected the categories and codes developed from the data and directly addressed the corresponding RQ. The refinement process included reviewing the meaning and scope of each theme, confirming coherence among the grouped categories, and determining the clearest wording to describe each theme. Table 4 presents the revised wording of the initial themes. Table 5 shows the alignment of each RQ with the finalized themes and the categories associated with each theme.

Table 5

Final Themes Aligned to RQs and Categories

RQs	Finalized themes	Categories
RQ1: How do elementary school teachers describe the importance of using PBL in their classrooms?	1 – PBL promotes engagement, collaboration, and deeper learning	1 - PBL enhances group work and collaboration 2 - PBL promotes peer-to-peer learning 3 - PBL develops problem-solving skills 4 - PBL enhances digital literacy among students 5 - PBL increases student engagement and ownership of learning
RQ2: How do elementary school teachers describe their perspectives on the ease of using PBL?	2 - PBL implementation is valuable but requires significant time, planning, and flexibility	6 - PBL requires extensive preparation 7 - Teachers need training for effective PBL implementation 8 - PBL implementation relies on external experts or guidance
RQ3: How do elementary school teachers describe their successes in implementing PBL?	3 - Technology, collaboration, flexibility enhance PBL success	9 - PBL involves effective technology integration 10 - Strategic technological use enhances PBL effectiveness 11 - PBL fosters student engagement and self-directed learning 12 - PBL encourages peer-to-peer learning and collaboration 13 - Success in PBL implementation often relies on improvisation and expert input
RQ4: How do elementary school teachers describe the support they needed to implement PBL effectively?	4 - Effective PBL implementation requires ongoing support, resources, and professional development	14 - Teachers need access to resources for effective PBL implementation 15 - Successful PBL implementation requires strong administrative support

Phase 6: Writing the Thematic Analysis Report

The final phase of the thematic analysis involved writing a comprehensive report that presented the study's key findings in relation to the RQs. This phase required synthesizing the four major themes that emerged from the coding process, conceptual clustering, and constant comparison of the interview data. Each theme

represents a distinct yet interconnected aspect of elementary school teachers' experiences and perceptions regarding the implementation of PBL in Saipan.

The report includes detailed descriptions supported by representative participant quotes that illustrate how teachers perceive the value of PBL, the challenges they encounter, and the support they believe is needed for effective implementation. By connecting these themes to existing literature and educational perspectives, the analysis provides a nuanced understanding of the benefits and complexities of PBL in elementary school settings. These findings highlight areas where targeted professional development, adequate resources, and administrative support are essential for strengthening PBL use in classrooms.

Throughout the reporting process, I worked to maintain the authenticity and accuracy of participants' voices while situating the findings within broader educational contexts. The result is an evidence-based account that answers the RQs and offers insight to guide future efforts to enhance PBL implementation in similar educational environments.

Results

In this section, I present the results of this basic qualitative study, organized by each RQ. To communicate the findings, I follow a consistent structure for each theme. As part of Phase 5 of the data analysis, I developed a concise, 3–5 sentence description for each theme to summarize its core meaning and significance. These theme descriptions serve as introductions to each subheading in the results section, helping readers quickly understand the main idea before reviewing supporting evidence. After each description, I include direct quotes from teachers to illustrate the theme and demonstrate how it is grounded in the data. This approach ensures that the

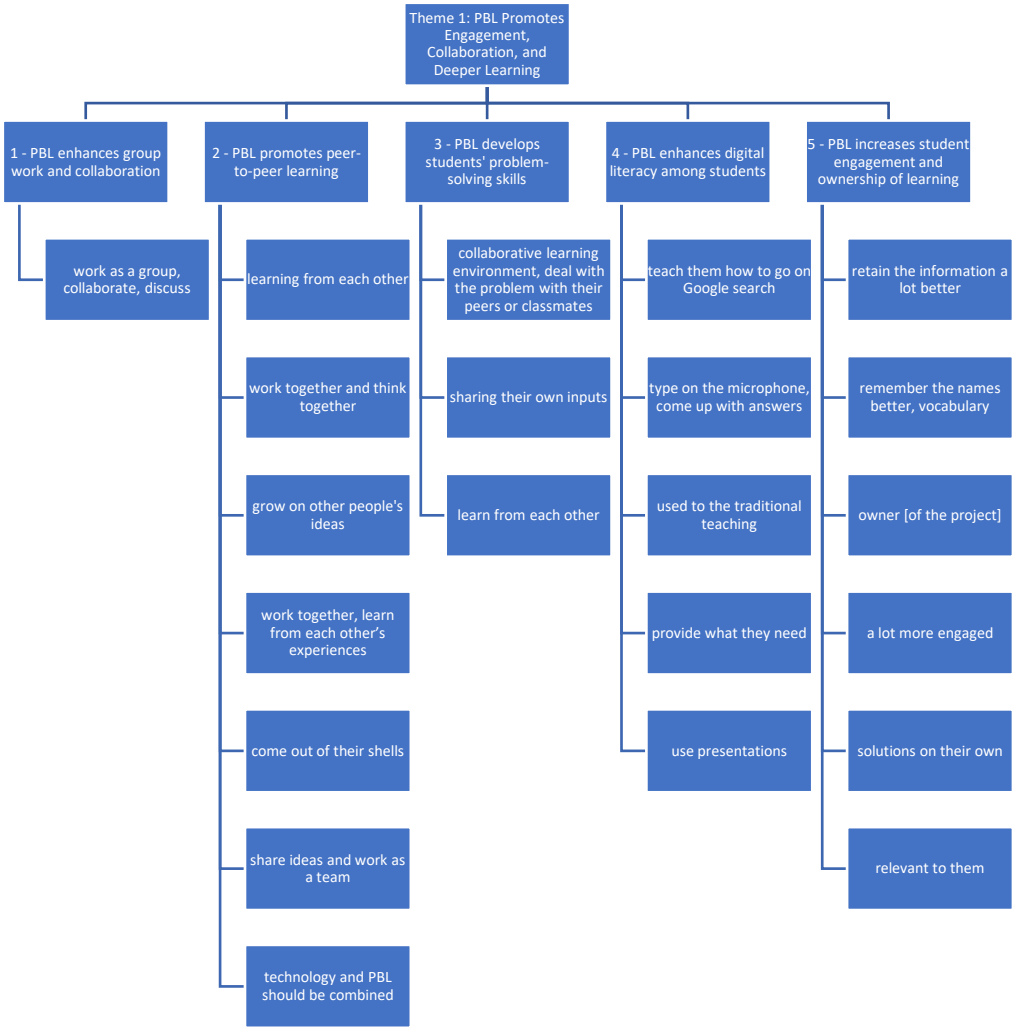
voices of teachers remain central while also allowing readers to see how the themes connect to the study's overall purpose.

RQ1 Theme: PBL Promotes Engagement, Collaboration, and Deeper Learning

Theme 1 addressed RQ1: How do elementary school teachers describe the importance of using PBL in their teaching? Teachers shared that PBL is valuable because it increases student engagement, encourages collaboration, and leads to deeper, more meaningful learning. They described how PBL allows students to take ownership of their work and connect learning to real-world experiences. This theme encompassed five categories that reflected the key benefits as described across the interviews. Teachers also shared that students were more motivated, invested, and responsible for their learning because they had more choices and opportunities to contribute. Overall, teachers emphasized the educational value of PBL in fostering engagement, supporting collaboration, and deepening understanding through real-world application. Figure 1 shows the categories and codes for Theme 1.

Figure 1

Theme 1: Categories and Codes for RQ1



Teachers noted that students became more motivated and engaged when they had ownership of their learning process. As one interviewee shared, “Because it was their ideas they’re putting down, they were a lot more engaged” (Interviewee 5). Several also emphasized how collaborative learning through PBL allowed students to “learn from each other in ways they might not in regular lessons” (Interviewee 5) and “grow on other people’s ideas” (Interviewee 10).

This process contributed not only to academic gains but also to increased student confidence, with one teacher noting that students “come out of their shells because they’re learning with and from others” (Interviewee 7). Overall, Theme 1

includes subthemes such as collaborative learning, ownership of learning, application of knowledge, and improved learning outcomes, indicating that teachers perceive PBL as crucial for fostering meaningful and engaging learning experiences.

Category 1: PBL Enhances Group Work and Collaboration

The first category was that teachers believed PBL played a key role in enhancing group work and collaboration among students. Teachers described how PBL activities encouraged students to work together, share responsibilities, and support one another's learning in a team setting. For example, one teacher mentioned that "having the time to plan and collaborate with peers would make implementing PBL more seamless" (Interviewee 4), highlighting the importance of planning in ensuring effective group work. Teachers also emphasized the value of collaboration related to students working together, with one stating, "This will create a more collaborative learning environment because students will be able to deal with the problem with their peers or classmates" (Interviewee 6).

The ability to collaborate in PBL tasks was noted as beneficial for peer learning, as one teacher explained: "They really made it together, as they work as a group, they collaborate, they discuss" (Interviewee 2). Role allocation was recognized as crucial in ensuring effective collaboration, as one interviewee stated, "Unless there are designated roles, kids will fall into leader and follower" (Interviewee 3). The importance of balancing strengths and weaknesses within the group was also noted: "Augmenting someone's weaknesses and using other strengths to help the group get better" (Interviewee 4). Another teacher added, "Working together, they learn from each other in ways they might not in regular lessons" (Interviewee 5). The concept of a "hive mind" was also mentioned, with one teacher noting that "kids can work

together as a hive trying to feed off each other's strengths and weaknesses" (Interviewee 7).

Overall, group cohesion was identified as a significant benefit, with teachers describing how students share their ideas and insights, enhancing the collaborative nature of the learning experience. "They're sharing their own inputs, like what they think should be in the playground" (Interviewee 1), and another teacher expressed that group work allows students to engage with real-world problems: "It helps them feel more real-world problems" (Interviewee 6).

Category 2: PBL Enhances Peer-to-Peer Learning

The second category revealed that teachers viewed PBL as a valuable strategy for promoting peer-to-peer learning. They noted that, through the structure of PBL, students were often required to exchange ideas, give feedback, and engage in joint problem-solving, which helped them learn from one another in authentic and meaningful ways. Teachers described how, by working together, students can share ideas, leading to more dynamic learning experiences. As another teacher pointed out, "They're sharing their inputs, like what they think should be in the playground" (Interviewee 1).

Teachers also noted that even students with lower reading levels benefit from learning alongside their peers. One teacher observed, "Even though their reading level is low, they still can touch it, learn it, and they're only learning from each other, with their peers" (Interviewee 3). Another emphasized that "this will create a more collaborative learning environment because students will be able to deal with the problem with their peers or classmates" (Interviewee 6). Teachers recognized that peer-to-peer interaction enhances students' ability to discuss and solve problems

together. As one teacher shared, “The feedback process is different from traditional methods. They get peer reviews, which is much more constructive” (Interviewee 5).

This process enables students to learn from one another and enhance their work, thereby reinforcing the collaborative and supportive nature of peer-to-peer learning in PBL. As one teacher explained, “They can discuss the problems, and they can discuss even their solutions” (Interviewee 6), demonstrating how students can collaborate to find solutions and build understanding using PBL. Teachers also observed that this peer interaction helps quieter students gain confidence. One teacher noted, “I’ve seen students who are quiet come out of their shells because they’re learning with and from others” (Interviewee 7), illustrating the positive impact of PBL on student self-esteem and communication skills.

Category 3: PBL Develops Students’ Problem-Solving Skills

The third category was that teachers recognized PBL as a practical approach to building students’ problem-solving and critical-thinking skills. Teachers explained that students had to think independently, make decisions, and overcome challenges within real-world project tasks. PBL was noted for promoting cognitive learning, with one teacher stating, “PBL is very important because it enhances their cognitive learning” (Interviewee 3), suggesting that it engages students in deeper thinking. Another teacher reiterated the value of collaboration in this process: “This will create a more collaborative learning environment because students will be able to deal with the problem with their peers or classmates” (Interviewee 6).

Through PBL, students were encouraged to analyze and reflect on problems. One teacher noted, “They have to think whether it is working and why it is working that way” (Interviewee 6), illustrating the need for critical evaluation of solutions. The

motivation to tackle these challenges was also cited as a benefit, with one teacher observing, “It motivates them to work toward that goal. They’re aware, and it’s relevant to them, and they know what to expect” (Interviewee 8).

Teachers also pointed out that PBL allows students to apply strategies and solutions, enhancing their ability to tackle complex problems. This approach led to greater retention of knowledge, with one teacher commenting, “They retain the information a lot better… they have a deeper understanding compared to just basic questions or problems being answered” (Interviewee 5). Furthermore, PBL encourages students to find solutions independently. Through real-world applications, students acquire relevant and practical skills. For example, “They were able to use real-world experiences to gain a better understanding of how to find area or perimeter” (Interviewee 5). Another teacher added, “They will find the answer to the question by giving solutions on their own” (Interviewee 6).

Category 4: PBL Enhances Digital Literacy Among Students

The fourth category reflected teachers’ belief that PBL enhanced students’ digital literacy by giving them frequent opportunities to use technology to conduct research, present findings, and collaborate with classmates. The comfort students have with technology was noted, as one teacher observed, “Kids nowadays are very comfortable with using technology” (Interviewee 1), suggesting that PBL helps students become more adept at using various digital tools. Another teacher emphasized the importance of teaching students basic digital skills, saying, “We teach them how to go on Google search, how to type, how to voice command” (Interviewee 4), illustrating how PBL promotes foundational technology skills.

Vocabulary preparation was also part of this digital engagement, with teachers ensuring that students were equipped with the necessary terminology to navigate online resources. One teacher shared, “I had to make sure I had all the vocabulary words... And then I had to get graph paper” (Interviewee 11). The use of Google as a resource was another common practice, as one teacher explained, “I just Googled geometric city ideas. So, I would use images” (Interviewee 11), reflecting how PBL encourages students to utilize online platforms for information and inspiration.

Furthermore, accessibility tools like text-to-speech features were highlighted as ways to support students’ diverse needs. One teacher noted, “We use voice commands and text-to-speech features to assist younger students still developing their reading and writing skills” (Interviewee 4). AI-assisted tools were also employed: “When they go on the iPad, and they go to Google, and they type on the microphone... The AI will type it up for them, and then it will come up with answers” (Interviewee 4). These examples suggest that PBL provided opportunities for students to develop digital literacy in meaningful and practical ways.

Category 5: PBL Increases Student Engagement and Ownership of Learning

The fifth category highlighted that teachers observed increased student engagement and ownership of learning when using PBL. They shared that students were more motivated, invested, and responsible for their knowledge because they had more choice and control over their projects. Teachers explained that PBL significantly enhances student engagement and ownership of learning, as it encourages active participation and collaboration. One teacher described how PBL provides opportunities to work together and think collectively, making the classroom more engaging: “PBL gives them a chance to work together and think together, which

makes the class more engaging" (Interviewee 5). This collaborative environment fosters deeper involvement as students become more invested in their projects. The same teacher noted: "Because it was their ideas they're putting down, they were a lot more engaged" (Interviewee 5).

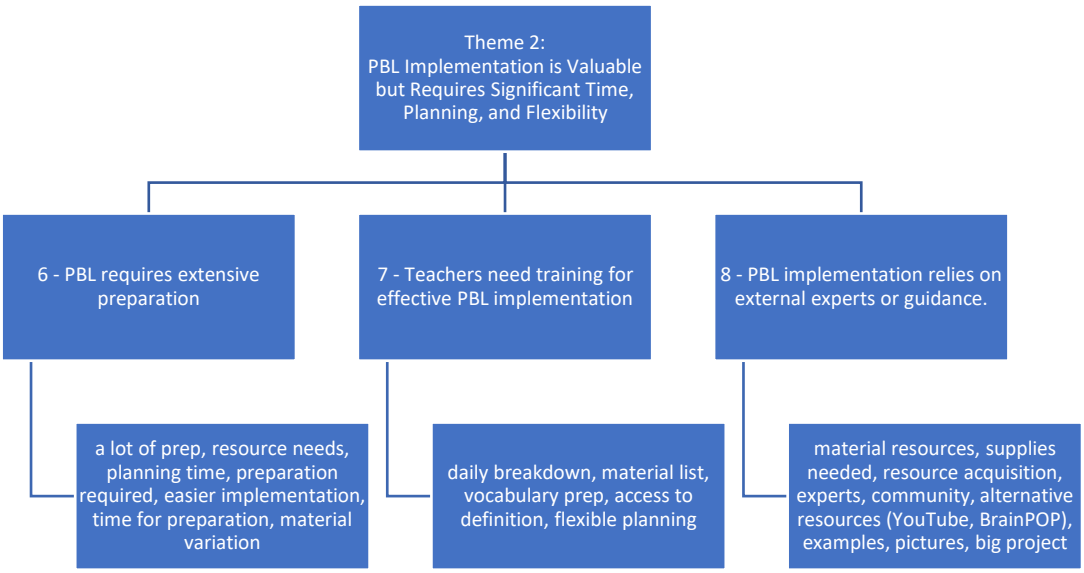
Students also felt a sense of ownership over their work. As one teacher pointed out, "It's almost like they are the owner [of the project]" (Interviewee 1). Teachers observed that the time spent on PBL activities often passed quickly, as students were fully immersed in their tasks, with one teacher sharing, "They love it. Like today, we do PBL, and then the time is this fast. It's already 2:10, and time to go" (Interviewee 3). Another teacher explained: "It's more about discovery, and students take ownership of their learning" (Interviewee 7). The engagement factor was also emphasized: "It's the engagement factor. Students are actively involved, rather than just listening and absorbing" (Interviewee 9). These accounts suggest that PBL fostered both engagement and a stronger sense of responsibility for learning.

RQ2 Theme: PBL Implementation Is Valuable but Requires Significant Time, Planning, and Flexibility

Theme 2 was generated to answer RQ2: How do elementary school teachers describe their perspectives on the ease of using PBL in their teaching? Teachers expressed that, while PBL is valuable and rewarding, it requires a significant amount of time, detailed planning, and flexibility to implement effectively. Many noted the challenges of aligning PBL with curriculum standards and managing student needs within limited instructional time. Despite these challenges, teachers believed the benefits outweighed the difficulties. Figure 2 shows the categories and codes for Theme 2.

Figure 2

Theme 2: Categories and Codes for RQ2



Although teachers recognized the benefits of PBL, they also described it as demanding in terms of time, preparation, and adaptability. Implementation was viewed as both rewarding and labor-intensive, with successful delivery largely dependent on careful planning and teacher readiness. Teachers frequently cited the extensive planning required for PBL. One teacher remarked, “It takes a lot of planning time” (Interviewee 11), while another explained, “The planning part is the hardest part because you want to make sure that whatever project you’re doing, it’s flexible enough for everyone” (Interviewee 5). Teachers also expressed concerns about logistical complexity and resource demands. Some viewed the multi-step process of PBL as potentially overwhelming, especially without adequate support. As one teacher summarized, “Some teachers said... there’s a lot of steps, and it’s too much, and the kids get overwhelmed” (Interviewee 4).

This theme incorporates elements from initial themes on differences between traditional and PBL methods, planning and preparation challenges, and mixed perceptions of PBL. Overall, teachers acknowledged PBL's value but emphasized that it was not easily implemented without considerable effort and support structures. Three categories were grouped under Theme 2, continuing the numbering from Theme 1. The sixth category was that PBL requires extensive preparation. The seventh category was that teachers felt that they needed training for effective PBL implementation. The eighth category was that PBL implementation relies on external experts or guidance.

Category 6: PBL Requires Extensive Preparation

The first category under Theme 2 was that PBL requires extensive preparation. Teachers expressed that it took considerable time and effort to plan and prepare PBL units. One teacher noted, "It does require a lot of prep work" (Interviewee 1). Another teacher suggested breaking down the preparation into manageable parts: "A lot of times teachers think, 'Oh, I have to prepare this much,' but I think it could be broken down daily" (Interviewee 1). One teacher acknowledged that the process becomes easier once the initial stage is completed, as one teacher explained, "It was challenging in the beginning, but once the planning stage is done, implementing it becomes easier" (Interviewee 5). Another teacher also pointed out that the time needed for preparation could be overwhelming, as reflected in "It takes a lot of planning time" (Interviewee 11).

Category 7: Teachers Need Training for Effective PBL Implementation

The seventh category was that teachers felt that they needed training for effective PBL implementation. Interviewee 6, in particular, emphasized the need for

more professional development to use PBL successfully in the classroom. This teacher remarked, “More training... that’s the reason why I always...”and later stated, “I would say, please give us more training” (Interviewee 6). This teacher also noted that professional development was crucial for enhancing their PBL implementation skills, explaining, “Although we heard we need more professional development” (Interviewee 6). Finally, this teacher highlighted the challenge of transitioning from traditional teaching methods, recalling that, “Some of my previous school teachers were going to the mainland to attend the training” (Interviewee 6).

Category 8: PBL Implementation Relies on External Experts or Guidance

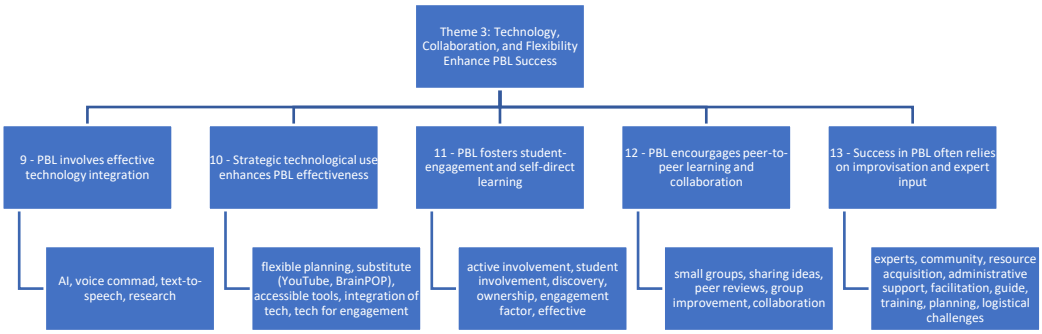
The eighth category showed that teachers believed PBL implementation often relied on external experts or guidance. Teachers recognized the value of bringing in specialists to enhance the learning experience. One teacher said, “It’s very powerful when we bring in experts” (Interviewee 4), and others noted the benefits of expert input in subjects like biodiversity. However, improvisation was sometimes necessary due to logistical constraints. As one teacher explained, “Bringing in an entomologist to talk about how insects contribute to biodiversity would be ideal, but we have to improvise...” (Interviewee 4). Teachers also acknowledged that administrative support was necessary to facilitate these connections, with one stating, “Bringing in experts is great, but we also need administrative support for making those connections” (Interviewee 4). These findings highlight the complexities teachers encountered when adopting PBL, particularly in terms of preparation, professional development, and external support.

RQ3 Theme: Technology, Collaboration, and Flexibility Enhance PBL Success

Theme 3 was generated to answer RQ3: How do elementary school teachers describe their successes in implementing PBL? The Theme 3 indicated that successful PBL implementation, as described by teachers, often involved effective integration of technology, increased student engagement, peer collaboration, and flexible approaches that included improvisation and expert input. Teachers shared that their successes with PBL were closely tied to their ability to integrate digital tools, foster self-directed learning, and encourage collaboration. They emphasized that using technology and interactive methods helped students present their work, explore content in greater depth, and develop important 21st-century skills. Figure 3 shows the categories and codes for Theme 3.

Figure 3

Theme 3: Categories and Codes for RQ3



Five categories addressed RQ3, numbered 9-13. The ninth category was that PBL involves the effective integration of technology. The tenth category was that strategic technology use that enhances the effectiveness of PBL. The eleventh category was that PBL fosters student engagement and ownership of learning. The twelfth category was that PBL encourages peer-to-peer learning and collaboration.

Finally, the thirteenth category was that success in PBL often relies on improvisation and expert input. I will organize my discussion into these categories.

Category 9: PBL Involves Effective Technology integration

Teachers recognized the critical role of effectively integrating technology within PBL to enhance student engagement, foster problem-solving skills, and improve presentation skills. They emphasized that using digital tools not only complements students' growing tech familiarity but also empowers them to take ownership of their learning. One teacher noted, "We teach them how to go on Google search, how to type, how to voice command" (Interviewee 4), illustrating how foundational digital literacy is built into classroom routines. Another teacher emphasized the autonomy this fostered, stating, "They will find the answer to the question by giving solutions on their own" (Interviewee 6), highlighting how technology supports independent inquiry and problem-solving.

Teachers also shared examples of how students used digital tools to showcase their learning. One teacher reported, "I use tools like Canva or Google Slides so they can showcase their learning creatively" (Interviewee 7). Another explained, "With grade school students, they're not really novices with devices. So, I would use technology more in their work presentations" (Interviewee 8). The growing ease with which students navigate these tools makes technology a natural and effective medium for presenting their project outcomes. As a result, many teachers viewed technology not as an add-on, but as an essential component that enriches students' communication, creativity, and confidence in sharing what they have learned.

Category 10: Strategic Technological Use Enhances PBL Effectiveness

Teachers emphasized that technology served as a powerful tool that, when used strategically, enhanced the effectiveness of PBL by promoting student engagement, creativity, and ownership. Several teachers shared that, when used strategically, digital tools allowed students to explore content in dynamic and personalized ways. One teacher noted, “We used Google Slides, and students were proud of the way they could design and present their projects. It wasn’t just about content; it was their voice” (Interviewee 5). Another teacher shared, “Technology helps students access more than the textbook. They go deeper, ask questions, and do their own research” (Interviewee 2).

Teachers also highlighted that, when technology was used intentionally, it encouraged higher-order thinking. For example, one teacher stated, “My students were creating videos to show what they learned, and they had to write scripts, organize visuals, and decide how to explain things clearly. That’s more than just memorizing facts” (Interviewee 3). The combination of digital platforms and PBL led students to engage in the creative process and develop communication skills. As one teacher described, “Even students who usually stay quiet were excited to show their work using tech tools like Canva or Flip. They felt more confident” (Interviewee 6).

However, teachers clarified that the key was strategic use of technology, not simply using devices for their own sake. When integrated purposefully, technology supported student-centered learning and empowered students to take initiative. One teacher reflected, “It’s not about putting them on a Chromebook. It’s about using tech to let them explore, collaborate, and create in ways they couldn’t before” (Interviewee 9). Overall, teachers viewed technology not as a replacement for instruction but as an enhancer of student thinking and project quality.

Category 11: PBL Fosters Student Engagement and Self-Directed Learning

A recurring success described by the teachers was how PBL increased student engagement and promoted self-directed learning. Multiple teachers noted that students were more excited, focused, and motivated during PBL compared to traditional lessons. “You could see the excitement in their faces. They wanted to show their progress and kept asking when they could work on their projects again,” one teacher said (Interviewee 5). Another shared, “Even students who struggle with traditional worksheets were suddenly more confident and invested in what they were doing” (Interviewee 6).

PBL also gave students more autonomy, which many teachers saw as a major benefit. Students planned, researched, created, and presented their work with increasing independence. One teacher described, “They took charge of their learning. I gave them the framework, but they ran with it. Some were looking up extra facts or asking to revise their work to make it better” (Interviewee 1). This shift toward self-direction was especially notable among students who typically needed more support in traditional settings. “They surprised me. Students who usually wait for instructions were now asking, ‘Can I try it this way?’” (Interviewee 7).

Teachers also reported that, when students had more control over their learning, their understanding of the material deepened. One explained, “They retain the information a lot better because they’re doing something with it. It’s not just answering questions, it’s making sense of it, applying it, and sharing it” (Interviewee 5). This level of engagement and ownership was seen as an indicator of how PBL supported student-centered growth.

Category 12: PBL Encourages Peer-to-Peer Learning and Collaboration

Teachers widely described peer collaboration as a vital strength of PBL. They observed students naturally helping each other, discussing ideas, and working as teams to solve problems. One teacher noted, “We have students who are great at tech, and they’re always jumping in to help their classmates. That kind of support is so powerful” (Interviewee 3). Another added, “They learned more from each other than from me sometimes. They were teaching, questioning, and explaining ideas in their own words” (Interviewee 9).

In group settings, students developed communication and leadership skills. Teachers reported that PBL helped shy or less confident students become more engaged and active. One teacher shared, “One of my quietest students became the group leader during a community project. She took responsibility and helped her team stay organized” (Interviewee 2). This kind of peer interaction was described as creating a more inclusive and cooperative classroom culture. Another teacher reflected, “Even students who don’t usually work well together found common ground because they had a shared goal” (Interviewee 4).

Additionally, the collaborative nature of PBL led to richer learning outcomes. One teacher explained, “Students would bring different strengths to the group, someone might be good at research, another at presenting, and another at visuals. They learned how to depend on each other” (Interviewee 6). These experiences helped students develop teamwork and interpersonal skills while also deepening their understanding of the content. Teachers viewed this as an essential component of preparing students for real-world learning and future academic challenges.

Category 13: Success in PBL Often Relies on Improvisation and Expert Input

Teachers also identified the use of expert input and improvisation when implementing PBL. Bringing in real-world experts or guest speakers helped make learning more meaningful and authentic. One teacher shared, “We had a scientist Zoom in to talk about marine ecosystems. The students asked thoughtful questions and were so inspired by hearing from someone in the field” (Interviewee 4). Another said, “It’s powerful when students see that what they’re learning connects to the real world outside the classroom” (Interviewee 7).

When experts weren’t available, teachers improvised. One teacher explained, “We used YouTube, BrainPOP, and other media when we couldn’t bring someone in. The content was still rich, and we made it interactive with follow-up discussions and reflections” (Interviewee 5). Improvisation became a common practice when dealing with limited time, access, or materials. Another teacher described, “I wanted a meteorologist to speak to the class, but instead I used a recorded interview and paired it with a hands-on weather experiment” (Interviewee 3).

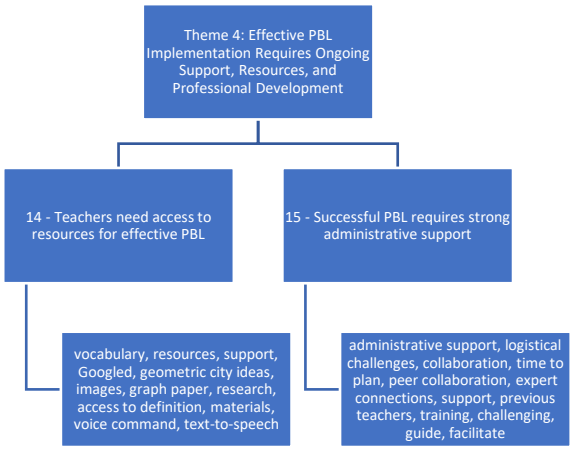
Teachers emphasized that flexibility and quick thinking were essential in making PBL work under real-world constraints. One teacher said, “Sometimes the materials I ordered didn’t arrive, or the tech didn’t work—so I had to adjust the plan” (Interviewee 2). Despite these challenges, teachers viewed their ability to adapt and improvise as a core strength that helped maintain the quality of instruction and student engagement. One teacher concluded, “PBL forces you to be creative, and that’s what makes it fun—for us and the students” (Interviewee 6).

RQ4 Theme: Effective PBL Implementation Requires Ongoing Support, Resources, and Professional Development

Theme 4 was generated to answer RQ4: How do elementary school teachers describe the support they needed to implement PBL effectively? Theme 4 revealed that teachers described both material and institutional support as crucial to the successful implementation of PBL. This included access to adequate instructional resources, as well as strong support from school leadership. Teachers emphasized the need for tools, supplies, and technological resources to design and facilitate meaningful projects. They also highlighted the importance of administrative support, such as scheduling flexibility, professional trust, and encouragement to take instructional risks. Two categories were grouped under this theme, which were numbered 14 and 15. Figure 4 shows the categories and codes for Theme 4.

Figure 4

Theme 4: Categories and Codes for RQ4



Category 14: Teachers Need Access to Resources for Effective PBL Implementation

Elementary school teachers emphasized the importance of having adequate resources when implementing PBL. Many teachers reported the necessity of gathering specific materials, such as vocabulary word cards and graph paper, as well as other essential classroom supplies, to ensure the successful completion of student projects. One teacher shared, “I had to make sure I had all the vocabulary words... and then I

had to get graph paper" (Interviewee 11), highlighting the personal burden of preparation in the absence of centralized support.

In addition to physical materials, teachers expressed a need for access to instructional resources and creative inspiration. For instance, one teacher mentioned sourcing ideas online by saying, "I just Googled geometric city ideas. So, I would use images" (Interviewee 11). This indicates that teachers frequently had to independently seek content to enrich students' experiences. Other teachers emphasized that both human and material resources were essential, as PBL often required collaborative facilitation, peer interaction, and a variety of tools to accommodate active learning. Without adequate access to such resources, teachers found it challenging to maintain the quality and depth of PBL activities.

Category 15: Successful PBL Requires Strong Administrative Support

Teachers also emphasized the need for strong administrative and logistical support to implement PBL effectively. Interviewee 4 noted that while incorporating external experts, such as guest speakers or professionals, was highly beneficial to PBL, the process of coordinating these collaborations was often hindered by a lack of administrative support. One teacher stated, "Bringing in experts is great, but we also need administrative support for making those connections" (Interviewee 4), revealing a gap between pedagogical aspirations and institutional structures.

Teachers identified logistical challenges, including managing class schedules and coordinating substitute teachers during training periods, as barriers to successful implementation. One teacher shared, "Sometimes, we're trying to make it happen, but without the support, even simple logistics like finding coverage become a big issue" (Interviewee 7), reinforcing how systemic barriers can complicate efforts to bring

PBL to life. Moreover, some teachers mentioned that due to a lack of available experts, they had to substitute real-life experiences with digital content, such as YouTube or BrainPOP videos. Another teacher further noted that attending off-site training required administrative permission and travel arrangements, as described by Interviewee 6, who reflected, “Some of my previous school teachers were going to the mainland to attend the training.” Overall, these reflections demonstrate that the successful implementation of PBL depends not only on teacher readiness but also on systemic support from school leadership and logistical facilitation.

Evidence of Trustworthiness

To ensure the rigor and quality of the analysis, I incorporated multiple strategies aligned with qualitative trustworthiness standards—credibility, transferability, dependability, and confirmability—throughout the research process, as outlined in Chapter 3. Following the reflexive thematic analysis framework proposed by Braun and Clarke (2022), I employed systematic and transparent procedures that reflected my role as an active and reflexive researcher.

Credibility

In line with Braun and Clarke’s (2022) reflexive thematic analysis framework, credibility was established through methodological coherence and participant validation. I conducted semistructured interviews guided by a standardized interview protocol developed during the proposal phase, ensuring consistency in data collection. Following transcription, I engaged in member checking by emailing each participant their transcript, allowing them two weeks to review and verify the accuracy of their responses. This process ensured that the data authentically reflected participants’

perspectives. No substantial revisions were received, supporting the trustworthiness and credibility of the transcribed accounts.

Transferability

Transferability, as outlined by Braun and Clarke (2022), involves providing rich, detailed descriptions to allow readers to determine the applicability of findings in other contexts. This study included 11 elementary school teachers from Saipan who had experience implementing or attempting PBL in public school classrooms. Thick descriptions of participant demographics, teaching roles, and school settings were provided to offer contextual clarity. These details support the reader in evaluating how the findings may or may not transfer to similar educational environments or populations.

Dependability

To enhance dependability, I employed an audit trail throughout the research process. This included maintaining detailed records of all research activities, including data collection methods, recruitment strategies for interviewees, and the analytical framework used to interpret the data. Documenting these steps ensured consistency and allowed me to easily reference how decisions were made at each stage of the research. Additionally, I conducted preliminary interviews to test the interview protocol, making necessary adjustments based on the feedback received from these initial interviews. This iterative process allowed me to refine my approach and enhance the overall reliability of the data collection methods.

Confirmability

To establish confirmability, I focused on minimizing researcher bias throughout the study. I maintained an audit trail documenting my thoughts,

reflections, and decisions during the research process, which helped ensure transparency. Regularly engaging in peer debriefing sessions with colleagues allowed me to discuss potential biases and assumptions that might influence the interpretation of data. These strategies contributed to ensuring that the findings were grounded in the teachers' accounts rather than in my own prior assumptions.

Summary

There were four significant findings in this study, with one theme corresponding to each RQ. Theme 1, which addressed RQ1 (How do elementary school teachers describe the importance of using PBL in their classrooms?), revealed that teachers felt the importance of PBL lay in its promotion of engagement, collaboration, and deeper learning. Teachers described PBL as a meaningful approach that supports student participation, inquiry, and active learning across subjects. Theme 2, which addressed RQ2 (How do elementary school teachers describe their perspectives on the ease of using PBL in their teaching?), indicated that PBL implementation is valuable but requires significant time, planning, and flexibility. Teachers shared that although PBL was effective, it often posed challenges related to workload, pacing, and classroom management.

In addition, Theme 3, which addressed RQ3 (How do elementary school teachers describe their successes in implementing PBL?), showed that technology integration, collaboration, and flexibility enhanced teachers' success with PBL. Teachers described how collaboration with colleagues, access to materials, and targeted training contributed to their ability to successfully implement PBL. Finally, Theme 4, which addressed RQ4 (How do elementary school teachers describe the support they needed to implement PBL effectively?), showed that ongoing support,

resources, and professional development were critical to successful PBL implementation. This included access to physical resources, technology, expert input, and strong administrative backing to support instructional innovation.

Teachers in this study generally viewed PBL as a powerful instructional approach that fosters student engagement, real-world relevance, and deeper learning. Many described PBL as making learning more hands-on and meaningful, with observed benefits including improved student motivation, collaboration, and critical thinking. However, the effectiveness and ease of implementing PBL varied widely among teachers. While some teachers seamlessly integrated PBL into their instruction, others faced obstacles, including limited planning time, insufficient resources, and challenges in managing student behavior.

The findings also highlighted the critical role of teacher preparation and adaptability in the successful application of PBL. Teachers emphasized the need for sustained professional development, readily available instructional materials, and supportive leadership to overcome implementation barriers. Although most interviewees held positive views, one teacher expressed skepticism about PBL's effectiveness, citing difficulties with classroom management. These findings suggest that a one-size-fits-all approach may not be feasible and that tailored support systems are essential for scaling PBL effectively across diverse educational environments.

In the next chapter, I will further interpret these findings in relation to the existing literature, discuss their implications for practice and policy, and offer recommendations for future research. Chapter 5 will also explore how these results contribute to a broader understanding of PBL implementation in elementary settings.

Chapter 5: Discussion, Conclusion, and Recommendations

The research problem addressed in this study was a lack of understanding of elementary teachers' practices in implementing PBL in Saipan. The purpose of this qualitative study was to examine elementary teachers' perspectives on the benefits of PBL, the ease or difficulty when implementing PBL, the success of PBL implementation, and the professional support needed to implement PBL in Saipan. Through interviews with 11 teachers, I examined how they described the importance of using PBL, how they perceived the ease of implementation, how they experienced successes with the approach, and what support they needed for effective use. In this chapter I discuss the findings in relation to the existing literature, interprets how the results addressed the RQs, and considers the implications of the teachers' perspectives for instructional practice within elementary schools in Saipan. Because PBL is widely promoted as a student-centered instructional model that supports engagement and authentic learning; understanding teachers' experiences provides meaningful insight into how PBL can be strengthened and supported in local educational settings.

The study resulted in four final themes: (a) PBL enhances group work and collaboration; (b) PBL requires extensive preparation; (c) PBL requires resources and professional development; and (d) teachers need collaboration and flexibility for effective PBL implementation. Teachers acknowledged that PBL offered clear benefits, including increased student engagement, stronger collaboration, and the development of critical thinking and problem-solving abilities. At the same time, they described several challenges that affected implementation, such as time constraints, resource limitations, and logistical issues related to planning. The need for ongoing professional development also emerged as a critical theme, as teachers emphasized the importance of receiving more training and structured support to use PBL

effectively. Despite these challenges, many teachers reported notable successes in their classrooms, suggesting that PBL could lead to improvements in student learning outcomes with adequate guidance, materials, and administrative support.

Interpretation of the Findings

The first RQ investigated how elementary school teachers viewed the importance of incorporating PBL into their classrooms. Teachers described PBL as a valuable instructional approach that fosters student engagement, promotes collaboration, and supports deeper learning through real-world application. Their reflections emphasized that PBL encourages ownership of learning and helps students develop academic and social skills that extend beyond the classroom.

RQ1: How Do Elementary School Teachers Describe the Importance of Using PBL in Their Classrooms?

Teachers consistently described PBL as a powerful instructional approach that promotes essential skills such as collaboration, communication, and critical thinking while significantly increasing student engagement. These findings align with recent research identifying PBL as an effective method to foster authentic, student-centered learning experiences that prepare students for complex, real-world challenges. Studies show that PBL supports communication, collaboration, and other 21st-century competencies that students need to transfer their knowledge beyond classroom boundaries (Jelodari et al., 2025; Rehman et al., 2024; Wurdinger et al., 2020).

In this study, teachers also described how the purposeful integration of technology within PBL deepened student engagement. Rather than using devices for passive tasks, students used technology to support inquiry and communicate their project outcomes. Yağcı's (2018) findings highlights the role of technology in the

environments further enhances students' ability to research, create, and communicate their ideas, leading to deeper engagement and motivation. Similarly, the findings revealed that teachers observed students moving beyond passive use of technology for games or drills to more meaningful applications such as collaborative presentations and multimedia projects. Wurdinger et al. (2020) argued that such technology-enhanced, socially mediated learning experiences help nurture students' sense of hope and motivation in learning, which in turn strengthens engagement. Taken together, these studies reinforce that PBL is more than just an instructional strategy; it creates a learning culture centered on social interaction, active engagement, and student agency—key elements that teachers in Saipan valued highly.

The second RQ explored teachers' perspectives on the ease of using PBL, focusing on the challenges and facilitators of implementation. Teachers acknowledged that while PBL is highly rewarding, it often requires significant time, careful planning, and flexibility to align with curriculum standards. Teachers emphasized that the ease of implementation is closely connected to teacher preparedness, the availability of resources, and the specific classroom context.

RQ2: How do Elementary School Teachers Describe Their Perspectives on the Ease of Using PBL in Their Teaching?

Despite strong endorsements for the educational value of PBL, teachers in this study frequently described significant challenges related to its practical implementation, particularly citing the time-consuming nature of planning and managing projects. This challenge is well-documented in the literature. Henderson et al. (2021) identified a lack of teacher confidence as a significant barrier hindering the widespread adoption of PBL. Teachers also emphasized the importance of having

sufficient autonomy to adapt projects to their classrooms, echoing findings by Farrow et al. (2022), who noted that balancing curriculum requirements with flexible, student-centered instruction is crucial for successful implementation.

Professional development was another recurring theme. Teachers reported that one-off workshops were insufficient for building the confidence and practical skills needed for PBL, emphasizing the need for ongoing, collaborative, and practice-focused training. Other research highlighted that sustained PD programs are essential for helping teachers implement PBL effectively while maintaining instructional quality (Pan et al., 2024; Rizal et al., 2023). These findings collectively suggested that while PBL could transform learning experiences, its ease of implementation is closely tied to teacher preparation, professional support, access to resources, and the flexibility to adapt projects to individual classroom contexts.

The third RQ investigated how teachers described their successes with PBL. Many participants attributed their positive outcomes to ongoing support, access to instructional resources, and collaboration with colleagues or experts. Their experiences revealed that when adequate training and planning structures are in place, PBL may lead to meaningful student engagement, creativity, and skill development.

RQ3: How Do Elementary School Teachers Describe Their Success in Implementing PBL?

Teachers in this study shared a variety of successes, demonstrating that PBL can lead to significant cognitive, social, and motivational gains when implemented effectively. One notable success was the observation of deeper conceptual understanding and knowledge transfer across content areas, consistent with findings from Ospankulova et al. (2025), who reported that PBL positively influences learning,

critical thinking, and engagement in higher education settings. Another success that teachers described was how PBL energized students, encouraging creativity and enthusiasm. In “Mapping Enabling Conditions for High-Quality PBL,” Potvin et al. (2022) highlighted that in classrooms where teachers have agency and professional learning support, students tend to show more meaningful engagement and deeper disciplinary thinking. Collectively, these successes underscore that PBL, when well supported, has the potential to reshape classroom culture toward more student-driven, active learning.

The increased use of digital tools during projects, as reported by teachers, is echoed by recent research highlighting blended and technology-integrated learning environments as catalysts for fostering student engagement, autonomy, and ownership of learning (Sánchez-García & Reyes-de-Cózar, 2025; Zheng et al., 2024). Teachers also highlighted peer mentoring and collaborative problem-solving as indicators of success, consistent with current studies that show PBL supports social learning through the co-construction of knowledge and group interactions, which promote leadership, communication, and empathy among students (Costa, 2025). This peer collaboration deepened not only academic understanding but also fostered essential social-emotional skills for holistic student development.

Collectively, these successes demonstrate that PBL, when adequately supported, can transform classroom culture from teacher-centered to student-centered, promoting active and meaningful learning experiences. The teachers’ reflections affirm that PBL is a viable approach for enhancing academic outcomes while simultaneously nurturing creativity and interpersonal skills, which are key for

preparing students to meet future educational and professional challenges (Dean et al., 2023; Morrison et al., 2020).

The fourth RQ examined the types of support teachers identified as essential for successful PBL implementation. Participants emphasized the importance of having sufficient materials, technological tools, and administrative backing to facilitate project-based instruction. They also noted that professional development and scheduling flexibility play a critical role in ensuring that PBL can be delivered effectively and sustainably.

RQ4: How Do Elementary School Teachers Describe the Support They Need to Implement PBL Effectively?

Teachers in this study emphasized the importance of both material and institutional support to implement PBL successfully. The critical importance of access to sufficient physical and digital resources aligns with findings by Sánchez-García and Reyes-de-Cózar (2025) and Markula and Aksela (2022), who identified resource availability, including technology, as a key factor in successful PBL implementation. Many teachers reported scaling back or modifying projects due to limited materials, emphasizing that adequate resourcing is a prerequisite for ambitious, authentic projects.

Equally important was the role of strong administrative leadership and support. Teachers expressed that school leaders who provided flexible scheduling, dedicated collaboration time, and ongoing encouragement created an environment conducive to instructional innovation. Darling-Hammond et al. (2021) similarly argued that school leadership is a pivotal factor in fostering deeper learning opportunities by cultivating supportive conditions and promoting teacher growth. The

presence of such leadership increased teachers' confidence and willingness to take risks in their pedagogy.

Lastly, teachers expressed a desire for enhanced community partnerships and access to expert knowledge to enrich student learning experiences. These sentiments mirror Thomas' (2000) assertion that expert involvement enhances PBL authenticity but also requires coordinated institutional support for successful integration. Taken together, these findings suggest that while teachers are committed to PBL, systemic supports—such as adequate materials, leadership, and community collaboration—are essential to overcome challenges and sustain high-quality PBL in elementary classrooms.

Limitations of the Study

The study is subject to several limitations that impact its trustworthiness and the extent to which the findings may be applied to other contexts. First, the analysis relies heavily on individual interviews, which may introduce personal biases and subjectivity in the teachers' responses. Because the findings are based on personal narratives, the perspectives shared may not represent the full range of attitudes held by all elementary teachers regarding PBL. Second, a significant limitation arises from the exclusion of pre-service and special education teachers from the study, which may have led to missed insights that these groups could provide regarding the implementation of PBL in diverse educational contexts. Finally, the study may be susceptible to selection bias. Although efforts were made to recruit a range of participants, the sample may inadvertently reflect certain demographic or experiential characteristics more strongly than others. This limitation may reduce the

generalizability of the findings across broader populations of teachers and school settings.

Recommendations for Further Research

Future research should broaden the teacher demographics by including a more diverse range of elementary school teachers from various socioeconomic backgrounds and different school settings, including urban and rural schools. Expanding the sample in this way would provide a more comprehensive understanding of how PBL is perceived and implemented across various contexts.

In addition, future studies should examine the role of professional development in supporting teachers' adoption of PBL. Future studies should examine the impact of different training approaches, including workshops, online courses, and peer collaboration, on teachers' confidence and preparedness to implement PBL effectively. This line of research would help identify the most effective strategies for teacher training and professional growth in relation to PBL.

Another important direction for future research is the examination of student outcomes resulting from the implementation of PBL. By assessing factors such as academic achievement, student engagement, and social skills development, researchers can provide a more comprehensive evaluation of the impact PBL has on learners. Linking teacher perspectives to student outcomes would further strengthen the evidence base supporting PBL as a practical instructional approach.

Finally, future studies may benefit from employing mixed-methods research designs that combine both qualitative and quantitative data. This research design would enhance the validity and reliability of future findings. Combining interviews with surveys or classroom observations would allow researchers to quantitatively

capture broader trends while maintaining the depth of qualitative insights. This integrated approach would contribute to a more robust and nuanced understanding of PBL implementation in elementary education.

Implications

Implications for Administrators

The findings of this study offer valuable insights for school administrators seeking to improve the implementation of PBL. Understanding the specific needs and challenges teachers face in adopting PBL allows administrators to design targeted PD that directly supports effective PBL implementation. Ongoing PD workshops that focus on practical strategies, lesson planning, and the integration of technology can help build teachers' confidence and instructional skills.

Administrators also play a key role in creating structures that support teacher collaboration. Providing time during the school day or through professional learning communities enables teachers to share best practices, co-plan projects, and support one another in overcoming obstacles. Such collaboration not only improves the quality of PBL implementation but also builds a positive organizational culture centered on innovation and continuous improvement.

In addition, administrators must ensure that teachers have access to adequate resources, including technology, instructional materials, and dedicated time for planning. When these supports are available, teachers are better able to design and facilitate meaningful PBL experiences for their students. Administrators who prioritize these conditions help cultivate an environment where PBL can thrive, ultimately improving student engagement, achievement, and the overall quality of instruction.

Positive Social Change

The findings of this study have several implications for positive social change at the individual, family, organizational, and societal levels. At the individual level, teachers' strengthened understanding and use of PBL can enhance student engagement, motivation, and development of critical 21st-century skills such as critical thinking, collaboration, and problem-solving. These active learning experiences help prepare students for future academic and career demands.

At the family level, PBL may encourage increased family involvement in children's learning. When students engage in meaningful, hands-on projects, families who often participate by supporting project activities at home, which can strengthen home-school connections and reinforce learning beyond the classroom.

At the organizational level, schools that adopt PBL can promote a more collaborative professional culture. Sharing strategies, co-planning, and exchanging resources may enhance morale, support professional growth, and promote a collective commitment to innovative teaching practices. Such collaboration can help improve teacher retention and strengthen the overall school community.

At the societal level, the study's findings contribute to broader conversations about effective instructional practices. Insights from this research may inform policymakers and educational leaders as they consider investments in teacher training, curriculum support, and resources needed to expand PBL in schools. By prioritizing instructional approaches that support student agency and real-world learning, communities can better prepare learners to participate meaningfully in a dynamic and global society.

Theoretical Implications

This study reinforces the constructivist framework underpinning the use of PBL by demonstrating how teachers' beliefs about student-centered learning influence instructional practices. The findings support the constructivist view that learning is an active, social process where students construct knowledge through engagement with meaningful tasks. Teachers who embraced PBL described practices that reflected core constructivist principles, such as student autonomy, collaboration, and learning through exploration, which aligns with existing research on how beliefs influence pedagogical choices.

The results also extend understanding of how teacher perceptions influence PBL implementation. As noted by Du et al. (2019), teachers with positive beliefs about student-centered instruction are more likely to show flexibility and adapt their teaching to support inquiry-based learning. The findings from this study similarly suggest that teachers who viewed PBL favorably demonstrated greater willingness to modify lessons, scaffold learning, and encourage active participation.

Finally, the study highlights the importance of ongoing support in sustaining constructivist practices such as PBL. Teachers' reflections emphasized that collaboration with colleagues, access to resources, and supportive leadership are critical for maintaining practices grounded in constructivist theory. This underscores the need for professional development and organizational structures that encourage shared learning and continuous instructional growth.

Recommendations for Practice

Based on the findings of this study, several practice recommendations were developed. First, educational leaders should prioritize professional development programs that focus on PBL implementation. These programs should emphasize not

only the theoretical aspects of PBL but also practical strategies that teachers can readily apply in their classrooms.

Second, schools should foster a culture of collaboration among teachers, encouraging them to share best practices and resources related to PBL. This collaborative spirit can be nurtured through regular professional learning communities or peer mentoring programs, allowing teachers to learn from one another's experiences.

Finally, schools must ensure that teachers have access to the resources and support necessary for successful PBL implementation. This support includes access to materials, time for planning, and administrative support. When these conditions are in place, teachers are better equipped to implement PBL successfully and to provide meaningful, engaging learning experiences for their students.

Conclusion

In this study, I explored elementary teachers' perspectives on the benefits of PBL, the ease or difficulty when implementing PBL, and the professional support needed to implement PBL in Saipan. This investigation underscores the crucial importance of examining how educators perceive PBL, both as a student-centered learning strategy and as a professional instructional practice. This study identified themes related to the importance, challenges, successes, and support needs associated with PBL.

First, teachers consistently described PBL as a powerful tool for promoting student engagement, collaboration, and deeper learning, particularly through real-world applications and peer interaction. Second, teachers emphasized that while PBL is valuable, it requires significant time, planning, and flexibility, often adding to their

existing workload and scheduling challenges. Third, the success of PBL depends heavily on ongoing access to resources, strong administrative support, and structured professional development opportunities. Finally, teachers expressed that effective PBL implementation requires ongoing support, resources, and professional development. Collectively, these themes highlight that while teachers are enthusiastic about PBL's potential, they also identify clear conditions that must be met for successful implementation.

References

Ahdhianto, E., Marsigit, H., & Nurfauzi, Y. (2020). Improving fifth-grade students' mathematical problem-solving and critical thinking skills using problem-based learning. *Universal Journal of Educational Research*, *8*(5), 2012–2021. https://doi.org/10.13189/ujer.2020.080539

Aidoo, B. (2023). Teacher educators' experience adopting problem-based learning in science education. *Education Sciences*, *13*(11), 1113. https://doi.org/10.3390/educsci13111113

Al-Abdullatif, A. M., & Gameil, A. A. (2021). The effect of digital technology integration on students' academic performance through project-based learning in an e-Learning environment. *International Journal of Emerging Technologies in Learning*, *16*(11), 210–220. https://doi.org/10.3991/ijet.v16i11.19421

Albar, S. B., & Southcott, J. E. (2021). Problem and project-based learning through an investigation lesson: Significant gains in creative thinking behavior within the Australian Foundation (preparatory) classroom. *Thinking Skills and Creativity*, *41*, 100853. https://doi.org/10.1016/j.tsc.2021.100853

Al-Busaidi, S., & Al-Seyabi, F. (2021). Project-based learning as a tool for student teachers' professional development: A study in an Omani EFL teacher education program. *International Journal of Learning, Teaching and Educational Research*, *20*(4), 116–136. https://doi.org/10.26803/ijlter.20.4.7

Aldabbus, S. (2018). Project-based learning: Implementation and challenges. *International Journal of Education, Learning, and Development*, *6*(3), 71–79. https://www.eajournals.org/journals/international-journal-of-education-

learning-and-development-ijeld/vol-6-issue-3-march-2018/project-based-learning-implementation-challenges/

Alhabsi, S. S. (2024). Ethical considerations in obtaining informed consent in research participation. *International Journal of Educational Contemporary Explorations*, *1*(1), 22–32. https://doi.org/10.69481/DIVL1152

Almulla, M. A. (2020). The effectiveness of the project-based learning (PBL) approach as a way to engage students in learning. *Sage Open*, *10*(3), 1–15. https://doi.org/10.1177/2158244020938702

Al-Thani, N. J., & Ahmad, Z. (2025). Driving project-based learning and problem-based learning through research in middle schools. In *Teaching and learning with research cognitive theory* (pp. 45–58). Springer. https://www.researchgate.net/profile/Saleh-Al-Busaidi/publication/351989477_Project-based_Learning_as_a_Tool_for_Student-Teachers'_Professional_Development_A_Study_in_an_Omani_EFL_Teacher_Education_Program/links/60daa0eb92851ca944940c71/Project-based-Learning-as-a-Tool-for-Student-Teachers-Professional-Development-A-Study-in-an-Omani-EFL-Teacher-Education-Program.pdf

Amiri, S. M. H. (2025). Project-based learning pedagogy: Bridging theory and practice for real-world impact. *SSRN*. https://doi.org/10.2139/ssrn.5333995

Anggraeni, D. M., Binar, K., Suprapto, N., & Shofiyah, N. (2023). Systematic review of problem-based learning research in fostering critical thinking skills. *Thinking Skills and Creativity*, *49*, 101334. https://doi.org/10.1016/j.tsc.2023.101334

Ariza, J. Á., & Olatunde-Aiyedun, T. G. (2023). Bringing project-based learning into renewable and sustainable energy education: A case study on the development of the electric vehicle EOLO. *Sustainability*, *15*(13), 10275. https://doi.org/10.3390/su151310275

Bartz, D. (2023). *A phenomenological case study of teacher perceptions on the effectiveness of project-based learning* [Doctoral dissertation, St. John's University]. St. John's Scholar. https://scholar.stjohns.edu/cgi/viewcontent.cgi?article=1553&context=theses_dissertations

Bazen, A., Barg, F. K., & Takeshita, J. (2021). Research techniques made simple: An introduction to qualitative research. *Journal of Investigative Dermatology*, *141*(2), 241–247. https://doi.org/10.1016/j.jid.2020.11.029

Belwal, R., Belwal, S., Sufian, A. B., & Al Badi, A. (2020). Project-based learning (PBL): Outcomes of students' engagement in an external consultancy project in Oman. *Education + Training*, *63*(3), 336–359. https://doi.org/10.1108/et-01-2020-0006

Bendlage, A. C. (2021). *The effect of project-based learning on student mastery of NGSS practice (Master's thesis). Northwestern College.*. https://nwcommons.nwciowa.edu/cgi/viewcontent.cgi?article=1273&context=education_masters

Bielik, T., Finnie, K., Peek-Brown, D., Klager, C., Touitou, I., Schneider, B., & Krajcik, J. (2022). High school teachers' perspectives on shifting towards teaching NGSS-aligned project based learning curricular units. *Journal of*

Science Teacher Education, *33*(4), 413–434. https://doi.org/10.1080/1046560x.2021.1961973

Braun, V., & Clarke, V. (2022). *Thematic analysis: A practical guide*. SAGE Publications.

Bulu, V. R., & Tanggur, F. (2021). The effectiveness of STEM-based PjBL on student's critical thinking skills and collaborative attitude. *Al-Jabar: Journal Pendidikan Matematika*, *12*(1), 219—228. https://ejournal.radenintan.ac.id/index.php/al-jabar/article/view/8831/4457

Busetto, L., Wick, W., & Gumbinger, C. (2020). How to use and assess qualitative research methods. *Neurological Research and Practice*, *2*, 14. https://doi.org/10.1186/s42466-020-00059-z

Cai, Z., Zhu, J., Yu, Y., & Tian, S. (2023). Elementary school teachers' attitudes towards project-based learning in China. *Humanities and Social Sciences Communications*, *10*(1), 1–11. https://doi.org/10.1057/s41599-023-02206-8

Campbell, D., & Francis, J. (2024). *Using mind maps to deliver phenomenon-based learning in a Post-1992 university: An academic perspective.* In *Proceedings of EDULEARN 24 (16th International Conference on Education and New Learning Technologies, Palma, Spain, 1-3 July 2024)* (pp. 2065-2073). IATED Digital Library. https://doi.org/10.21125/edulearn.2024.0601

Campbell, S., Greenwood, M., Prior, S., Shearer, T., Walkem, K., Young, S., Bywaters, D., & Walker, K. (2020). Purposive sampling: Complex or simple? Research case examples. *Journal of Research in Nursing*, *25*(8), 652–661. https://doi.org/10.1177/1744987120927206

Caniglia, G., Lüderitz, C., von Wirth, T., Fazey, I., Martín-López, B., Hondrila, K., König, A., von Wehrden, H., Schäpke, N., Laubichler, M. D., & Lang, D. J. (2021). A pluralistic and integrated approach to action-oriented knowledge for sustainability. *Nature Sustainability*, *4*(2), 93–100. https://doi.org/10.1038/s41893-020-00616-z

Çetin, A. (2020). Examining project-based STEM training in a primary school. *International Online Journal of Education and Teaching*, *7*(3), 811–825. https://files.eric.ed.gov/fulltext/EJ1258419.pdf

Chen, C. H., & Yang, Y. C. (2019). Revisiting the effects of project-based learning on students' academic achievement: A meta-analysis investigating moderators. *Educational Research Review*, *26*, 71–81. https://doi.org/10.1016/j.edurev.2018.11.001

Clayton, M. V. (2023). *The causal-comparative analysis of academic performance of high school students with and without disabilities in the face-to-face and online educational settings*. (Doctoral dissertation, Liberty University). ProQuest Dissertations Publishing, 2023. 30817981. https://digitalcommons.liberty.edu/cgi/viewcontent.cgi?article=6097&context=doctoral

Costa, S. A. (2025). *Extending problem based learning, argumentation and transactivity through knowledge building* (Doctoral dissertation, University of Toronto (Canada). https://utoronto.scholaris.ca/server/api/core/bitstreams/dac290fd-91b4-4608-b507-a7cf1e001011/content

Courtemanche, D. (2022). *A narrative inquiry of the relationship between principal walk-through evaluations and teacher identity* (Doctoral dissertation). Texas Tech University. https://ttu-ir.tdl.org/server/api/core/bitstreams/37f268c3-a464-4868-ada0-2530f534143c/content

Darling-Hammond, L., Flook, L., Cook-Harvey, C., Barron, B., & Osher, D. (2021). Implications for educational practice of the science of learning and development. *Applied Developmental Science, 24*(2), 97–140. https://doi.org/10.1080/10888691.2018.1537791

Dean, C. G.-P., Grossman, P., Enumah, L., Herrmann, Z., & Kavanagh, S. S. (2023). Core practices for project-based learning: Learning from experienced practitioners in the United States. *Teaching and Teacher Education, 133*, 104275. https://doi.org/10.1016/j.tate.2023.104275

Du, X., Chaaban, Y., & Mabrd, Y. A. (2019). Exploring the concepts of fidelity and adaptation in implementing project-based learning in the elementary classroom: Case studies from Qatar. *International Journal of Learning, Teaching and Educational Research, 18*(9), 1–22.

Duke, N. K., Halvorsen, A. L., Strachan, S. L., Kim, J., & Konstantopoulos, S. (2021). Putting PjBL to the test: The impact of project-based learning on second graders' social studies and literacy learning and motivation in low-SES school settings. *American Educational Research Journal, 58*(1), 160–200. https://doi.org/10.3102/0002831220929638

Elfeky, A. I. M., Alharbi, S. M., & Ahmed, E. S. A. H. (2022). The effect of project-based learning in enhancing creativity and skills of arts among kindergarten student teachers. *Journal of Positive School Psychology*, *6*(8), 2182–2191.

Farrow, J., Kavanagh, S. S., & Samudra, P. (2022). Exploring relationships between professional development and teachers' enactments of project-based learning. *Education Sciences*, *12*(4), 282. https://doi.org/10.3390/educsci12040282

Ferrero, M., Vadillo, M. A., & León, S. P. (2021). Is project-based learning effective among kindergarten and elementary students? A systematic review. *PLOS ONE*, *16*(4), e0249627. https://doi.org/10.1371/journal.pone.0249627

Ghani, A. S., Rahim, A. F., Yusoff, M. S., & Hadie, S. N. (2021). Effective learning behavior in problem-based learning: A scoping review. *Medical Science Educator*, *31*(3), 1199–1211. https://doi.org/10.1007/s40670-021-01292-0

Guo, P. (2021). *Online project-based higher education: student collaboration and outcomes* (Doctoral dissertation, Leiden University). https://hdl.handle.net/1887/3209246

Guo, P., Saab, N., Post, L. S., & Admiraal, W. (2020). A review of project-based learning in higher education: Student outcomes and measures. *International Journal of Educational Research*, *102*, 101586. https://doi.org/10.1016/j.ijer.2020.101586.

Haatainen, O., Turkka, J., & Aksela, M. (2021). Science teachers' perceptions and self-efficacy beliefs related to integrated science education. *Education Sciences*, *11*(6), 272. https://doi.org/10.3390/educsci11060272

Harefa, M., & Utami, N. C. M. (2023). Improving narrative text writing skills using project-based learning techniques in elementary school. *Jurnal Cakrawala Pendas*, *9*(3), 390–398. https://ejournal.unma.ac.id/index.php/cp/article/view/4919

Henderson, K. J., Coppens, E. R., & Burns, S. (2021). Addressing barriers to implementing problem-based learning. *AANA Journal*, *89*(2). https://research.ebsco.com/c/4wdw3l/search/details/ggpzktui6b?db=a9h

Hsin, C. T., & Wu, H. K. (2023). Implementing a project-based learning module in urban and indigenous areas to promote young children's scientific practices. *Research in Science Education*, *53*(1), 37–57. https://link.springer.com/article/10.1007/s11165-022-10043-z

Hwang, H. J., & Kang, E. (2023). The importance of anonymity and confidentiality for conducting survey research. *Journal of Research and Publication Ethics*, *4*(1), 1–7. https://www.researchgate.net/publication/370048267

Issa, H. B., & Khataibeh, A. (2021). The effect of using project-based learning on improving the critical thinking among upper basic students from teachers' perspectives. *Pegem Journal of Education and Instruction*, *11*(2), 52–57. https://files.eric.ed.gov/fulltext/EJ1302127.pdf

Jelodari, Z., Zenouzagh, Z. M., & Hashamdar, M. (2025). Exploring PBL and e-PBL: implications for 21st-century skills in EFL education. *Discover Education*, *4*(1), 311. https://doi.org/10.1007/s44217-025-00773-3

Judijanto, L. (2021). Patterns, trends, and gaps in the current pool of knowledge: Contributing to a more diverse understanding of PBL in the context of secondary education. *QALAMUNA: Jurnal Pendidikan, Sosial, dan Agama*, *13*(2), 969–980. https://doi.org/10.37680/qalamuna.v13i2.4317

Juuti, K., Lavonen, J., Salonen, V., Salmela-Aro, K., Schneider, B., & Krajcik, J. (2021). A teacher–researcher partnership for professional learning: Co-designing project-based learning units to increase student engagement in

science classes. *Journal of Science Teacher Education*, *32*(6), 625–641. https://doi.org/10.1080/1046560x.2021.1872207

Khasawneh, A. J., Khasawneh, M. A. S., Al-Sarhan, K. E., & Alkhawaldeh, M. A. (2023). Assessment of the perspectives of experts on the evolution of translation education in the 21st century. *Migration Letters*, *20*(S2), 894–908.

Kofler, I., Innerhofer, E., Marcher, A., Gruber, M., & Pechlaner, H. (2020). *The future of high-skilled workers: regional problems and global challenges*. Springer Nature. https://doi.org/10.1007/978-3-030-42871-6

Kristianto, I. I., & Harendita, M. E. (2022). The implementation of project-based learning in an ESP class to improve reading and speaking skills. *ELTR Journal*, *6*(1), 1–10. https://doi.org/10.37147/eltr.v6i1.126

Liao, J., Yang, J., & Zhang, W. (2021). The student-centered STEM learning model based on artificial intelligence project: A case study on intelligent car. *International Journal Emerging Technologies in Learning (iJET)*, *16*(21), 100–120. https://doi.org/10.3991/ijet.v16i21.25001

Lim, W. M. (2025). What is qualitative research? An overview and guidelines. *Australasian Marketing Journal*, *33*(2), 199–229. https://doi.org/10.1177/14413582241264619

Llorent, V. J., González-Gómez, A. L., & Farrington, D. P. (2022). Improving literacy competence and social and emotional competencies in primary education through cooperative project-based learning. *Psicothema*, *34*(1), 102–109. https://doi.org/10.7334/psicothema2020.372

Makewa, L. N. (2019). Constructivism theory in technology-based learning. *In Technology-supported teaching and research methods for educators* (pp. 268–287). IGI Global. https://doi.org/10.4018/978-1-5225-5915-3.ch015

Markula, A., & Aksela, M. (2022). The key characteristics of project-based learning: how teachers implement projects in K-12 science education. *Disciplinary and Interdisciplinary Science Education Research*, *4*(1), Article 2. https://doi.org/10.1186/s43031-021-00042-x

Marsiti, C. I. R., Santyasa, I. W., Sudatha, I. G. W., & Sudarma, I. K. (2023). The effect of project-based blended learning and students' creativity on eleventh-grade students' learning achievement. *International Journal of Instruction*, *16*(4), 805–826. https://doi.org/10.29333/iji.2023.16445a

McKim, C. (2023). Meaningful member-checking: A structured approach to member-checking. *American Journal of Qualitative Research*, *7*(2), 41–52. https://www.ajqr.org/download/meaningful-member-checking-a-structured-approach-to-member-checking-12973.pdf

Meng, N., Dong, Y., Roehrs, D., & Luan, L. (2023). Tackle implementation challenges in project-based learning: A survey study of PBL e-learning platforms. *Educational Technology Research and Development*, *71*(3), 1179–1207. https://doi.org/10.1007/s11423-023-10202-7

Mitry, M. M. (2021). Translating constructivism into pedagogy from philosophy to practice: Active project-based learning. *The International Journal of Humanities Education*, *19*(1), 39–51. https://doi.org/10.18848/2327-0063/CGP/v19i01/39-51

Moallem, M. (2019). Effects of PBL on learning outcomes, Knowledge Acquisition, and higher-order Thinking skills. In M. Moallem, W. Hung, & N. Dabbagh (Eds.), *The Wiley Handbook of Problem-Based Learning*, pp. 107–133. https://doi.org/10.1002/9781119173243.ch5

Morrison, J., Frost, J., Gotch, C., McDuffie, A. R., Austin, B., & French, B. (2020). Teachers' role in students' learning at a project-based STEM high school: Implications for teacher education. *International Journal of Science and Mathematics Education, 19*(6), 1103–1123. https://doi.org/10.1007/s10763-020-10108-3

Motulsky, S. L. (2021). Is the member checking the gold standard of quality in qualitative research? *Qualitative Psychology*, *8*(3), 389. https://doi.org/10.1037/qup0000215

Mwita, K. (2022). Factors to consider when choosing data collection methods. *Available at SSRN 4880486*. https://doi.org/10.2139/ssrn.4880486

Nassaji, H. (2020). Good qualitative research. *Language Teaching Research*, *24*(4), 427–431. https://doi.org/10.1177/1362168820941288

Navy, S. L., & Kaya, F. (2020). PBL as a pedagogical approach for integrated STEM: Evidence from prospective teachers. *School Science and Mathematics, 120*(5), 285–296. https://doi.org/10.1111/ssm.12408

Ngereja, B., Hussein, B., & Andersen, B. (2020). Does project-based learning (PBL) promote student learning? A performance evaluation. *Education Sciences*, *10*(11), 330. https://doi.org/10.3390/educsci10110330

Nguyen, T., Nguyen, T., Thai, T., Truong, T., & Nguyen, T. (2024). Teaching mathematics through project-based learning in K-12 schools: A systematic

review of current practices, barriers, and future developments. *Journal of Educational Research and Practice, 13*(3). https://doi.org/10.18421/tem133-33

Nii Laryeafio, M., & Ogbewe, O. C. (2023). Ethical consideration dilemma: systematic review of ethics in qualitative data collection through interviews. *Journal of Ethics in Entrepreneurship and Technology*, *3*(2), 94–110. https://doi.org/10.1108/jeet-09-2022-0014

Ortega, Y. (2024). Charlas y comidas: Humanising focus groups and interviews. *Qualitative Research*, *24*(4), 773–792. https://doi.org/10.1177/14687941231176947

Ospankulova, E., Maxutov, S., Lathrop, R., Anuarova, L., & Balta, N. (2025). Science students' attitudes, learning, critical thinking and engagement in project-based learning. *Cogent Education*, *12*(1), 2445358. https://doi.org/10.1080/2331186x.2024.2445358

Pan, H. L. W., Chen, C. H., & Wiens, P. D. (2024). Teacher professional development and practice of project-based learning in Taiwan: The moderating effect of self-efficacy. *Asia Pacific Journal of Education*, *44*(4), 707–722. https://doi.org/10.1080/02188791.2022.2114423

Panasan, M., & Nuangchalerm, P. (2010). Learning outcomes of project-based and inquiry-based learning activities. *Journal of Social Sciences*, *6*(2), 252–255.https://doi.org/10.3844/jssp.2010.252.255

Park, S. H., & Ertmer, P. A. (2007). Impact of problem-based learning (PBL) on teachers' beliefs regarding technology use. *Journal of Research on*

Technology in Education, *40*(2), 247–267. https://doi.org/10.1080/15391523.2007.10782507

Potvin, A. S., Miller, E. A., Kuck, R., Berland, L. K., Boardman, A. G., Kavanagh, S. S., Newman, K. R., Duran, M., Friedrich, T., & Cheng, B. H. (2022). Mapping enabling conditions for high-quality PBL: A collaboratory approach. *Education Sciences*, *12*(3), 222. https://doi.org/10.3390/educsci12030222

Ramli, F., Ayub, A. F., Zulnaidi, H., Salim, N. R., & Gopal, K. (2020). Impact of problem-based learning strategy on students' mathematical value among secondary school students. *Universal Journal of Educational Research*, *8*(8), 3295–3302. https://doi.org/10.13189/ujer.2020.080801

Razak, A. A., Ramdan, M. R., Mahjom, N., Zabit, M. N. M., Muhammad, F., Hussin, M. Y. M., & Abdullah, N. L. (2022). Improving critical thinking skills in teaching through problem-based learning for students: A scoping review. *International Journal of Learning, Teaching and Educational Research*, *21*(2), 342–362. https://doi.org/10.26803/ijlter.21.2.19

Rechsteiner, B., Compagnoni, M., Wullschleger, A., Schäfer, L. M., Rickenbacher, A., & Merki, K. M. (2022). Teachers involved in school improvement: Analyzing mediating mechanisms of teachers' boundary-crossing activities between leadership perception and teacher involvement. *Teaching and Teacher Education*, *116*, 103774. https://doi.org/10.1016/j.tate.2022.103774

Rees Lewis, D. G., Gerber, E. M., Carlson, S. E., & Easterday, M. W. (2019). Opportunities for educational innovations in authentic project-based learning: Understanding instructor perceived challenges to design for adoption.

Educational Technology Research and Development, 67(4), 953–982. https://doi.org/10.1007/s11423-019-09673-4

Rehman, N., Huang, X., Mahmood, A., AlGerafi, M. A., & Javed, S. (2024). Project-based learning as a catalyst for 21st-Century skills and student engagement in the math classroom. *Heliyon*, *10*(23), e39988. https://doi.org/10.1016/j.heliyon.2024.e39988

Rizal, S., Prayogi, S., Muhali, M., & Kurnia, N. (2023). Problem-Based Learning (PBL) in Science Education: A Literature Review Study. *Lensa: Jurnal Kependidikan Fisika*, *11*(2), 116–136 https://ojspanel.undikma.ac.id/index.php/Lensa/article/view/14671/6816

Rowlands, J. (2021). Interviewee transcript review as a tool to improve data quality and participant confidence in sensitive research. *International Journal of Qualitative Methods*, *20*, 16094069211066170. https://doi.org/10.1177/16094069211066170

Saldaña, J. (2021). The coding manual for qualitative researchers. SAGE Publication. ISBN–13: 978–1529731743. https://www.karlancer.com/api/file/1689576529-m4EL.pdf

Sánchez-García, R., & Reyes-de-Cózar, S. (2025). Enhancing Project-Based Learning: A Framework for Optimizing Structural Design and Implementation—A Systematic Review with a Sustainable Focus. *Sustainability (2071–1050)*, *17*(11), Article 4978. https://doi.org/10.3390/su17114978

Stahl, N. A., & King, J. R. (2020). Expanding approaches for research: Understanding and using trustworthiness in qualitative research. *Journal of Developmental Education*, *44*(1), 26–28. https://files.eric.ed.gov/fulltext/EJ1320570.pdf

Stehle, S. M., & Peters-Burton, E. E. (2019). Developing students' 21st-century skills in selected exemplary inclusive STEM high schools. *International Journal of STEM Education*, *6*(1), 1–15. https://doi.org/10.1186/s40594-019-0192-1

Suryanti, N., & Nurhuda, N. (2021). The effect of problem-based learning with an analytical rubric on the development of students' critical thinking skills. *International Journal of Instruction*, *14*(2), 665–684. https://doi.org/10.29333/iji.2021.14237a

Susetyarini, E., Nurrohman, E., & Husamah, H. (2022). Analysis of students' collaborative, communication, critical thinking, and creative abilities through problem-based learning. *Jurnal Penelitian Dan Pengkajian Ilmu Pendidikan: E-Saintika*, *6*(1), 33–42.

Taquette, S. R., & Borges da Matta Souza, L. M. (2022). Ethical dilemmas in qualitative research: A Critical literature review. *International Journal of Qualitative Methods*, *21*, 160940692210787. https://doi.org/10.1177/16094069221078731

Thomas, J. W. (2000). *A review of research on project-based learning.* The Autodesk Foundation. https://tecfa.unige.ch/proj/eteach-net/Thomas_researchreview_PBL.pdf

Tsybulsky, D., & Oz, A. (2019). From frustration to insights: Experiences, attitudes, and pedagogical practices of preservice science teachers implementing PBL in

elementary school. *Journal of Science Teacher Education*, *30*(3), 259–279. https://doi.org/10.1080/1046560x.2018.1559560

Vasiliene-Vasiliauskiene, V., Vasiliauskas, A. V., & Sabaityte, J. (2020). Peculiarities of educational challenges implementing project-based learning. *World Journal on Educational Technology: Current Issues*, *12*(2), 136–149. https://doi.org/10.18844/wjet.v12i2.4816

Viro, E., Lehtonen, D., Joutsenlahti, J., & Tahvanainen, V. (2020). Teachers' perspectives on project-based learning in mathematics and science. *European Journal of Science and Mathematics Education*, *8*(1), 12–31. https://doi.org/10.30935/scimath/9544

White, S., Lock, G., Hastings, W., Cooper, M., Reid, J. A., & Green, B. (2021). Investing in sustainable and resilient rural social space: Lessons for teacher education. *Australian and International Journal of Rural Education*, *31*(2), 46–55. https://search.informit.org/doi/pdf/10.3316/informit.020173840308948

Wilhelm, S., Förster, R., & Zimmermann, A. (2019). Implementing competence orientation: Towards constructively aligned education for sustainable development in university-level teaching-and-learning. *Sustainability*, *11*(7), 1891. https://doi.org/10.3390/su11071891

Wurdinger, S., Newell, R., & Kim, E. S. (2020). Measuring life skills, hope, and academic growth at project-based learning schools. *Improving Schools*, *23*(3), 264–276. https://doi.org/10.1177/1365480220901968

Xia, X. (2025). Assessing the Quality of PBL. In *Localization and Quality Assessment of Project-Based Learning in China* (pp. 143–201). Springer Nature Singapore. https://doi.org/10.1007/978-981-96-7462-6_7

Yağcı, M. (2018). Web-mediated problem-based learning and computer programming: Effects of study approach on academic achievement and attitude. *Journal of Educational Computing Research, 56*(2), 272–292. https://doi.org/10.1177/0735633117706908

Zhang, L., & Ma, Y. (2023). A study of the impact of project-based learning on student learning effects: a meta-analysis study. *Frontiers in Psychology*, *14*, 1202728. https://doi.org/10.3389/fpsyg.2023.1202728

Zhang, W., Guan, Y., & Hu, Z. (2024). The efficacy of project-based learning in enhancing computational thinking among students: A meta-analysis of 31 experiments and quasi-experiments. *Education and Information Technologies, 29(11)*, 14513–14545. https://doi.org/10.1007/s10639-023-12392-2

Zheng, C., Yuan, K., Guo, B., Hadi Mogavi, R., Peng, Z., Ma, S., & Ma, X. (2024, May). Charting the future of AI in project-based learning: A Co-design exploration with students. In *Proceedings of the 2024 CHI Conference on Human Factors in Computing Systems* (pp. 1–19). https://doi.org/10.1145/3613904.3642807

Appendix A: Interview Protocol

Good morning, my fellow educators! Thank you for participating in this research study on project-based learning. Let me introduce the purpose of the study. The purpose of this study is to explore the perspectives of elementary school teachers on project-based learning. To gain a deeper understanding of teachers' perspectives on PBL and how they implement it, I developed a series of open-ended questions to collect data and information for this study. I will record this interview to document and to ensure the accuracy of the data collection. Hopefully, the findings will contribute to the literature on PBL implementation and help elementary school teachers consistently integrate PBL into their classrooms. Any questions? Let's begin!

Before we begin the official interview, I would like to learn more about you and your experience with project-based learning, and to collect some data to describe the population and sample of this study.

Demographic Questions

1. How many years have you been teaching?
2. What grade level are you teaching now?

   How many years have you been teaching s in this grade level?
3. How many years have you been using PBL?
4. What subjects have you been using in PBL?
5. What is the class size while you are using PBL?
6. What is your ethnicity?
7. How do you hear about my study?

Thank you. Let us go ahead and move into the interview questions. My interview questions relate to elementary school teachers' perspectives on project-based learning.

RQs	Initial Questions	Probing Questions
RQ1: How do teachers describe the importance of using PBL?	• Discuss the importance of PBL for student learning. • How does PBL impact learning and engagement? • How is PBL different from other methods?	• Explain with examples why PBL is/is not important. • Examples of how PBL influenced understanding and engagement. • Share personal experiences shaping your view of PBL.
RQ2: How do teachers describe the ease of using PBL?	• Describe how easy or difficult PBL is in your practice. • How is technology used with PBL?	• Specific examples of when PBL was easy/difficult. • How your perspective changed and influencing factors.
RQ3: How do teachers describe successes with PBL?	• Examples of successful PBL projects. • Indicators of PBL's benefits. • Factors contributing to success.	• Differences between successful PBL and traditional methods. • Classroom examples. • How successes shaped your teaching.
RQ4: How do teachers describe support needed for PBL?	• What support is needed? • How do you access resources? • What challenges have you faced?	• Examples of support sought. • Helpful institutional/administrative factors. • Specific support challenges.

Appendix B: Codebook

Code	Definition	Interviewee Quote
1.3D Shapes and Vocabulary	Use of 3D modeling to reinforce vocabulary and geometry concepts.	"By seeing the students make the 3D shapes, they were able to remember the names better, and then also the vocabulary." (Interviewee 11)
2.Active Student Participation	Involvement of students in hands-on, meaningful tasks within the learning process.	"They retain the information a lot better... they have a deeper understanding..." (Interviewee 5)
3.Administrative Support	Support from school leadership to connect educators with external experts and logistics.	"Bringing in experts is great, but we also need administrative support for making those connections." (Interviewee 4)
4.AI Tools for Early Learners	Use of AI features to assist early grade students with reading, writing, or research.	"We introduce AI to the kids... So, some of the first graders, they're still learning how to read and write." (Interviewee 4)
5.AI-assisted Typing	Speech-to-text features that assist students with typing and information retrieval.	"When they go on the iPad and they go to Google and they type on the microphone... The AI will type it up for them and then it will come up with answers." (Interviewee 4)
6.Alternative Resources	Use of online tools or multimedia content when direct expert involvement is not available.	"That's when we use alternative resources like YouTube or BrainPOP videos." (Interviewee 4)
7.Career Relevance	Integration of career-related knowledge and skills into classroom projects.	"We try to give them a lot of aspects of career and how it's important to our community." (Interviewee 9)
8.Challenge of Shifting Methods	Difficulty of transitioning students from traditional instruction to project-based methods.	"It's going to be challenging because first, our students are used to the traditional teaching." (Interviewee 6)
9.Classroom Group Cohesion	Students building unity and shared responsibility through teamwork.	"Hive mind. You know, kids can work together as a hive trying to feed off each other's strengths and weaknesses." (Interviewee 7)
10.Classroom Peer Support	Students assisting one another, particularly with technology use.	"We have some students who are great in technology and they're helping their peers." (Interviewee 3)

Code	Definition	Interviewee Quote
11.Classroom Real-world Application	Using real-life situations in lessons to deepen learning and application.	"They were able to use real-world experiences to gain a better understanding of how to find area or perimeter." (Interviewee 5)
12.Classroom Resource Needs	Required materials, human support, and digital tools necessary for successful PBL.	"A lot of resources are needed both material-wise and human-wise." (Interviewee 8)
13.Classroom Strategy Application	Student application of problem-solving strategies during PBL.	"In PBL, students will be allowed to think about the problem and have the chance to apply strategies and different solutions." (Interviewee 6)
14.Classroom Time Management	Planning and organizing PBL lessons to fit within the school day.	"A lot of times teachers think, 'Oh, I have to prepare this much,' but I think it could be broken down daily." (Interviewee 1)
15.Classroom Vocabulary Preparation	Ensuring key vocabulary is introduced and understood before project implementation.	"I had to make sure I had all the vocabulary words, had access to the definition..." (Interviewee 11)
16.Collaborative Learning	Learning that occurs when students work in groups, sharing and building on ideas.	"The kids were working together, and it was a lot of group discussions." (Interviewee 9)
17.Collaborative Planning	Joint efforts between teachers in designing and refining PBL projects.	"Having the time to plan and collaborate with peers would make implementing PBL more seamless." (Interviewee 4)
18.Cognitive Learning	Enhancement of students' thinking skills through active engagement and discovery.	"PBL is very important because it enhances their cognitive learning." (Interviewee 3)
19.Combining PBL and Technology	Intentional integration of tech tools with project-based activities for richer learning.	"I think technology and PBL should be combined." (Interviewee 3)
20.Communication and Feedback	Students' verbal sharing of ideas, solutions, and constructive peer evaluations.	"The feedback process is different from traditional methods. They get peer reviews, which is much more constructive." (Interviewee 5)
21.Daily Project Breakdown	Structuring large projects into manageable daily tasks.	"A lot of times teachers think, 'Oh, I have to prepare this much,' but I

Code	Definition	Interviewee Quote
		think it could be broken down daily." (Interviewee 1)
22.Deeper Understanding	Improved comprehension and retention through experiential learning.	"They retain the information a lot better... they have a deeper understanding compared to just basic questions or problems being answered." (Interviewee 5)
23.Easier Implementation	Project rollout becomes smoother after the planning phase is completed.	"It was challenging in the beginning, but once the planning stage is done, implementing it becomes easier." (Interviewee 5)
24.Educational Technology Comfort	Students' confidence in using digital tools for learning.	"Kids nowadays are very comfortable with using technology." (Interviewee 1)
25.Engagement Factor	The extent to which students are involved and invested in the lesson.	"It's the engagement factor. Students are actively involved, rather than just listening and absorbing." (Interviewee 9)
26.Expert Improvisation	Adjusting to expert unavailability by using recorded media or role-playing.	"Bringing in an entomologist to talk about how insects contribute to biodiversity would be ideal, but we have to improvise." (Interviewee 4)
27.Expert Involvement	Inclusion of field specialists to enrich students' understanding of subject matter.	"It's very powerful when we bring in experts." (Interviewee 4)
28.Expert Substitution	Use of online videos or alternate resources in place of live experts.	"Sometimes to substitute that, if we don't bring in a guest, again, I would assign a video on YouTube or BrainPOP." (Interviewee 4)
29.Expert Support Importance	The necessity of external professional input to enhance learning depth.	"Bringing in experts is great, but we also need administrative support for making those connections." (Interviewee 4)
30.Flexible Learning	Adapting instruction to meet diverse student needs within a PBL framework.	"The flexibility of PBL allows me to help students who are struggling while also challenging those who are more advanced." (Interviewee 5)
31.Flexible Planning	Designing lessons that allow for changes based on student progress and needs.	"The planning part is the hardest part because you wanna make sure that whatever project you're doing, it's flexible enough for everyone." (Interviewee 5)

Code	Definition	Interviewee Quote
32.General Resource Acquisition	Locating and gathering basic tools and materials needed for PBL.	"You just need to get the resource of it." (Interviewee 002)
33.Google for Resources	Teachers sourcing ideas and instructional content from internet searches.	"I just Googled geometric city ideas. So I would use images." (Interviewee 11)
34.Google Search Skills	Teaching students to navigate search engines for research purposes.	"We teach them how to go on Google search. How to type. How to use voice command." (Interviewee 4)
35.Group-Based Problem Solving	Team collaboration to analyze and resolve complex challenges.	"The students got together in small groups and solved problems collaboratively, which was really rewarding." (Interviewee 7)
36.Group Cohesion	Unity among group members working on a shared goal.	"Hive mind. You know, kids can work together as a hive trying to feed off each other's strengths and weaknesses." (Interviewee 7)
37.Group Decision Making	Students jointly determining approaches and solutions.	"Augmenting someone's weaknesses and using other strengths to help the group get better." (Interviewee 4)
38.Human and Material Resources	Tangible and personnel support needed to implement PBL effectively.	"A lot of resources are needed both material-wise and human-wise." (Interviewee 8)
39.Idea Sourcing Online	Finding creative inspiration and examples for PBL via the web.	"I just Googled geometric city ideas. So I would use images." (Interviewee 11)
40.Improved Accessibility	Technology providing access to information and learning for all students.	"Technology helps us to accessibility and learning because we can, or be able to reach out to our students and make them visible to us." (Interviewee 2)
41.Information Retention	Long-term memory of academic content due to active learning.	"They retain the information a lot better... they have a deeper understanding compared to just basic questions or problems being answered." (Interviewee 5)
42.Learning from Peers	Students gaining knowledge by observing and interacting with classmates.	"Even though their reading level is low, they still can touch it, learn it, and they're only learning from each other, with their peers." (Interviewee 3)

Code	Definition	Interviewee Quote
43.Learning Ownership	Students taking initiative and responsibility for their educational progress.	“It’s more about discovery, and students take ownership of their learning.” (Interviewee 7)
44.Logistical Support Needed	Institutional backing required to handle the demands of PBL coordination.	“I wish there was more support to handle some of the logistical challenges that come with PBL.” (Interviewee 9)
45.Material List Creation	Listing necessary supplies before beginning the project.	“It doesn’t have to be a whole day thing. You could talk about it first, and then create a list of materials.” (Interviewee 1)
46.Methodological Consistency	Consistent use of interview protocols and processes for validity.	“Some of my previous school teachers were going to the mainland to attend the training.” (Interviewee 6)
47.Motivation	Students’ internal drive to participate and succeed in projects.	“It motivates them to work toward that goal. They’re aware, and it’s relevant to them, and they know what to expect.” (Interviewee 8)
48.More Engaged	Students showing greater involvement when lessons are student-driven.	“Because it was their ideas they’re putting down, they were a lot more engaged.” (Interviewee 5)
49.More Training	Teacher requests for ongoing PBL-specific professional development.	“More training... that’s the reason why I always...” (Interviewee 6)
50.Need for Administrative Support	Desire for school leadership to help facilitate expert and resource access.	“Bringing in experts is great, but we also need administrative support for making those connections.” (Interviewee 4)
51.Need for Resources and Support	Teachers’ expressed needs for materials, people, and time to implement PBL.	“It’s important to... have resources and support.” (Interviewee 9)
52.Past Training Logistics	Teachers’ previous experiences attending off-site or external PD.	“Some of my previous school teachers were going to the mainland to attend the training.” (Interviewee 6)
53.Peer Communication	Dialogue among students about tasks, challenges, and ideas.	“They’re sharing their own inputs, like what they think should be in the playground.” (Interviewee 1)

Code	Definition	Interviewee Quote
54.Peer Feedback	Students offering constructive suggestions to one another.	"The feedback process is different from traditional methods. They get peer reviews, which is much more constructive." (Interviewee 5)
55.Peer Support	Assistance from fellow students during collaborative tasks.	"We have some students who are great in technology and they're helping their peers." (Interviewee 3)
56.Peer-to-Peer Interaction	Reciprocal learning between students in a shared task.	"I've seen students who are quiet come out of their shells because they're learning with and from others." (Interviewee 7)
57.Planning Time	Scheduled time for teachers to develop, revise, and assess projects.	"It takes a lot of planning time." (Interviewee 11)
58.Preparation Work	The extensive setup required before launching PBL.	"It does require a lot of prep work." (Interviewee 1)
59.Problem Analysis	Students evaluating why certain ideas or processes work.	"They have to think whether it is working and why it is working that way." (Interviewee 6)
60.Professional Development	Training sessions for educators focused on effective PBL implementation.	"Although we heard we need more professional development." (Interviewee 6)
61.Project Ownership	Student investment in projects due to personal input and leadership.	"It's almost like they are the owner [of the project]." (Interviewee 1)
62.Project Preparation	Readiness steps before beginning classroom projects.	"The preparation does take a certain amount of preparation before we implement the project." (Interviewee 8)
63.Real-world Application	Connecting classroom content to real-life scenarios.	"They were able to use real-world experiences to gain a better understanding of how to find area or perimeter." (Interviewee 5)
64.Real-world Problem Solving	Tackling challenges that simulate or replicate actual community issues.	"Like I say, they [teachers]...students, huge impact. It helps them feel more real-world problems." (Interviewee 6)
65.Request for More Training	Teachers asking for additional support and skill-building opportunities.	"I would say, please give us more training." (Interviewee 6)

Code	Definition	Interviewee Quote
66.Resource Needs	Requirements for tools, materials, or people in PBL settings.	"A lot of resources are needed both material-wise and human-wise." (Interviewee 8)
67.Retention and understanding	Lasting student comprehension developed through exploration.	"They retain the information a lot better... they have a deeper understanding compared to just basic questions or problems being answered." (Interviewee 5)
68.Role Allocation	Assigning specific responsibilities to ensure group productivity.	"Unless there's designated roles, kids will fall into leader and follower." (Interviewee 3)
69.Self-solution	Students independently identifying and implementing solutions.	"They will find the answer to the question by giving solutions on their own." (Interviewee 6)
70.Specific Supply Needs	Clear identification of materials essential to completing PBL tasks.	"I had to get graph papers, all the supplies the kids need." (Interviewee 11)
71.Step-by-Step Learning with Tech	Using digital tools to guide students through multistep tasks.	"With grade school students, they're not really novices with devices... so, I would use technology more in their work presentations." (Interviewee 8)
72.Strategy Application	Use of various thinking or problem-solving strategies by students.	"In PBL, students will be allowed to think about the problem and have the chance to apply strategies and different solutions." (Interviewee 6)
73.Student Inputs	Learner contributions that influence the direction of the project.	"They're sharing their own inputs, like what they think should be in the playground." (Interviewee 1)
74.Student Support Through Tech	Technology enabling individual learning paths and needs.	"Actually, it's not difficult. We just have to provide what they need." (Interviewee 3)
75.Student-Centered Learning	Instruction that prioritizes student choice, voice, and interests.	"The students come up with questions that I never thought of." (Interviewee 2)
76.Student Familiarity with Devices	Students' ability to comfortably use hardware or applications.	"With grade school students, they're not really novices with devices." (Interviewee 8)
77.Technology Accessibility	Ensuring all students can utilize digital tools regardless of ability.	"Technology helps us to accessibility and learning because we can be able to reach out to our students and make them visible for us." (Interviewee 2)

Code	Definition	Interviewee Quote
78.Technology and PBL Combination	Pairing digital resources with inquiry-based projects.	"I think technology and PBL should be combined." (Interviewee 3)
79.Technology Comfort	Students' confidence in navigating tech-enhanced learning.	"Kids nowadays are very comfortable with using technology." (Interviewee 1)
80.Technology for Presentations	Digital tools used by students to display or explain work.	"By seeing the students make the 3D shapes... they were able to remember the names better." (Interviewee 11)
81.Text-to-Speech Features	Accessibility tools that convert written text to spoken words.	"We use voice commands and text-to-speech features to assist younger students still developing their reading and writing skills." (Interviewee 4)
82.Time Flies	Perception of faster time passage due to high engagement in tasks.	"They love it. Like today, we do PBL, and then the time is this fast. It's already 2:10 and time to go." (Interviewee 3)
83.Time for Planning	The necessary allocation of time for teachers to adequately prepare projects.	"Having the time to plan and collaborate with peers would make implementing PBL more seamless." (Interviewee 4)
84.Training Challenge	Difficulty faced due to insufficient teacher preparation.	"It's going to be challenging because first, our students are used to the traditional teaching." (Interviewee 6)
85.Use of Substitutes for Experts	Replacing guest speakers with digital content.	"Sometimes to substitute that, if we don't bring in a guest, again, I would assign a video on YouTube or BrainPOP." (Interviewee 4)
86.Visualization with Tech	Seeing learning outcomes or processes through simulations or visuals.	"By seeing the students make the 3D shapes, they were able to remember the names better, and then also the vocabulary." (Interviewee 11)
87.Vocabulary and Material Prep	Preparing key terms and resources prior to instruction.	"I had to make sure I had all the vocabulary words... And then I had to get graph papers." (Interviewee 11)
88.Vocabulary Preparation	Curating academic terms relevant to the project theme.	"I had to make sure I had all the vocabulary words... And then I had to get graph papers." (Interviewee 11)
89.Voice Command	Technology allowing students to navigate and search via speech.	"We teach them how to go on Google search, how to type, and how to voice command." (Interviewee 4)
90.Voice Command and Accessibility	Tech features that improve inclusion and participation.	"We use voice command and text-to-speech features to help them with

Code	Definition	Interviewee Quote
		research and make things more interactive." (Interviewee 4)
91.Work and Think Together	Promoting joint problem-solving and cooperative learning.	"PBL gives them a chance to work together and think together, which makes the class more engaging." (Interviewee 5)
92.Work Together	Students collaborating effectively to achieve a shared goal.	"They really made it together, like they work as a group, they collaborate, they discuss." (Interviewee 002)

Appendix C: Transition from Initial Themes to Final Themes

Initial Themes (Grouped from Codes)	Changes Made	Final Themes
Collaboration and Peer Interaction (e.g., Collaborative Learning, Work and Think Together, Peer-to-Peer Interaction, Group Cohesion, Peer Support, Role Allocation, Learning from Peers, Group-Based Problem Solving)	Merged with Student Voice and Choice to form a comprehensive theme emphasizing cooperative learning and learner agency.	Student Engagement and Ownership of Learning
Student Voice and Choice (e.g., Project Ownership, Learning Ownership, Student Inputs, Motivation, More Engaged, Engagement Factor, Time Flies)	Combined with Collaboration and Peer Interaction to reflect active, student-centered participation.	Student Engagement and Ownership of Learning
Administrative Support (e.g., Need for Administrative Support, Logistical Support Needed)	Combined with Access to Resources for a broader institutional support category.	Institutional Support for PBL Implementation
Access to Resources (e.g., Need for Resources and Support, Resource Needs, Specific Supply Needs, General Resource Acquisition, Material List Creation, Vocabulary Preparation, Google for Resources, Idea Sourcing Online, Vocabulary and Material Prep)	Combined with Administrative Support to show interconnected nature of support needs.	Institutional Support for PBL Implementation
Professional Development (e.g., More Training, Request for More Training, Past Training Logistics, Training Challenge)	Integrated with Teacher Confidence in PBL to emphasize preparation and growth.	Teacher Preparedness and Professional Growth

Initial Themes (Grouped from Codes)	Changes Made	Final Themes
Teacher Confidence in PBL (e.g., Easier Implementation, Flexible Planning, Flexible Learning, Methodological Consistency)	Integrated with Professional Development to highlight the role of training in building competence.	Teacher Preparedness and Professional Growth
Implementation Barriers (e.g., Planning Time, Preparation Work, Daily Project Breakdown, Time for Planning, Classroom Time Management, Challenge of Shifting Methods, Step-by-Step Learning with Tech, Project Preparation)	Grouped with Assessment Challenges to consolidate planning and evaluation difficulties.	Challenges and Barriers to PBL
Assessment Challenges (e.g., Problem Analysis, Retention and Understanding, Cognitive Learning, Information Retention)	Integrated with Implementation Barriers for a comprehensive challenges theme.	Challenges and Barriers to PBL
Technology Integration (e.g., Technology and PBL Combination, Combining PBL and Technology, Technology Comfort, Educational Technology Comfort, Student Familiarity with Devices, Technology for Presentations, Visualization with Tech, Voice Command, Text-to-Speech Features, AI Tools for Early Learners, AI-assisted Typing, Improved Accessibility, Student	Incorporated into Institutional Support for PBL Implementation when linked to resources, or into Student Engagement and Ownership of Learning when directly linked to learning experiences.	Institutional Support for PBL Implementation / Student Engagement and Ownership of Learning

Initial Themes (Grouped from Codes)	Changes Made	Final Themes
Support Through Tech, Technology Accessibility)		
Expert Support (e.g., Expert Involvement, Expert Improvisation, Expert Substitution, Expert Support Importance, Use of Substitutes for Experts)	Folded into Institutional Support for PBL Implementation to emphasize access to professional expertise.	Institutional Support for PBL Implementation