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Current School District Administrators' and Math Teachers' Perspectives of Teacher Buy-In for Problem-Based Learning in Middle School Math

Kelly Riley Hastings
Walden University

Walden University

College of Education

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Kelly Riley Hastings

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Review Committee
Dr. Martin Ratcliffe, Committee Chairperson, Education Faculty
Dr. Mary Hallums, Committee Member, Education Faculty
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Chief Academic Officer and Provost
Sue Subocz, Ph.D.

Walden University
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MA, University of Texas at Arlington, 2004

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Project Study Submitted in Partial Fulfillment

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Abstract

Project-Based Learning (PBL) in middle school math classrooms is a topic that has not been well-researched, even though math scores in the United States have been declining. In a school district in the Southcentral United States, the local problem was that teacher buy-in for PBL in middle school math classes was unknown, as current literature regarding administrator and teacher perspectives on teacher buy-in is limited. The purpose of the study was to explore current school district administrators' and math teachers' perspectives of teacher buy-in for PBL in middle school math in a Southcentral U.S. state. Vygotsky's social constructivist theory contributes to the understanding that student learning is created through social interactions with others and formed the basis for the conceptual framework of this study. Basic qualitative research with semistructured interviews was the design for the study. Purposeful sampling was used to identify 10 participants: five current school district administrators and five middle school math teachers who had some knowledge of a PBL instructional model and had at least three years of teaching experience. Open and a priori coding was used to identify units of meaning. The results of these analyses indicated emerging themes of equipping teachers with autonomy, engaging all students in real-world learning, engaging students to build confidence, equipping teachers to meet external teaching demands, and empowering teachers to adapt and take control. School districts may benefit from the results of this study by embracing teacher perspectives when creating professional development to include leadership and coaching support that results in increased math student outcomes.

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Dedication

I dedicate this project study to my family. My husband, Steve, who has been supportive from the beginning as this has taken a lot of time, his patience and understanding have grown. My children, Emily, Mandee, Cole, and Caitlyn who have kept me going to complete this research. The memory of my son, Josh, was with me during the final years as well. I would like to thank Daniel Gallagher, Ross Roberts, and Cyndy Mika, who provided ways to overcome the barriers I experienced in completing the data collection. I would like to thank my friend, Denise, who continued asking me about my progress; I needed that! Thank you, Libby, who gave me feedback on my work along the way and supported me through the last few years, too. I want to thank all of my peers and co-workers who supported me along this journey; I will forever be grateful to all of you!

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Section 1: The Problem

The Local Problem

A school district in the Southcentral United States implemented a Problem-Based Learning (PBL) paradigm several years ago to increase academic achievement on state standardized tests. The district collaborated with an outside agency to build a more engaging instructional model. Administrators and teachers were trained but were not involved in the development. The problem to be investigated was that current school district administrators' and math teachers' perspectives of teacher buy-in for PBL in middle school math were unknown.

All teachers were required to attend training and implement the district PBL initiative. Math teachers, however, did not appear to want training in the district's PBL initiative and may not have had buy-in; evidence for this problem was obtained via personal communications with middle school math teachers who wondered about the effectiveness of PBL in middle school math (middle school math teachers, personal communication, October 30, 2021). Understanding the viewpoints of those involved in implementing the PBL instructional model provided a clearer picture. Teacher motivation to engage in professional learning opportunities is a consideration in school reform (Valoyes-Chavez, 2018). As most math teachers were not interested when the PBL training was offered, the Math Curriculum Coordinator at the time determined that PBL would not work for math instruction (former Math Curriculum Coordinator, personal communication, October 30, 2021).

Buy-in is a connection between beliefs and the results of a change or reform (Briggs et al., 2018). Consideration of buy-in could result in a more successful

implementation. Listening to those experiencing the change is integral to buy-in because it creates ownership (Boden et al., 2020). Because educators are instrumental in the success or failure of curricular implementations, ownership is a key component (Sengai & Mokhele, 2020). Teachers experience vast change throughout their careers, and many of those changes are imposed upon them (Briggs et al., 2018). Failure to achieve intended outcomes often results when the perspectives of educators are not included in the creation or feedback of a program (Shibani et al., 2020). Leaders play a role in support of change; current administrators' role in educational improvement include restructuring schools and adopting new educational programs (Sutcher et al., 2017). Administrators have a responsibility in teachers learning new programs, as administrators send teachers to training and ensure the learning and change occurs and is a priority (Sarkadi & Fadhillah, 2020). If administrators do not understand its importance, teachers may not have access to the new learning. Administrators and teachers create change at the organizational level, so support to implement any change is necessary. Classroom changes require action by teachers; their readiness to create this change must be investigated (Du & Chaaban, 2020). Research regarding perceptions and change efforts may be lacking (Ford & Gilson, 2021). Change may be necessary, but administrators and teachers may not understand that. Data may make the necessary change more evident.

Rationale

The school district addressed the lower-than-average middle school math scores by implementing a PBL instructional model, understanding that increases in academic achievement require change in instruction (Coordinator of Professional Learning, personal communication, February 9, 2021). There was a demonstrated need to improve

middle school student understanding of math, yet practices had not changed dramatically in math classrooms, and students were not applying the concepts they were learning to their lives (Kul & Çelik, 2020). By making learning more relevant and explicitly teaching skills to students, the school district's intent was to increase student scores, but administrators and teachers needed to be trained on the PBL model before it could be implemented. Perspectives and bias influence changes in instructional practice (Bas & Senturk, 2019; Madani, 2020; Smith & Robinson, 2020). If administrators and teachers had a perception or belief regarding PBL, it was likely to impact implementation. Exploring current administrators' and math teachers' perspectives of buy-in for PBL in middle school math in the Southcentral United States can help researchers understand how to better implement the district's PBL instructional model.

PBL is designed to engage students in real-world scenarios embedded in teaching and learning (Virtue & Hinnant-Crawford, 2019). The instructional model developed by the district is unique and was locally created; the concepts include real-world connections to teach problem-solving and other skills the district deemed relevant. Principals from each of the schools volunteered for the first year, and teachers within those schools had a choice to participate. Out of the 75 schools in the district, 15 volunteered to participate the first year. The second year the instructional model was implemented, 12 schools elected to participate, and teachers were given some choice to participate. The third year, area superintendents invited schools based on readiness of the staff to increase the number of schools involved (Coordinator of Professional Learning, personal communication, March 22, 2020). The fourth year, the COVID-19 pandemic hit the

United States, and the district did not train or support the implementation of the PBL instructional model.

Existing research exploring administrator and teacher perspectives about teacher buy-in for PBL in middle school math is limited (Hung et al., 2019; Merritt et al., 2017). An EBSCO search through Walden University using the dates "January 2017 through February 2021" and the search terms, *teachers' or educators' perspectives*, and *PBL or problem based learning or project based learning*, and *middle school math* elicited no results. It appears administrators' and teachers' perspectives regarding buy-in for PBL may not have been recently explored, if at all. Exploring current administrators' and teachers' perspectives of teacher buy-in for PBL in middle school math can offer some insight and inform practices into a larger school reform picture and support effective implementation.

Quantitative research regarding PBL in STEM exists, although most studies focus on science, not math (Merritt et al., 2017). Qualitative studies exist, as well, although fewer in number (Hung et al., 2019). Thibaut et al. (2019) found a negative correlation between the teaching experience of math teachers toward inquiry-based learning, and the authors suggested a qualitative study that included teacher interviews. Hung et al., (2019) authored a meta-analysis which concluded research into PBL should be focused on specific context, such as math in middle school, and that there are still many questions regarding PBL in math that are not answered in research.

The use of more student-centered methods, such as PBL, may assist students in developing 21st century skills like critical thinking, problem solving, collaboration, and communication, which may benefit them in learning math through real-world experiences

(World Economic Forum, 2018). Although a lack of direct instruction during students' formative years may increase the probability of later difficulties with the subject by the time the student reaches 8th grade, there may be the need for more diverse teaching methods (Jao, 2017; Jao & Radakovic, 2017). In addition, educators acknowledge the importance of developing 21st century skills (Viro et al., 2020), yet continue to use teacher-centered instruction in math despite declining scores. As PBL appears to be a viable alternative to traditional teaching practices, exploring current administrators' and math teachers' perspectives for PBL in middle school math prompted the need for this study.

Some research has shown that teachers have a negative perception of change that is imposed upon them, but that lack of skills can also be a factor (Lomba Portela & Pino Juste, 2020). Teachers may not change the way they teach, even with training, because change is complex and simple, one-day training is not enough (Li, 2019). Teacher beliefs play a part, as well (Conner & Gomez, 2019). Success in math decreases as students move through their educational career and into high school, so more support for teachers to change instructional practice to include students "play with ideas to see multiple possibilities for solving mathematical problems" (Mun & Hertzog, 2018, p. 1). If teachers believe that direct instruction increases student understanding, they are less likely to join the district efforts since PBL practices break from their views. Teachers are, also, less likely to join reform efforts when there are multiple initiatives at the same time (Mrachko et al., 2020). Schools may have been involved in different initiatives at the time the school joined the district instructional model implementation. Increased teacher load is another reason for teachers to be resistant to one more thing (Desyatova, 2020). Learning

something new could be perceived as increasing their load. If teachers have been through a myriad of poorly implemented initiatives, they are more reluctant to embrace the change (Smith et al., 2019). There are many reasons why teachers would not fully commit to a change coming from outside of their circle of influence.

Educators are responsible for ensuring that their students make progress, and part of this is being developmentally responsive to the students' age and academic level (Rheaume, et al., 2021). To develop skills essential for the 21st-century demands, current educational research supports using student-centered instructional procedures, as opposed to traditional, lecture-centered models (Holincheck & Galanti, 2022; Üçgül & Altıok, 2022). These student-centered approaches include teaching skills for collaboration. Addressing a potential gap in teacher practice requires investigating different instructional approaches, like PBL, which presents students with problems that require student collaboration to investigate, gather information, pose questions, and resolve problems (Merritt et al., 2017). Since middle school administrators' and math teachers' perspectives of teacher buy-in for PBL in middle school math in the Southcentral United States were unknown, exploration to understand their perspectives was warranted.

Research by Dervić et al. (2018) supported the conclusion that student-centered theories are significantly more successful when compared to teacher-centered instructional techniques. Whannell et al. (2018) advised schools to incorporate authentic inquiry in curricula to enable students to be better prepared to handle the unique challenges of the future. According to Dewey (1938), students can benefit from experiencing education they find relevant and meaningful. The social constructivist theory, developed by Vygotsky (1978), furthers Dewey's view that education should be

an active process where the learner constructs knowledge through social interaction with others (Vygotsky, 1978). When educators utilize the social constructivist theory in their instruction, students interact with other students to increase learning. Students can simultaneously develop problem-solving strategies and skills within meaningful circumstances, which engage learners and promote higher-order thinking (Santra & Mani, 2017). Students learn skills through the social constructivism learning process.

An extension of PBL is that teachers enable learners to connect classroom experiences to the world outside the classroom by applying their learning and utilizing 21st-century skills (Jirasatjanukul & Jeerungsuwan, 2017; Kaymakamoğlu, 2018). Students can make inquiries into real-world problems to which they understand the relevance and want to find the solutions. Especially noteworthy is that underserved students are more motivated to engage in school within PBL settings, and the results show the academic gap diminishes significantly for minority students engaging in PBL classrooms (Craig & Marshall, 2019). Nevertheless, math teachers in the school district were not voluntarily participating in training for the district's PBL instructional model.

The purpose of the study was to explore current school district administrators' and math teachers' perspectives of teacher buy-in for PBL in middle school math in the Southcentral United States. Administrators and middle school math teachers were interviewed regarding their perspectives of teacher buy-in of the district's PBL instructional model. Exploring current administrators' and math teachers' perspectives of teacher buy-in for PBL in middle school math in the Southcentral United States provided more information than what was readily available to better understand administrator and

teacher buy-in for PBL in middle school math in order to implement any program designed for improvement.

Definition of Terms

Buy-in: the feeling of having experience and perspectives acknowledged, implies a direct involvement (Piccardo et al., 2019).

Educational change: process by which improvement is the outcome, but resistance is implied (Lomba Portela & Pino Juste, 2020).

Inquiry-based instruction: a method of learning through investigation that requires students to apply learning in a real-world context (Krawec & Steinberg, 2019).

Lecture-based or teacher-centered instruction: a highly structured process that is a teacher-focused, traditional classroom approach to teaching in which students take notes and follows the teacher (Jao, 2017).

Learner- or student-centered instruction: interactive teaching that engages the learners/students (Katradis et al., 2017).

Problem-Based Learning: is an instructional method in which students are provided an ill-structured problem and asked to collaborate in small groups to develop questions, investigate the problem, and gather pertinent information to solve the problem (Merritt et al., 2017).

STAAR: State of Texas Assessment of Academic Readiness is the existing state-mandated assessment in Texas (TEA, 2017).

Significance of the Study

The local problem to be investigated was current school district administrators' and math teachers' perspectives of teacher buy-in for PBL in middle school math in the

Southcentral United States were unknown. The study addressed the gap in the practice by generating a deeper understanding of current administrators' perspectives of teacher buy-in for implementing PBL in middle school math, as well as generating a deeper understanding of middle school math teachers' perspectives of buy-in for PBL in middle school math.

Current research indicated student-centered approaches, such as PBL, are more effectual in comparison with teacher-centered approaches at higher grade levels (Dervić et al., 2018). PBL infuses the 21st-century skills of critical thinking, cooperation, problem-solving, creativity, communication, and innovation needed for students to excel academically. PBL is a learner-centered method in which learning begins with an ill-structured problem through which teachers can further the students' capacity to creatively solve problems (Erdogan & Senemoglu, 2017). The district instructional model follows what Sasaki et al., (2017) found to be aligned to PBL–collaborative and student-centered that focuses on real-world situations providing students a deeper understanding of the model and enhanced social skills. Forms of authentic learning can be cross functional in the curriculum and enable 21st-century students to come into meaningful contact with potential employers and stakeholders in their future using PBL, yet use of PBL is not widely used in math classes in the district (Huttell & Gnaur, 2017; Knowles, 2018). Exploring current administrators and math teacher perceptions of buy-in for PBL in middle school math in the Southcentral United States provides a better understanding for ways to support the implementation.

This study contributed to a deeper understanding of administrators' and math teachers' perspectives of buy-in for PBL in middle school math in the Southcentral

United States. Positive social change may occur when more effective leadership strategies are learned. When administrators have a better understanding of teacher perspectives, they may have more tools to support the implementation of PBL in middle school math. This better understanding may result in a more positive culture, where administrators listen to middle school math teachers, and the teachers feel their voices are heard. Components of teacher voice include creating a trusting and respectful environment for teachers to share their thoughts and opinions, those ideas shared are good for the whole group, and the person sharing accepts responsibility for next steps (Quaglia, et al., 2020). When teachers feel empowered and administrators use information from teachers for change, distributed leadership results. This could create a school culture in which administrators and teachers collaborate to improve student outcomes, both academically and social-emotionally.

Research Question

The problem to be explored was that school district administrators' and math teachers' perspectives of teacher buy-in for PBL were unknown. The purpose of the study was to explore current school district administrators' and math teachers' perspectives of teacher buy-in for PBL in middle school math in the Southcentral United States. Responses to interview questions provided information regarding closing a potential gap in practice by identifying elements of effective practice with teaching and learning middle school math and overall change efforts. Effective leadership strategies were identified, as well. The responses demonstrated teacher beliefs and attitudes regarding ways to promote successful student learning in math. To better implement the district's PBL instructional model, these research questions were identified:

Research Question 1 (RQ1): What are current school district administrators' perspectives of teacher buy-in for PBL in middle school math in a Southcentral U.S. state?

Research Question 2 (RQ2): What are current math teachers' perspectives of teacher buy-in for PBL in middle school math in a Southcentral U.S. state?

Review of the Literature

The purpose of the study was to explore current school district administrators' and math teachers' perspectives of teacher buy-in for PBL in middle school math in the Southcentral United States. Reviewing peer-reviewed articles and Walden dissertations provided more knowledge regarding the elements and benefits of PBL (Merritt et al., 2017). I delved deeper into administrator and teacher perspectives to explore a potential difference in understanding or purpose for the implementation of the district's instructional model. The literature review provided a foundation of effective math instruction, while supporting the problem that current school district administrators' and math teachers' perspectives of teacher buy-in for PBL in middle school math in the Southcentral United States were unknown.

Conceptual Framework

The conceptual framework for this study was based upon Vygotsky's social constructivist theory (Vygotsky, 1978). The social constructivist theory holds that students learn effectively through collaboration with the teacher and other students. Independent problem-solving increases with the collaboration of peers (Weaver et al., 2018). Vygotsky (1978) observed that the use of language in social interactions is a fundamental role in the learning process. Lubbers (2017) and Nguyen (2017) asserted

that Vygotsky emphasized that language allows learners to think and process information, which makes it meaningful to the learner. According to Vygotsky (1978), students learn socially; when they can engage in work where cooperation with other students is a fundamental part, they learn at higher levels. Vygotsky suggested that students could accomplish more complex tasks when collaborating with others versus working independently (Wright, 2018). Learning with others is an integral piece of constructivism, and in an actively engaged classroom these skills may be both applied and practiced (Tsourapa, 2018). The district's PBL instructional model was based on student and teacher collaboration, where interaction is important to the learning process.

Social constructivism is the theoretical foundation for interactive learning and small group instruction and is therefore valuable in promoting the student-centered method of teaching that PBL encourages (Barger et al., 2018). The zone of proximal development within social constructivism states that learners can achieve certain things by themselves, and they can achieve other things with teacher support (Margolis, 2020). This occurs in classrooms through individual or small group instruction (Surya & Syahputra, 2017). Small group instruction, and scaffolding for learners, is embedded into the district's PBL instructional model. Vygotsky's work is a vehicle by which to observe all humans and their experiences, which transforms concepts into opportunities for higher-order thinking through collaboration (Newman & Latifi, 2021). According to Vygotsky and the principles of constructivism, when students connect with the real world and engage, they learn more (Mlotshwa et al., 2020). The use of the social constructivist theory results in learners deriving meaning from information, where critical thinking skills are developed through the inquiry process (Cloete, 2018). PBL is one type of

learning where these skills are explicitly taught and practice. The district's PBL instructional model incorporates explicitly teaching these types of skills for life-long learning. Exploring administrators' and math teachers' perspectives of buy-in for PBL in middle school math uncovered core beliefs, which led to a deeper understanding for effective implementation.

Vygotsky's social constructivist theory grounded the development of the research questions in this exploration. Because current administrators' and math teachers' perspectives of buy-in for PBL in middle school math in the Southcentral United States were unknown, research questions were derived from listening to current administrators' and teachers' voices regarding their perspectives of PBL in middle school math. Ensuring voice of participants are heard provides "transformative power" (Eun, 2018). Listening to participants' voices, specifically regarding the implementation of the district's PBL instructional model added depth to the understanding of implementation for the school district.

Through a basic qualitative design using semistructured interviews, I constructed interview questions to discover new knowledge regarding current administrators' and math teachers' perspectives of buy-in for PBL in middle school math in the Southcentral United States. Social constructivists view learning as "an holistic integrative perspective on learning that combines experience, perception, cognition and behaviour" (Abderrahim & Gutiérrez-Colón Plana, 2021, p. 39). Collaboration is integral. The social constructivist theory framed this exploration by asserting that learners engage more when in partnership with other students and educators, and when experiencing math in both hands-on and real-life capacities. Since constructivism states that individuals create their own

knowledge based on their experiences, interview questions were developed to explore their experiences and understanding PBL in middle school math. According to the social constructivist theory, it is implicit that learners must take an active role in their own learning. In this case, the learners were administrators and math teachers; interview questions were developed to determine to what extent they take an active role in their own learning. Current school district administrators' and math teachers' perspectives of buy-in for PBL in middle school math in the Southcentral United States were unknown regarding the engagement and partnership of teachers with students in the work of learning math, a foundation of constructivism. Research questions were developed to delve into perspectives regarding student engagement and the role of the teacher.

The data analysis was grounded in Vygotsky's social constructivist theory by applying thematic data analysis for the interviews. I transcribed the recordings and used a priori codes to listen for the social language of administrators and math teachers while they shared their perspectives of teacher buy-in for PBL in middle school. I used Vygotsky to ground my data analysis by using social constructivist theory to help organize the data and apply themes, looking for answers that reflect experience, experience of others, and how the participants have constructed information from their social interaction and adaptation. This entire data analysis process was fluid and flexible (Ravitch & Carl, 2019). The next step was summarizing from the initial codes to create findings.

Review of the Broader Problem

This literature review incorporated a variety of sources, including peer-reviewed academic publications, theoretical texts, quantitative studies, and graduate dissertations.

These materials were accessed through Walden University's library. Specific databases included Academic Search Premier, EBSCO, Education Research Complete, Sage Premiere, and ERIC. Keywords used either individually or in conjunction include *achievement*, *active learning*, *assessment*, *authentic learning, buy-in*, *constructivism, didactic instruction, education*, *educational change, engagement*, *experiential learning, hands-on learning*, *inquiry-based learning, instruction*, *learning, lecture-based instruction, mathematics, middle school*, *motivation*, *performance*, *problem posing*, *problem-based learning*, *problem-solving*, *scaffolding*, *secondary school*, *standards*, *student-centered instruction, students*, *teacher-centered instruction, teachers*, and *teaching*. I chose these keywords due to the connection with the problem, the conceptual framework, and administrators' and math teachers' perspectives of buy-in for PBL in middle school math.

The literature review consisted of analyzing peer-reviewed, current research specific to PBL and administrator and math teacher perspectives of buy-in for PBL in middle school math. A brief review of Vygotsky's (1978) social constructivist theory contributed to the exploration of factors that add to the enhancement of middle school math achievement. The literature review, also, addressed several topics related to the study's problem statement and related to factors that influenced perspectives about math in middle school. The related factors discussed consisted of (a) the history of school reform, (b), shortcomings of traditional education, (c) staying competitive in the 21st century, (d) National Council of Teachers of Mathematics, (e) strategies for teaching math using PBL, (f) strategies to positively influence students with PBL, (g) teachers' perspectives, (h) administrators' perspectives, and (i) further implications.

History and School Reform

Documentation of educational reform in the United States can be found as early as 1818, when Thomas Jefferson urged lawmakers to require basic skills for students (Lopez-Estrada et al., 2017). In response to the Sputnik launch by the Soviets in 1957, the U.S. financed education programs in math and science (Kolberg et al., 2017). In the 1980s, A Nation at Risk was published that created urgency in educational reform (Shuffelton, 2020). The result from these reforms was the expansion of the federal government into education, previously a state domain, opening the door for more expansive federal legislation. In 2001, public schools in the United States were required to follow guidelines mandated in the No Child Left Behind (NCLB) Act, which mandated assessments in reading and mathematics.

The Every Student Succeeds Act (ESSA) was signed into law by President Obama in 2015, reforming the NCLB Act of 2001. The primary goal of ESSA was to close the achievement gap between African Americans, Hispanics, and students from low socioeconomic settings and their non-minority peers (De Voto & Reedy, 2021). Higher standards for student achievement were put in place for implementing the Common Core Standards for instructors and higher levels of achievement in schools (Hodge, et al., 2020). Thereafter, reading and math became a dominant focus of instruction (Herrera et al., 2017). As a possible unintended consequence, an emphasis on standardized tests and teacher evaluation evolved (Dee & Wyckoff, 2017). This put more focus on teacher practice.

One effect of ESSA's focus on math was the need for improved math learning for eighth-grade students (Ladd, 2017). Due to NCLB and ESSA requirements, thereafter,

restructuring math instruction became a component of improvement. The OECD (2018) reported that a weakness of U.S. students was the inability to create a mental model to show their understanding of math in real-world situations. This required a firm understanding of the questions and application of appropriate mathematical thinking to solve problems (OECD, 2018). According to OECD, public school students living in the United States were not adequately prepared to interpret real-world situations and apply mathematical concepts. Other weaknesses included reasoning and a lack of focus in higher-order activities that relate to the real world (OECD, 2018).

Shortcomings of Traditional Education

To develop appropriate skills, one option is to focus on student learning through using instructional techniques that are learner-centered, while shifting away from conventional teaching models (Craig & Marshall, 2019). Students often express a desire to pursue high demand careers where math knowledge is a crucial component, yet, despite the extreme demand for science, technology, engineering, and mathematics (STEM) professionals, interest in STEM careers by U.S. students is low (Garriott et al., 2017). A striking shortage of students pursuing STEM disciplines has been documented from data from the National Science Foundation (NSF) documents, and there is concern over the persistent underrepresentation of women, students of color, and economically disadvantaged students in STEM majors (Young et al., 2017). Craig and Marshall (2019) advocated that educational strategies and standards must shift from conventional teaching models and instead focus on student learning. The following topics of lecture-based instruction and standardized testing with STAAR are frequently discussed in relation to the shortcomings of traditional education and are presented below.

Lecture-Based Instruction. Lectures are a direct and straightforward way by which some educators attempt to impart knowledge (Taat et al., 2020). According to different researchers, lecture-based instruction can be beneficial in some cases (Jao, 2017; Jao & Radakovic, 2017). Jao (2017) stated that educators who use this method argue that it is most effective, and that using teacher-directed and lecture-based teaching strategies positively influences student achievement. Lecture is an easy method to use to teach but has limited success in achievement (Taat et al., 2020). Lecture has a role in education, but it may not be the most effective way to learn.

Jao and Radakovic (2017) explored that many aspects of transdisciplinary teaching methods in math education, including lecture-based instruction, can be a useful tool for producing student achievement in math. The authors further posited that the success of an instructional method is dependent on several factors including worldviews, social contexts, learning styles, and more. Although there is clearly some support for lecture-based instruction in that some students learn more easily in this manner, lecture-based instruction is described by students to be less collaborative and interactive (Clinton & Wilson, 2019). The discipline is taught and/or covered through assigned text readings and possibly supplemented by other readings or video presentations, with a focus on repetition and memorization (Monk & Newton, 2018). Passive learning takes place in a classroom with little connection to the outside world, and the learner relies on the textbook and teacher for knowledge, which may or may not result in a larger, conceptual understanding and application of the information (Farashahi & Tajeddin, 2018; Shimada & Konomi, 2017). Learning is not evident during lecture but requires follow-up by the lecturer to ensure learning.

Success in math decreases as students move from primary to high school (Li & Stylianides, 2018), yet teacher-centered instruction is widely utilized in math despite declining scores (Jao, 2017). Analyzing additional or different techniques for obtaining the solution to a problem is not a foundation of lecture-based instruction. The teacher verbally delivers content to passive, listening, note-taking students in a one-way process, and it is not as effective as an active learning setting (Hyun et al., 2017). Often, engagement is not the primary focus of lecture-based instruction.

Standardized Testing With STAAR. In the standard mathematics instructional approaches or more traditional education, students are not effectively prepared for the current demands of passing standardized mathematics tests and excelling academically (Kingsbury, 2022; Wijnen et al., 2017). This problem affects 8th-grade students because students in Texas are required to pass the standardized 8th-grade math test, the STAAR, before promotion to high school (Texas Education Agency, 2017). Math scores are relevant to middle school students.

Staying Competitive in the 21st Century

Compared to both U.S. standards and their international peers, middle school math students in the United States fail to excel in math (Guglielmi & Brekke, 2017; OECD, 2018). To develop skills necessary for the 21st-century demands, current educational strategies could require using student-centered instructional procedures as opposed to traditional, lecture-centered models (Craig & Marshall, 2019). Students can ask questions to real-world problems to which they understand the relevance and want to find the solutions to remain competitive and knowledgeable in the 21st century (Zhang et al., 2017).

National Council of Teachers of Mathematics

For more than two decades, the NCTM (2018a) has advocated for more student-centered and inquiry-based teaching methods that support students explaining their thinking (Jao, 2017) and have promoted the development of students' critical thinking, reasoning, understand, and problem-solving abilities (NCTM, 2018a). The NCTM Standards were first presented in 1989 (NCTM, 2018a). This was an important first step, but simply creating standards would not affect the change necessary to improve mathematics instruction. In 2000, the NCTM established six guiding principles for K-12 mathematics: assessments, curricular planning, equity inclusion, learning, teaching methods, and technological advancements.

Equity. The NCTM (2018a) contends that all students have the right to a quality curriculum in mathematics, as well as: effective teachers, quality learning opportunities, high expectations placed on them and for their teachers, and the resources and support necessary for them to thrive. Because of unequal educational opportunities, test scores have revealed long-standing gaps among student groups based on ethnicity, gender, and socioeconomic status (Chikwe & Cooper, 2020). The existing literature has demonstrated that an underrepresentation of minorities exists in advanced math courses (Provasnik, et al., 2019). Zilanawala et al., (2018) observed that in a sample of 1600 students, greater than 80% of minority students were put in Algebra I or below in the 9th grade, in comparison to 32% of the Asian-American students and 66 % of the White students in the sample. Educational achievement disparities increase as children mature and move through the school system, indicating that educational opportunities are determined, at least in part, by ethnicity and socioeconomic conditions (Maldonado, et al., 2018). This is

further supported by inequalities related to course offerings during high school, specifically that African American students typically have less access to higher-level mathematics and science classes during high school (Same et al., 2018). Despite years of reform, gaps continue to exist and generally have not decreased (Zilanawala et al., 2018). Researchers have called for equity and accessibility for all students by changing the way math has been taught (Scott, 2019).

Curriculum. The NCTM (2018a) maintains that "an excellent mathematics program includes a curriculum that develops important mathematics along with coherent learning progressions and develops connections among areas of mathematical study and between mathematics and the real world" (p. 5). The real world may not be present in math curriculum. The prevailing curriculum has generally separated math from everyday life, marginalizing historically underserved students and contributing to the achievement gap (Buenrostro & Radinsky, 2019). Districts have addressed this. Some school districts have supported improvement in math achievement through centralized curriculum (Rigby et al., 2017). Implementing a rigorous curriculum may be a challenge.

Teaching. Curriculum may be rigorous, but often the instructional practice does not follow (Rigby et al., 2017). Traditional teaching includes strategies such as memorization, recitation, and individual application of the curriculum (Abdul-Wahhab & Ahmed, 2020). This approach has not garnered improvement in math achievement. There is a gap between best practice and realistic practice in middle school math classrooms (Rigby et al., 2017). Instruction should be as rigorous as the curriculum.

The NCTM (2018a) explained for a mathematics program to be excellent, the program must have teachers who are effective and engaging. They should be able to

make the learning of mathematics personal and meaningful through individual and group instruction and should support students in their ability to understand mathematical topics and application. Engagement increases when students learn through student-centered strategies supporting claims previously explored (Dole et al., 2017). Active learning can occur in mathematics instruction.

The NCTM further elaborated on the topic in the 2000 Standards, which called on teachers to encourage students to articulate their mathematical thinking clearly and coherently to peers and adults. Donohoo and Katz (2017) explained that teachers take ownership of the students in the entire school, including student behavior and achievement as active teaching in math involves recognizing what students understand and need to understand. In this way, teachers are engaged in stimulating and aiding students acquire math skills (NCTM, 2018b). Learning math is different from teaching it.

Learning. Engagement is important in an effective classroom and affects student achievement (Ayçiçek & Yanpar Yelken, 2018). Engagement, also, supports the creation of knowledge (George & Supreetha, 2021). Positive emotions are inferred when engagement occurs, and emotion plays a major role in the efficacy in math (Liu et al., 2018). Communication among learners is essential to engage learners. The NCTM (2018a) recommended that students engage in discourse, which Anderson-Pence (2017) supported when he asserted that students who are equipped to understand, apply, and speak about mathematical concepts are more likely to have a more thorough understanding of the topics.

Assessment. The NCTM (2018a) identified assessment as a vital piece of successful instruction because it provides teachers, students, and guardians with proof of

improvement and proficiency in mathematical concepts and theories. In addition, assessment provides input on strategies being implemented, data collected, feedback and support offered to students, future curriculum and instruction decisions, and ways to improve the mathematics program (NCTM, 2018a). Best practices in teaching and learning play a part in the assessment. Teachers should utilize a variety of methods when assessing students' understanding (Saeed et al., 2018). There should be a purpose in testing. Assessment for learning, rather than assessment of or assessment as learning, should be the goal (Marynowski et al., 2019). Assessment for learning infers a more responsive approach to assessment.

Providing formative assessment and feedback where teachers adjust their teaching dependent on student learning has been shown to improve student understanding of their mistakes (Arends et al., 2017). This may not be a widespread practice. Intentional focus to provide responsive feedback to students about the learning is new to secondary schools (Hine & Aldridge, 2020). Teachers providing specific feedback to students is important but may be challenging since it is a new practice. Students could be shown how to take some ownership of their learning, supporting student agency, by knowing what they know, as well as what they do not know.

Teaching students how to go through self-assessment and metacognition can support problem-solving necessary in math (Irvine, 2017). This could support student agency. When students are actively participating in an assessment process, achievement and self-regulation improve (Nieminen & Tuohilampi, 2020). Involving students more in teaching and learning processes is beneficial to their education.

Technology. The NCTM (2018a) stated that it is imperative for mathematics to be integrated into daily activities and practices as vital tools and resources, allowing students to learn and apply the ideas and concepts, so they can better use mathematical reasoning and discuss mathematics more holistically. Studies have shown that technology can support the deeper learning of math. Applications or apps have been shown to help students connect their learning and close mathematical gaps. They can support students in learning mathematics in a number of ways, including—but not limited to—divulging, obscuring, and strengthening students' understanding of mathematics (Capitani, 2020). Blended learning, where students use technology part of the time in their learning, can enable personalized learning to increase mathematics achievement (Karam et al., 2017). The use of technology can support math curriculum through opportunities for students to connect math skills to the world outside the classroom, thereby responding to current deficits in math education (Lin & Williams, 2017).

Process Standards. The NCTM (2018b) also identified five process standards to support improving teaching math in the United States. These guiding principles address communication, problem-solving, connections, reasoning, proof, and representation. Process thinking in math can be accomplished through these means as well. By using communication tools, such as digital writing, students can better learn mathematical theories and express their concepts and ideas (Dobie & Sherin, 2021). Students can show what they learn when they can share their thinking in writing.

Forwarding the NCTM's (2018) guiding principles requires educators to be accountable to their students and their peer educators for their students' success in and outside of mathematics settings, as well their own professional and personal growth in

becoming more effective mathematics teachers. This concept aligns with what Hattie and Timperley termed collective teacher efficacy, where educators believe that they and their peers will improve student learning (Cansoy, 2020). Empowerment results when the shared vision is created and acted upon by the collective group (Kunnari et al., 2018). Donohoo and Katz (2017) noted, when teachers work collectively to improve their teaching, the group becomes more effective and more committed to their common goals, which results in them having higher expectations for themselves and each other, and to a greater acceptance of the responsibility they have to their students for high academic achievement. Collaboration among teachers could support implementation of the district's instructional model. When teachers hold each other to high expectations, every student has a better opportunity to learn at high levels.

Teaching Math through PBL

Educators are charged with teaching all students, regardless of socioeconomic background, ethnicity, or learning disabilities, to think and to live in an increasingly demanding global society. PBL is a pedagogic method with constructivist roots that engages students in meaningful, real-world activities to work collaboratively, to discuss ideas, and to produce a final product. PBL may be one way to help students fully appreciate how to employ critical thinking and problem-solving skills. The use of PBL requires learners to do more than passively receive knowledge; they must apply what they learn. As a result, students' ability to critically think increases (Ismail et al., 2018), and students learn more in a cooperative group setting when skills are explicitly taught (Sasaki et al., 2017). Students become more autonomous learners and take greater responsibility for their own learning (Cole, 2017).

The use of an inquiry-based educational method perpetuates active student participation in a cooperative learning setting, in which students to actively engage in tasks requiring the use of problem-solving and critical thinking skills (Hendry et al., 2017). Student-centered instructional strategies such as PBL can be innovative solutions that promote deep and meaningful learning in which to integrate cross-disciplinary content and support life-ready skills (Zhao et al., 2017). Teachers who have been trained in PBL and understand the outcomes have found PBL to be beneficial for students (Noble et al., 2020). Prior to this study, it was not known what teachers who have not been PBL-trained believed; this study aimed to gather that information.

Gaining an education through PBL could affect student learning in middle school math. The purpose of the study was to explore current school district administrators' and math teachers' perspectives of teacher buy-in in the Southcentral United States in order to support the implementation of a PBL system to increase student achievement in math. Two teaching strategies thought to better engage students, technology integration and real-world learning, are discussed below.

Technology Integration. A New Media Consortium (NMC) Horizon report discussed that the technology now found in blended learning designs will influence classroom learning in the coming years (Adams Becker et al., 2017). In a flipped classroom, a style of blended learning, students first encounter lecture materials at home in online videos, then engage with the concepts discussed in those videos and complete relevant activities in the classroom. This type of classroom requires students to make time outside of class to appropriately engage with these videos and requires students to have a very clear understanding of their responsibilities regarding classwork.

The NMC Horizon report also discussed how collaborative learning models and incorporating platforms like social media are on the rise due to their ability to create an interactive space for problem-solving and discussion for students (Adams Becker et al., 2017). Giving students a broad understanding of how technology can be productively used outside the classroom is extremely important; for students to be successful, they must understand the practicality of the technology they are using. Student-created content is also an important way to incorporate technology into the classroom experience. Creating podcasts is an effective example of student-created content (Cain et al., 2021). Last, focusing on collaborative learning methods such as digital classroom engagement is another important method of incorporating technology into the curriculum. The NMC discussed how designing learning spaces in which students can work together on similar projects can create a positive, collaborative, and supportive classroom environment (Adams Becker et al., 2017).

Real-World Connections. Students are often required to learn without a connection to support their understanding (Youngerman & Culver, 2019). A real-world connection gives students opportunity to better understand and apply skills. Students' lack of ability to think critically, to analyze information, and to exhibit effective communication and collaboration are primary concerns leading to investigate whether teaching these skills will lead to increased academic achievement (Dogan, 2017). Teachers will need a guide, though. PBL and the other strategies discussed in this review may enable our teachers to better teach the skills essential to being effective in the 21st Century (Idin, 2020). These skills may need applied to learning and reinforced.

Strategies to Positively Influence Students with PBL

A major advantage of PBL and other strategies is the potential motivation and positive attitude students may cultivate toward learning and may enhance students' intrinsic motivation to learn (Merritt et al., 2017). Discussed below are the topics of student engagement, solving problems, thinking critically, and student/teacher collaboration, all of which contribute to a positive learning experience for students (Merritt et al., 2017).

Student Engagement. Public education, specifically in math, has been criticized for lacking student engagement necessary to increase students' interest in careers that include math (Fitzmaurice et al., 2021). If students are disinterested, they may not take courses in math; effective math instruction includes engaging the student in learning. The NCTM (2018b) suggested teachers create motivating projects to engage students in mathematics. Engagement is important in an effective classroom and affects student achievement (Ayçiçek & Yanpar Yelken, 2018). Positive emotions are inferred when engagement occurs, and emotion plays a major role in the efficacy in math (Liu et al., 2018). PBL and other student-centered teaching strategies result in higher student engagement in class, which increases learning, especially regarding math lessons that involve students' interests encourage learning and are more motivating than traditional methods (MacMath et al., 2017). PBL and other strategies discussed promote engagement, which increases learning (Baloran et al., 2021). Standard instruction in math or more traditional education does not adequately prepare students for the current demands of passing standardized mathematics tests and excelling academically (Kingsbury, 2022; Wijnen et al., 2017). Alternatives are available.

Solving Problems and Thinking Critically. Problem-solving skills and critical thinking are increasingly assessed on standardized tests across the United States; Zhao (2018) encouraged keeping these skills intact while transforming schools. A qualitative study to explore teaching strategies related to students comprehending details about the subject matter before they were able to thoroughly comprehend and connect the concepts taught in the classroom in connection to the outside world (Shimada & Konomi, 2017). Discovery concerning the capacity for PBL and other strategies to positively influence students by developing higher levels of engagement, increasing an ability to solve problems and think critically, and fostering collaboration may reveal a new math forward for teaching mathematics in middle school (Sakir & Kim, 2020).

Student/Teacher Collaboration. Student/teacher collaboration and student-centered instructional strategies such as PBL are an innovative solution to promote deep and meaningful learning in which to integrate cross-disciplinary content and support life-ready skills (Zhao et al., 2017). Current research indicates that student/teacher collaboration and student-centered instructional methods are more successful when compared to teacher-centered strategies at the higher-grade levels (Dervić et al., 2018). For math students in secondary levels, student/teacher collaboration, which begins with a problem through which the teacher facilitates a student's learning, increases the student's capability to problem solve creatively (Erdogan & Senemoglu, 2017). The curriculum should be student-focused and centered on providing real-world situations through which students can gain a deeper understanding of an idea and enhance their social skills (Sasaki et al., 2017). Learning should provide a venue for students being actively involved by requiring students to ask and answer questions and challenge so that the

learner builds knowledge (Husni, 2020). Student/teacher collaboration is not a traditional way of teaching and learning and incorporating a real-world relevance may be different; teachers may need professional learning and ongoing support for these changes to occur.

Administrators' Perspectives

The role of current administrators is a challenging one, and some administrators may find it difficult to balance calls for accountability with effective support for teachers (Robertson, 2018). Pressure is attached to the role, possibly due to accountability of short-term goals as well as ensuring continuous improvement occurs (Gunnulfsen & Møller, 2017). Clarity of expectations is imperative to a successful outcome (Madani, 2020).

Historically, change has occurred top-down from administrators down to teachers; effective leadership requires collaboration between administrators and teachers (Watson et al., 2020). Top-down change does not result in changes in teacher practice and student achievement. Competent school administrators build their own skills to influence teachers to attain buy-in, change instructional practice, improve outcomes for students, and empower teachers (Marfan & Pascual, 2018). They know they must do something differently to affect change. Building trust, developing shared leadership, working with teachers, and keeping transparent communication can create school improvement (Graham, 2018). Effective leadership understands the role of buy-in during any change.

Administrators understand that adults must change if achievement is going to increase and have many things to consider when supporting a district initiative; change can be complex. School officials are responsible for rigorous instruction that results in higher levels of student achievement, regardless of the developmental level of the student

(Rheaume, et al., 2021). The work of school administrators has changed over time, moving from educational management to educational leadership. As a result, requirements for being successful have changed over time (Cansoy & Parlar, 2018). School administrators must fully understand the change process, and they must act on those guiding principles. Leaders must possess knowledge and model skills to support change (Abernathy, 2018). Districts train administrators so they have the tools they need. Teachers notice when administrators do not have the knowledge and skills necessary for the complex job of school principal (Fourie, 2018). Listening to those affected by change and incorporating their feedback into how the change is implemented has been shown to be a leadership skill that supports effective change (Fourie, 2018). School leaders need to overcome barriers, one of which is listening to teachers and acting on their expertise, for effective school reform. School leaders can listen to the voices of teachers and motivate them to high performance (Fourie, 2018). Leadership involves understanding and hearing concerns, then acting on them.

Teachers' Perspectives

Teachers' perspectives and beliefs are based on their education philosophies and impact the classroom (Bas & Senturk, 2019). Perspectives and beliefs have a direct effect on teaching. Teaching PBL is not like traditional teaching; the role of the teacher changes from holding all the knowledge to facilitating learning with students creating their own understandings (Lee & Blanchard, 2019). Change requires reinforcement and support, and teachers understand that. Teachers communicate that they need ongoing support when starting a new program (Madani, 2020). If teachers do not have the professional learning and ongoing support from administrators, implementation of a program may not

result in improvement, since implementation of curriculum is executed by the teacher. Teachers' perspectives of school administrators impact their success on student achievement, as well as their professional learning (Marfan & Pascual, 2018). Teacher perspectives of effectiveness have power.

Characteristics for effective professional learning for math teachers include content-focused, active learning, coherence, collective participation, and duration (Parrish et al., 2020). Math teachers report they need professional learning that focuses on their needs and should be ongoing (Grady, 2018). Teachers who have more autonomy to choose professional learning are more likely to attend (Parrish et al., 2020). Teacher choice increases the likelihood that the professional learning will be implemented in the classroom (Martin et al., 2019). It is important for teachers to have a voice, especially in the change process.

This literature review provided the foundation of a common understanding of the complexities of effective learning in math. Administrator and teacher perspectives of the components of instruction, particularly effective instruction, were shared. This research led to the concept that teachers need to buy-in to any change that directly affects them. Administrators need to know about effective math instruction, and more importantly, how to best support teachers to skillfully lead the change process.

Implications

The literature review showed the importance of teacher buy-in and administrative leadership. The study informed understandings regarding current middle school administrators' and math teachers' perspectives of teacher buy-in for PBL in middle school math. Conducting a qualitative study that focused on perspectives of teacher buy-

in for PBL supported a more beneficial implementation of the district's PBL instructional model.

Despite benefits found in academic research regarding PBL, there had been a disconnect to the classroom because of how it was perceived by current administrators and teachers and was a barrier to implementing the district's PBL instructional model. By uncovering some unexamined administrators' and teachers' perspectives of PBL in middle school math, the findings were used to develop professional learning to support the district's implementation of PBL.

From this research, possible project directions, based on anticipated findings of the data collection and analysis, were professional learning for administrators and teachers. This may include leadership training for administrators and teacher leaders.

Summary

Current middle school administrators' and math teachers' perspectives of teacher buy-in for PBL in middle school math in the Southcentral United States were unknown. Exploring current administrators' and math teachers' perspectives by conducting this study enabled administrators to understand math teachers' perspectives and more effectively integrate the district's PBL instructional model in middle school math in the Southcentral United States.

Section 1 contained the introduction to the local problem, the rationale, the definition of terms, the significance of the study, the research questions, the review of the literature, the implications, and the summary. Section 2 addresses the methodology, research design, and general approach to more fully understanding the topic. Section 3 includes information pertaining to the project: the rationale, a review of the literature, the

project description, a project evaluation plan, and project implications. The project study concludes with Section 4 and contains content related to the project's strengths and limitations, recommendations for alternative approaches, evaluation of the project and self-reflection. Additionally, this section consists of a review of the importance of the work, the implications and applications of the project, and directions for future research.

Section 2: The Methodology

Section 1 provided the foundation for this basic qualitative research study. Section 2 will describe the strategies for determining the answer to the research questions to explore current middle school district administrators' and math teachers' perspectives of teacher buy-in for PBL in middle school math in a Southcentral U.S. state, since they were unknown. Purposely planning the research and developing a method by which to determine the answers to the research questions supported the most effective outcome (Galas et al., 2018). The purposeful planning is discussed below.

Qualitative Research Design and Approach

This section discusses the research design and approach for the study, as well as information regarding the participants, including the criteria for choosing participants, justification for participant choice, an explanation regarding the establishment of a researcher-participant relationship, and the protection of participants' rights. Also included in this section is a discussion regarding the data collection process, including the instruments used and data organization, as well as an explanation of data analysis procedures, which included member checking and triangulation. This section concludes with a discussion regarding the limitations of the study.

Logical Evaluation Design

The purpose of the study was to explore current school district administrators' and math teachers' perspectives of teacher buy-in for PBL in middle school math in the Southcentral United States. The problem investigated was that current school district administrators' and math teachers' perspectives of teacher buy-in for PBL in middle school math in the Southcentral United States were unknown. To explore the research

questions in this study, I utilized a basic qualitative design. Merriam (2014) suggested using basic qualitative research in applied fields of practice, such as education, because it supported understanding and constructing meaning of experiences and perspectives. Since the purpose of the study was to explore current school district administrators' and math teachers' perspectives of teacher buy-in for PBL in middle school math in the Southcentral United States, a basic qualitative methodology design best aligned.

Qualitative Research Design Used

Basic qualitative inquiry refers to an approach to research which uses an interview-based approach to interrogate and explore the subjective views and experiences of participants who have had experiences with a similar phenomenon in the outer world (Birks et al., 2019). Basic qualitative inquiry is valuable for researchers who seek to understand the feelings, thoughts, opinions, behaviors, and reactions individuals have to a common set of circumstances or experience (Birks et al., 2019). This approach to research is generally employed when statistical measures of a given phenomenon does not or cannot adequately describe that which the researcher is attempting to study (Dobbins et al., 2021). Basic qualitative inquiries are generally ideal for researchers with a significant body of knowledge regarding the topic they intend to study, who have a sense of the targeted gaps in knowledge they intend to learn more about (Merriam, 2014). This often means that although semistructured interviews are the only data they collect, basic qualitative researchers often incorporate previously established bodies of knowledge to help them better guide their study (Creswell, 2014). Both a deeper examination and understanding are developed through basic qualitative research.

Justification

Research methodologies that are common approaches to conducting a study include qualitative, quantitative, and mixed methods (Creswell, 2014). Qualitative researchers explore a phenomenon to describe and interpret a problem in a real-life context (Taguchi, 2018). Alternatively, researchers use quantitative research methodologies to test theories using sets of data to analyze relationships among variables using statistical techniques (Creswell, 2014). In addition, the mixed method methodology is used to explore phenomena and affords researchers the opportunity to gain a deeper theoretical understanding by incorporating qualitative and quantitative methods in one study (Yin, 2018). Because this research was intended to explore perspectives using nonstatistical data collection and analysis methodologies, the quantitative research method was not suitable for this study. Since quantitative methodology was not appropriate for the purpose of this research, mixed methods was also inappropriate.

Qualitative designs were analyzed in order to explore the research questions that current school district administrators' and math teachers' perspectives of teacher buy-in for PBL in middle school math classes were unknown. There are different types of qualitative designs, just as in quantitative methods. Merriam (2014) presented the six most common types of qualitative designs: phenomenology, grounded theory, ethnography, narrative analysis, critical research, and basic qualitative research. According to Merriam, phenomenology studies intense, emotional human experiences over time. This research required interviews of administrators and teachers at one moment in time, not over a period of time. As a result, phenomenological design was not appropriate. Another qualitative design is grounded theory, of which the intent is to

generate a theory from the research (Merriam, 2014). This research intended to explore perspectives, not create an educational theory. Grounded theory was not appropriate because it does not take into account a rich description of a case. Ethnography is a qualitative design that concentrates on human societies and cultures, studying behavior patterns of a specific group of people (Merriam, 2014). Since this research was not being conducted in the actual setting but utilized information from interviews after the teaching and learning occurred, ethnography was not relevant. Another qualitative design is narrative analysis, which tells a personal story (Merriam, 2014). Since it tells the personal story of only one participant, narrative analysis was not appropriate. Critical research, the final qualitative research design considered, determines societal power structures (Merriam, 2014). Because the purpose of the study was to explore current school district administrators' and math teachers' perspectives of teacher buy-in for PBL in middle school math in the Southcentral U.S., a basic qualitative research design was most appropriate. A characteristic of basic qualitative research design is that people create their own individual realities based on the ways in which they interact in the world, socially and emotionally (Merriam, 2014). The design, also, allows researchers to examine new ideas to meet current needs (Siswono et al., 2018). Basic qualitative research creates an understanding of how people act and react in situations (Merriam, 2014). A basic qualitative method supported the purpose of the study, to explore current school district administrators' and math teachers' perspectives of teacher buy-in for PBL in middle school math in the Southcentral U.S.

Participants

Criteria for Selecting Participants

Administrators and teachers were the participants in the study. Five administrators and five teachers who fit the set of criteria were asked to participate (Butler et al., 2018). The selection criterion for the administrators was that they led the district's PBL program in this school district. The selection criterion for the teachers was that they had taught middle school math in the region. The participants had to work in one of five different schools in the district. To guarantee that viable data were used, participants who qualified under this set of criteria were included (Yin, 2018).

Justification of Participants

Five administrators and five teachers, who fit the set of criteria, were asked to participate (Butler et al., 2018). Purposeful sampling allowed for a better understanding of answers to the research question (Ravitch & Carl, 2019). Purposeful sampling encouraged a focus on exploring insights from current administrators' and math teachers' perspectives of teacher buy-in for PBL. Purposeful sampling occurs when the researcher is intentional in the selection of participants (Creswell, 2014). Purposeful sampling is a valid recruitment method used in qualitative studies that allows for the selection of individuals who have knowledge concerning a specific phenomenon and who serve as a demonstrative population (Denzin & Lincoln, 2018; Yin, 2018). The data to be explored came from both current administrators and math teachers who worked in the district that was implementing this PBL instructional model. There were five secondary administrators who were trained in the district's instructional model, as well as a minimum of five teachers who taught middle school math in the school district.

According to Yin (2018), a minimum of 10 is acceptable to achieve data saturation. I used purposeful sampling recommended by Campbell et al. (2020) and asked school administrators and math teachers who fit the criteria to participate.

Procedures for Gaining Access to Participants

I invited participants to take part in the study and collected information related to their experience by using Zoom or telephone interviews. Following approval from Walden University and the Internal Review Board (IRB), Approval Number 03-28-22-0227875, I contacted the potential participants by emailing the appropriate administrators, as well as those who taught middle school math in the school district (see Appendix B). The email explained the problem, purpose, and research questions of the study. Potential participants determined to be both eligible for and interested in study participation were invited to an interview with me, either in person on Zoom or on the phone. At that time, the participant and I arranged an appropriate time to meet for the interview, then I followed up with an official email invitation. Before the interviews were conducted, I had participants read and sign a consent form (see Appendix C) which outlined the responsibilities of study participants. Interview questions focused on understanding the administrators' and teachers' perspectives of PBL in middle school math. During the interview, I reminded the participants about the purpose of the study, as well as outlined the confidentiality rights. The participants were informed that they were being recorded during the interview, and the transcripts would be shared with them for clarification and, if necessary, correction.

Establishing a Researcher-Participant Relationship

Interviews create a relationship between the researcher and participant, even if they are brief (Ravitch & Carl, 2019). Bougie and Sekaran (2019) suggested that holding interviews provides a deeper understanding of the participants' feelings, experiences, beliefs, and sentiments, whereas other types of data may not give the same depth. Therefore, I used open-ended questions for all the semistructured interviews to gather all-inclusive data and to achieve a deep awareness of the participants' experiences, feelings, and thoughts (Yin, 2018). I made an intensive effort to cultivate a respectful rapport and sense of trust with the teachers by sharing that the purpose is to share their perspectives and that they have an important voice, while reassuring them that they can discontinue their participation in the study at any time. I was cognizant to assure the participants that any personal information or information about their schools and districts would remain confidential.

In the open-ended, semistructured interviews the current administrators and teachers were the sources; I used these strategies during the interviews by (a) being polite, (b) aspiring to gain the trust of others, (c) learning from nonverbal communication, and (d) encouraging participants to express themselves freely (Korstjens & Moser, 2018). Similarly, the course of natural conversation can allow for new discursive modalities, which allow for greater dissemination of information (Passmore et al., 2021).

Protection of Participant Rights

First, I informed participants of their rights and provided them with a copy in writing. Ensuring confidentiality was extremely important. Pseudonyms were used to protect privacy of individuals. In the interest of ensuring standards of ethical research

were met, Walden University's independent review board reviewed my research plan. To uphold the IRB's ethical standards, I agreed to protect participant privacy, follow the established participant recruitment plan, respect the rights of participants, and follow Walden University's informed consent process. These practices helped ensure that participants were adequately protected during this study. To ensure accuracy and adherence to ethical standards, all data gathered about the participants was kept strictly confidential. Participants were allowed to leave the study at their discretion and were not required to respond to interview questions they were uncomfortable with answering. The participants could remove themselves from the study when needed and without penalty, as recommended by Yin (2018). The participants were assured that there was mutual engagement, as suggested by Ravitch and Carl (2019).

Data Collection

Data Collection and Justification

Qualitative data collection generally consists of highly structured interview-based methods which strictly focus on obtaining concrete examples of real-word processes (Dobbins, et al., 2021). Qualitative data researchers utilize data collection tools such as semi or fully structured interviews, surveys, and questionnaires to ensure that the opinions on and experiences with the topic reach data saturation (Dobbins et al., 2021). Semistructured and fully structured interviews allow researchers to ask a series of common, predetermined, pre-structured questions, as well as engage in follow-up with probing questions (Ravitch & Carl, 2019). Surveys give participants a question with several predetermined response options to voice their opinions (Dobbins et al., 2021). In

all of these cases, researchers design questions based on their previously obtained knowledge of the topic they are studying (Dobbins et al., 2021).

The perspectives qualitative data researchers seek are generally those focused on subjective, material experiences of a common external activity; rather than focusing on individual participants' views on a given activity, the researchers focus on learning how common infrastructures, procedures, and experiences are experienced (Birks et al., 2019). Generally, this means that qualitative data researchers collect broad, brief interview samples of many different participants (Birks et al., 2019). This is because large-sample surveys are oftentimes more widely representative of a common material experience. In some instances, researchers will perform in-depth qualitative interviews with a few experienced participants to achieve data saturation through collecting highly specialized and complete perspectives on the subject they are studying (Dobbins et al., 2021). The iterative process, as Ravitch and Carl (2019) described, will result in richer and deeper data.

While Yin (2018) asserted that many data sources were valid in a qualitative context -- including empirical observation, interview transcripts, and documentation -- Yin (2018) also noted that a valid study does not require all types of valid data source to be used. The person-to-person interview can contribute to a deeper understanding of a phenomenon (Merriam, 2014). Ravitch and Carl (2019) encouraged dialogic engagement, a systemic process for iterative discussions. In this study, I used open-ended, semistructured interviews with both participant groups, current administrators and math teachers, to obtain data and secure findings. Each participant group was asked questions based on an interview protocol (see Appendix C) based on the research questions. In this

basic qualitative study, I collected data to understand current administrators' and math teachers' perspectives of teacher buy-in for PBL. For the interviews, we conducted an online meeting via Zoom or meet at a secure, private location when COVID-19 restrictions were lifted.

Data Collection Instrument

The instrument for this project study was an interview protocol (see Appendix B) and a set of semistructured interview questions (see Appendix C) to guide my one-on-one interviews with participants. The interviews occurred via Zoom, over the telephone, or we met at a secure, private location when COVID-19 restrictions were lifted. While I sought to conduct face-to-face interviews on Zoom when possible, I agreed to telephone interviews at the participant's request. At the start of the interviews, I shared the reason of the study with the participants, again assuring them that any information they chose to share would remain confidential. To warrant content validity, I verified the interview instruments, found in Appendix C and D, to confirm the appropriate number of questions, clarity of language, and the amount of time required to conduct the interviews, so as not to inconvenience the teachers, as noted by Tarnoki and Puentes (2019). I also used the recommendations by Taguchi (2018) to determine reliability by generating a detailed audit trail. Audit trails allow researchers to explain why participants were selected to join the study, explain the study's purpose, clarify the data collection process, outline how data collected during the study is processed, explain the methodology for proving the data's credibility, and report the study's findings (Yin, 2018).

Data Collection Instrument Source

I conducted online meetings via Zoom, or met at a secure, private location, depending on the participant's comfort level. The interviews were one-on-one and lasted approximately one hour. During interviews, I used two digital recorders, one for recording and one for a back-up, and a notebook for information organization. I utilized reflective listening, then emailed participants with preliminary findings to ensure I understood and was accurately conveying what the participants shared. The interview protocol (see Appendix B) was created by the researcher and developed using Walden University-developed interview materials. Semistructured interview questions (see Appendix C) were developed by the researcher, as well, using the same criteria. I ensured I aligned the interview protocol with the interview questions.

Interview questions addressed the research questions of the study (see Appendix C). I created these questions to better understand current administrators' and math teachers' perspectives of teacher buy-in for PBL in middle school math. I was trained in the PBL model when I worked for this school district, so I have a thorough understanding. The conceptual framework of this study, Vygotsky's social constructivist theory (Vygotsky, 1978), which holds that students learn through collaboration with the teacher and other students, was the foundation of the administrators' and math teachers' beliefs.

Sufficiency of Data Collection Instruments

To ensure data collection instrument sufficiency, there are considerations for conducting interviews. Ravitch and Carl (2019) shared that some of these include relational, contextual, non-evaluative, person-centered, temporal, partial, subjective, and

non-neutral. The procedure I used to collect data was flexible, as recommended by Yin (2018). The format of the semistructured interview protocol included a personalization of the protocol since follow-up questions are intrinsic (Ravitch & Carl, 2019). The semistructured interview process allowed for deeper discussion and probing, including the possibility of items not specifically included in the questions to surface. Due to the constitution of the semistructured interview process paired with an interviewer who was able to delve into what the participants shared, a sufficiency of data could be discovered.

I created data saturation by ensuring a thorough assessment of the interview responses, the themes revealed, and the literature explored. This process supported the uncovering of rich data to be further explored. The complexity came with categorizing the data that was unearthed.

Organizing the Data

Once the interviews were completed, I separated the data into different groups (i.e., notes, recordings, and responses) in order to be able to clearly recognize the different types of information. I played back digital audio recordings of interviews and transcribed interview data. Passmore et al. (2021) asserted to achieve accuracy and to avoid leaving out any significant information, the narratives should be transcribed directly after the interview is completed. According to Yin (2018), the transcription process allows for greater exactitude in data organization. I transcribed, encrypted and stored the transcript files on a backup drive. This backup drive, physical copies of transcripts, and relevant consent forms were stored in a secure facility for 5 years, accessible only by me. Once this 5-year period has ended, I will destroy all of the stored materials, per Passmore et al. (2021) and Yin's (2018) suggestions.

Tracking Data

There are many different ways of keeping track of and organizing data in a qualitative study (Passmore et al., 2021) Researchers use different types of cataloging systems such as research logs and reflective journals to help retain as much data as possible (Denzin & Lincoln, 2018; Levitt et al., 2018). I kept track of the breadth of data by keeping a reflective journal. After coding and categorizing the information gathered from the participants, I wrote my thoughts in a journal specifically used for this purpose only. In addition to writing my thoughts in a journal during the analysis process, I used the journal during the interviews with each participant. In leaving notetaking for after the interviewing process, it would be possible I could lose valuable information due to the inability to recall what had been shared verbally and nonverbally (King & Brooks, 2018). By jotting down my thoughts and understandings during the interviews, I was able to reach a depth of understanding needed to fully convey what is being shared.

Gaining Access to Participants

To acquire interviewees, I contacted potential participants by talking with principals who led schools that utilized PBL to gauge their willingness to participate and obtained the names of the math teachers involved in the district PBL instructional model. I determined if potential participants were eligible and willing to be interviewed for the study. I explained the reason for the study to eligible and willing prospective participants. I scheduled a Zoom or telephone interview, whichever was comfortable and adequately private for both of us. Participants were asked to sign a consent form (see Appendix C).

Role of the Researcher

Researchers should observe required procedures and should uphold ethical principles while engaged in research (Yin, 2018). I followed the guidelines stipulated in the Belmont Report (National Commission for the Protection of Human Subjects of Biomedical and Behavioral Research, 1979) by being honest regarding issues related to confidentiality. While there are many valid forms of qualitative study, I used semistructured interviews to obtain participants' perspectives (Levitt et al., 2018). I informed the participants that they could choose to remove themselves from the study at any time. I recognized that, in any academic study, objectivity is of paramount importance; I searched for potential sources of researcher bias and accounted for them while analyzing my data.

I currently work in this district and personally knew most of the school district administrators and math teachers prior to conducting the study, but I did not and do not supervise any of them. Researchers have distinct roles in their studies, including planning and logistics, participant engagement, and oversight. Generally, researchers become immersed into their studies, in large part due to their active involvement and participation in the process (Dash & Verma, 2019). In the case of qualitative studies, researchers also play the role of data collection tool, as they conduct the interviews and collect the information they need (Ravitch & Carl, 2019). The various ways I, personally, participated as a researcher included, but were not limited to, the planning, securing the IRB approval and sharing the consent form with participants for their consent, scheduling interviews, interviewing participants, being attentive and caring during the interviews, and then doing the data analysis. Because of my experiences, I may have had some bias

during the data collection. Bias is defined as an influence that distorts the results of a study (Galdas, 2017). My potential bias may have resulted from my interaction with these educators.

The acknowledgment of researcher bias is imperative to trustworthiness of the researcher, as well as the credibility of the findings (Johnson et al., 2020). To address this potential bias, I acknowledged the potential for bias during the data collection process and listened to what was being said without making judgement. Reflecting on what I heard and appreciating diverse beliefs may have limited bias (Dash & Verma, 2019). I, also, structured dialogic engagement, as suggested by Ravitch and Carl (2019). Dr. Janel Madeley, the Math Curriculum Coordinator in my current school district, had the math background and the analytical knowledge to challenge my thinking. We had a positive working relationship prior to this study, as well, and have continuously challenged each other professionally to better meet the needs of students; we will continue this work to explore current administrators' and math teachers' perceptions of teacher buy-in for PBL in middle school math.

As a researcher, I took steps to reduce the potential bias in the study. Though I have expertise in this area, I selected participants with whom I have no supervisory or employee relationship, so no parties feel an obligation to answer or act in a specific way. Following DeHart's (2020) example, I followed an interview script with open-ended questions to avoid asking questions that swayed participants into answering in certain ways. I conducted member checking, to ensure accuracy and validity of the data, and conducted my coding only after reviewing the interview transcripts multiple times to

ensure my own understanding and reduce the likelihood of inaccurate coding (Hall, 2020).

Data Collection

When conducting qualitative research, the data collection and analysis processes are vital to finding understanding of the topic at hand, as well as ensuring the study is valid (DeHart, 2020). I used interviews to gather information from participants on their thoughts, feelings, beliefs, and actions as they related to PBL in middle school math settings. Specifically, semistructured interviews were used because they allow for consistent information to be gathered, while also probing into interviewees' motivations, thoughts, and beliefs for a more complete sense of the story each interviewee has to tell (Merriam, 2014).

Given the restrictions of the COVID-19 pandemic, all semistructured interviews were conducted via Zoom, a video conferencing service. Ten interviews were conducted, five each for administrators and teachers. Each potential participant was sent an introductory email to request their participation. When participants indicated interest, a consent form was sent. Once the signed consent was received and filed, an interview time was established. I had a set of established interview questions but asked probing questions when appropriate to get a deeper understanding of the topic.

Each interview session was recorded with the participant's permission, and I took notes simultaneously. After the interviews were completed, I used a transcription service to transcribe the meetings. Transcripts were sent to the participants for member checking (Yin, 2018). Of the ten participants, nine agreed with their transcripts with no edits, while one had minor adjustments. After the changes were made, the transcript was re-sent to

that participant, who approved the updated version. Once the transcripts were approved by the participants, I began to code the data and identify themes related to the research question by finding patterns and similarities in the data (Moustakas, 1994). The data collected during the interviews did reveal sufficient information on the perceptions of both the teachers and administrators interviewed, which allowed me to reach conclusions related to the research (DeHart, 2020).

In order to decrease the potential for researcher bias, I conducted member checking with the participants. I shared initial findings with the participants to solicit feedback from the participants to verify accuracy of my findings, as Creswell (2014) suggested. Ravitch & Carl (2016) said that member checking is important to ensure the researcher's interpretations and analysis are accurate. Member checking provides the opportunity for participants to review their responses to ensure their perceptions are reported accurately (Ravich & Carl, 2016). Engaging in member checking provides a more balanced approach and suppresses researcher bias in the study (Lodico, et al., 2010).

Member checking supports other criteria for trustworthiness, which includes credibility and rigor, according to Ravitch and Carl (2016). Credibility, or how research findings align with participants' perceptions, is supported in member checking (Merriam, 2014). Obtaining the participants' input at this stage is imperative in a credible and rigorous study, as different lenses are applied in order to ensure reliable findings. Credibility, transferability, dependability, and confirmability are validity standards for qualitative research (Ravitch & Carl, 2016). Obtaining quality input from participants helps the researcher keep inferences that align with the findings (Ravitch & Carl, 2016).

I emailed the specific participants' responses to discuss my interpretation of their responses to the interviews. One of the school district administrators clarified a point, while the other participants agreed with my explanation. The data were adjusted as a result of that clarification.

There were a handful of factors that were important in the data collection process. First, I aimed to allow each participant the opportunity to answer each interview question (see Appendix C) fully, to share their full thoughts. My goal in doing so was to ensure the interviewees had explored each new potential topic fully, and to get the most complete data possible. Having depth to the interview process in this way helps to collect more complete data, which informs the themes and study results (Yin, 2018). Next, I ensured that participants felt comfortable during their interviews, which is meant to increase the accuracy and completeness of their answers (Levitt et al., 2018). As the researcher, I contributed to their comfort by ensuring my locations during the interviews were confidential and quiet, so the interviewees could focus and relax, and I encouraged them to find similar locations as recommended by Hall (2020). Finally, I followed a distinct interview procedure, including having a script, having established interview questions, and so on (Schoch, 2020).

Data Analysis

Thematic analysis is a process in which common responses, opinions, and points of view expressed across multiple qualitative surveys are analyzed to determine common elements of similar subjective experiences (Birks et al., 2019). While thematic analysis is not a complete research methodology, its wide applicability makes it a useful tool for investigating multiple kinds of qualitative analysis (Birks et al., 2019). Thematic analysis

generally consists of identifying and interpreting common trends across qualitative methodology survey materials collected by a study's researcher (Ravitch & Carl, 2019).

Thematic Data Analysis

Thematic data analysis is utilized to discover themes and meaning from data derived from the research questions in the study. It is important to ensure quality of the data analysis process. Creswell (2014) identified six iterative steps of data analysis to ensure meaningful data: (a) review the data, (b) organize the data, (c) code the data, (d) apply emerging themes, (e) report the findings, and (6) ensure accuracy through validation procedures.

Step 1: Reviewing the Data

The first step is to reexamine the data to prepare for effective analysis (Lodico et al., 2010). All data should be thoroughly reviewed; multiple reviews may be necessary in order to process the data (Creswell, 2014). I reviewed the data multiple times to confirm all responses are represented.

Step 2: Organizing the Data

Data should be organized into file or computer files, since the information from interviews could be considerable (Creswell, 2014). Tips shared by Creswell (2014) include developing a table or matrix, organizing by participant, and keeping duplicate copies. Following the interviews, I transcribed the recordings by listening carefully to what was shared. Then I created a matrix that divided administrator responses from teacher.

Step 3: Coding the Data

There are several steps involved in coding data. Creswell (2014) listed them as: (a) read transcripts thoroughly and make notes in the margin, (b) create underlying meanings by a more thorough examination of one document, (c) begin the process of coding by configuring text segments by topic, (d) synthesize codes to reduce to a smaller number, (e) return to the data to determine whether new codes emerge, and (f) narrow down to five to seven themes in order to provide detailed, more descriptive portrayal. I reviewed the transcription and manually conducted open-coding information to identify and categorize the information shared by the participants. Levitt et al. (2018) suggested data be coded this way in order to better identify and codify themes. Continual coding has also been shown to be helpful in finding themes in a study that are emerging and find the point of saturation of data in those themes (Denzin & Lincoln, 2018). An in-depth review of all data was read, and I coded each data item before going to the next (Braun & Clarke, 2021). I coded my data manually and digitally for a broader scope and accuracy of coding.

In order to analyze, identify, and organize the themes in my data, I used a software called NVivo 11. It added structure to previously unorganized data, since the NVivo 11 software was able to assist in coding and finding themes and trends in data (King & Brooks, 2018). It highlighted words and phrases from the interviews. I analyzed for similarities, first, and then differences, and categories were assigned based on the findings, moving from open-coding to more focused themes (Ravitch & Carl, 2019). I color-coded the teacher responses from the administrator responses and used the codes to organize into categories. I used open coding to begin the coding process, then axial

coding to create categories. I created a frequency table to show the codes and how they related to specific categories (Saldaña, 2016). I went back to the transcripts one last time to ensure all relevant information as included. I triangulated the codes in order to identify the categories (Saldaña, 2016).

Step 4: Apply Emergent Themes

The next step was organizing the categories into themes that were relevant to the research questions (Saldaña, 2016). All data were analyzed to ensure they were aligned with the research questions, so outliers were not be included (Merriam, 2014). I considered additional explanations for a complete understanding, as it was necessary to examine themes emerging from data iteratively (Ravitch & Carl, 2019). I reviewed the data by comparing the frequency table with a Venn Diagram to ensure the initial information was consistent with the thematic findings (Saldaña, 2016). Creswell (2014) suggested when initial themes emerged from reviewing the data, to make notes and determine if those early themes survive; I did that.

Braun and Clarke (2021) made light of themes automatically coming to the surface; finding the themes is an active process. As a result, I considered the most relevant themes to best share the participants' perspectives. This required a thorough assessment of the themes to ensure they connect the data with the research; this also required going through this process more than once (Braun & Clarke, 2021). After identifying and coding the key themes, I reviewed the themes, and connected them to existing literature and the framework I was using in this study. While there is no agreed-upon standard for evaluating the reliability of qualitative coding (Hemmler et al., 2020),

the iterative process I followed accepted qualitative data analysis research and thoroughly explained my thinking and analysis process.

Step 5: Report the Findings

Findings were reported based on the themes that emerged from Step 4. Results were organized by the research questions, first by administrator responses then teacher. The report told the story of current administrators' and math teachers' perspectives of teacher buy-in for PBL in middle school math.

Step 6: Validation

Thematic data analysis and data triangulation was utilized to ensure that qualitative information gathered during this study was valid and objective. They were important to show that research had validity, as well (Ravitch & Carl, 2019). Qualitative research uses "trustworthiness" to confirm that the participants' views are asserted without researcher bias. I followed the guidelines during this process.

After the 10 interviews were completed, transcribed, and checked by the participants, I began to analyze the data I had collected. See Table 1 below for demographic participant data.

Table 1

Demographics of Participants

Participant	Profession	Age	Race	Sex	Years of Experience
T1	Teacher	62	White	M	14
T2	Teacher	41	Asian	M	9
T3	Teacher	40	White	M	9
T4	Teacher	58	Black	F	19
T5	Teacher	42	White	F	3
AD1	Administrator	43	White	F	17
AD2	Administrator	44	White	F	18
AD3	Administrator	48	White	F	17
AD4	Administrator	42	Hispanic	F	14
AD5	Administrator	47	White	F	18

To collect the data, I conducted semistructured interviews with the participants, which allowed me to ask open-ended and probing questions (see Appendix C). Before beginning data analysis, I reviewed each interview transcript multiple times before attempting to code them or find themes. Once I understood the data, I began to sort it to create a meaningful system of organization (Braun & Clarke, 2021). As I reviewed the transcripts, I began to review similar codes and find overarching themes. For example, I found many common codes around engagement and empowerment, both of which ended up being themes. Using a combination of color-coded index cards and an Excel spreadsheet, I was able to find multiple themes that were used in the data analysis

(Merriam, 2014). Open coding was used after the manual transcription process in order to categorize the information shared by the participants. The initial codes were analyzed again to ensure they are appropriate and that they are reliable. An inductive qualitative analysis process probed into the perspectives of current middle school administrators and math teachers regarding buy-in for PBL in middle school math was the focus during the data analysis process.

Coding and Themes

The complete set of transcripts were reviewed multiple times for understanding. At that stage, I wrote thoughts and notes in the margins and began to bracket, underline, and circle the statements that I felt may be relevant to the research questions. This process allowed me to find categories, themes, and subthemes among each answer. Then I used a color-coding system to organize notes by teacher and question, per Hall (2020), so I could be sure that the information I had gathered was kept with similar information. I followed a similar system with the administrator data but opted to focus on one category of participants at a time to ensure the data remained separate and relevant.

After I had begun to find initial themes and key statements and phrases, I used the research questions to guide my data analysis. I reviewed the overall sentiments of statements and grouped them using my color-coded system to find commonalities in the qualitative data (Saldaña, 2016). That data drove the codes used and were checked against the transcripts for accuracy. My aim was to ensure that each code established could contribute to a larger theme; having enough data to form themes and subthemes is important in establishing high-quality results (Denzin & Lincoln, 2018). If there were codes that did not support a larger theme or subtheme, I reassessed the themes and, when

necessary, added additional themes (Saldaña, 2016). As recommended by Denzin and Lincoln (2018), I reviewed then existing codes to see if any statements or phrases would better fit in the new themes.

Using my color-coded notes, I copied the codes I had selected into an Excel document alphabetically, one document each for teachers and administrators, then began to copy the relevant statements into new tabs by code. I created a table of contents page that had all the codes, subthemes, and themes, to provide me with an overview of the data analysis. The Excel sheet was used to check against the transcripts for any missing data or information. From that point, I reviewed the codes one last time for redundancy or missing themes and consolidated or added themes as appropriate for succinct and relevant themes that supported the research findings (Hall, 2020).

Evidence of Quality and Trustworthiness

Trustworthiness and validity can be interchanged in qualitative research. Ensuring that a qualitative study is valid is a process and a goal (Ravitch & Carl, 2019). Some criteria for trustworthiness and quality qualitative research include credibility, transferability, dependability and confirmability (Korstjens & Moser, 2018). It is important to include these aspects, when appropriate, because of the nature of qualitative research. Quantitative research offers truth through internal validity, generalizability, reliability, and objectivity, but these do not have a place in qualitative research. To ensure that the findings can be trusted, including these qualitative items assure rigor in the study (Johnson et al., 2020). Participants reviewed the results of the data analysis for accuracy, as well, bringing another support for validity to this research.

Credibility

Credibility in qualitative research includes prolonged engagement, persistent observation, triangulation, and member checking (Korstjens & Moser, 2018). Credibility, which can be compared to internal validity in quantitative research, provides aspects of truth and believability. The foundation of credibility is a well-designed research study (Ravitch & Carl, 2019). Data were triangulated through the interviews of two different perspectives, current administrators and math teachers. In this study, thick descriptions and member checking were used to show credibility, as well.

Member Checking

According to Yin (2018), validity is improved by conducting member checking, a method of verifying the accuracy of the participants' interpretation of responses. Ravitch and Carl (2019) termed this as "participant validation strategies" to ensure credibility and trustworthiness (p. 176). For this study, member checking took place during and following the interviews by reviewing what the participants shared with them, as previously discussed. The member checking process gave me an opportunity to review and interpret the interviewees' responses, review their replies to the interview questions, and ask clarifying questions. After ensuring the participants provided enough information, each received an electronic copy of their answers to the interview queries.

Member checking is conducted to validate the data. Researchers perform member checking to augment the accuracy, credibility, validity, and transferability of a study (Tarnoki & Puentes, 2019). Even though Yin (2018) emphasized that member checking can occur at many stages within the process of collecting data; to increase the validity and credibility of this study, I used this process as the interviews progressed and after

each of the interviews concluded. I created an inviting and relaxing atmosphere during the interview process, in the hopes of reaching the greatest degree of conversational openness possible.

Transferability

Transferability describes the possibility of generalizing the findings to a larger setting (Yin, 2018). It relates to external validity in quantitative research (Ravitch & Carl, 2019). The transferability in this study was intended to support the district's deeper implementation of the PBL instructional model; exploring administrators' and teachers' perspectives provided some insight. To support the prospect of transferability, I shared and analyzed rich descriptions to allow readers to determine the extent to which the results transfer to other settings. Utilizing purposeful sampling supported this, as well.

Dependability

Dependability is the strength of the data (Ravitch & Carl, 2019). Ensuring that dependability is achieved requires the utilization of appropriate methods of data collection and analysis. This was ensured by utilizing research protocols from the Walden IRB. Also, interview questions were asked in the same order, then follow-up questions were asked for clarification only. Notes and an audio recording were kept and shared with participants to check for precision.

Confirmability

As the researcher, I exhibited neutrality throughout the study. All findings were shared as evidenced through data analyzed in the interviews, not personal convictions or perspectives. An audit trail was shared, from the time the research began to the development of the survey to the reporting of the findings; this improved confirmability

because it provided an external check (Sharp & Sanders, 2019). The records were kept throughout the study. This showed consistency throughout the research. By keeping these records, the thinking and the process were clarified.

At this point, I reviewed my data for discrepancies, which could either lead me to additional themes or invalidate other findings. I wanted to be mindful of potential discrepancies, in part due to the nature of the topic as personal preferences and beliefs; this is enforced by interview best practices (Merriam, 2014). In instances in which two or more participants felt differently about a topic, I reviewed the discrepancies and the stated causes to see how they had come across in the original interviews and if they still aligned with the patterns I had found in the data. I found that despite some of the participants feeling slightly differently, the major themes remained the same, so I chose to focus my analysis on codes that had all participants in agreement, while noting

Data Analysis Results

The data were collected through semistructured interviews with five teachers and five administrators in the Southcentral United States. These participants consented to the interview process, as well as the recording of the interviews and their inclusion in this study. Each interview was conducted via Zoom and audio-recorded, then transcribed verbatim for thematic analysis.

Findings

The findings of this basic qualitative research answered the research questions. Several themes were discovered among teachers and principals. The broader themes were: *engage*, *equip*, and *empower* but were more precise when applied to the two research questions (see Table 2).

Table 2

Emergent Themes and Participant Acknowledgement

Research Question	Emergent Theme	Occurrence
1	Theme 1: Equipping teachers with autonomy	AD1, AD2, AD3, AD4, AD5
1	Theme 2: Engaging students in real-world, authentic learning	AD1, AD2, AD3, AD4, AD5
2	Theme 3: Engaging students to build math confidence	T1, T2, T3, T4, T5
2	Theme 4: Equipping teachers to meet external teaching demands	T1, T2, T3, T4, T5
2	Theme 5: Empowering teachers to adapt and take control	T1, T2, T3, T4, T5

The following section outlines the five themes of (a) equipping teachers with autonomy, (b) engaging students in real-world, authentic learning, (c) engaging students to build math confidence, (d) equipping teachers to meet external teaching demands, and (e) empowering teachers to adapt and take control. Table 3 above shows how many respondents discussed each emergent theme. Based on the research questions, the themes are presented below with participants' thoughts. A table is also provided for each theme, delineating a review of excerpts, interpretation, and analysis for each theme.

Themes and Research Question 1

The first research question asked, "What are the current school district administrators' perspective of teacher buy-in for PBL in middle school math in a Southcentral U.S. state?" Themes 1 and 2 related to the broader themes of equipping and engaging. Theme 1 was about teacher autonomy and Theme 2 was about real-world learning.

Theme 1: Equipping Teachers with Autonomy

The administrators interviewed agreed that teachers should be given the opportunity to adjust to PBL on their own terms. Administrators indicated their willingness to support teachers throughout the transition to PBL. They suggested doing such would create better outcomes for students and teachers alike.

According to AD1, teachers are given more autonomy over the pacing of their lessons in PBL: "Pacing can absolutely be different but giving teachers a say in how they achieve this and decide where we are going to end up" is beneficial. This is mirrored in AD3's comments:

> Well, I think a lot, I mean, again, you're, you're almost asking people, anytime you ask people to kind of shift their paradigm, the buy-in is going to be essential because why would I change? Like what—what's in it for me, what's in it for students? Most teachers really want to do right by students. So, they—they would have to understand like all things we do, the why behind that's important."

All the administrators agreed, when switching to PBL, not only should teachers be given information on the reasoning behind the shift, but they should also be given the opportunity to learn the new way of teaching that better aligns with PBL. As noted by AD3 above, "you're asking people…to kind of shift their paradigm," which requires an adjustment in thinking and action. Part of this adjustment is through professional development and feedback, which further provides teachers with autonomy over their learning and change processes. AD2 clarifies the need for both, saying,

> [We would start with] something small, a couple teachers piloting it, um, giving 'em the extra professional development and time to develop those. And then

> especially an evaluation piece on, um, what worked and what didn't work. So that could be provided by an IC that could be provided by video. Um, most powerful, um, feedback for teachers in those kinds of cases is going to be protocols.

Administrators agree that teachers are often willing and able to shift to PBL, but their ability to effectively make this transition relies heavily on their own knowledge and understanding. This is aligned with teachers' beliefs on the topic, too, as is noted in Research Question 2. In keeping with the conceptual framework of this study, social constructivist theory, learning should be a collaborative experience — between teachers and students, teachers and their peers, and students and their peers. Having teachers collaborate on learning PBL, then applying PBL to help students collaborate with one another, is an opportunity to grant both groups more autonomy.

One of the more abstract aspects of autonomy is trust. Teachers must trust their administrators and partner teachers, and administrators must trust their teachers. By building trust in one another, teachers are granted more autonomy, and their autonomy allows them to work more effectively and improves their practices of PBL. This is noted by AD4: "And so I think that when applying PBL to math, I think it can be super beneficial, but because it is so concrete and the idea of PBL is so abstract, um, it would definitely take a special person and a whole lot of planning and trust with a partner." Again, partnership improves the outcomes for teachers and students alike. Table 3 below provides more details regarding the emergent theme of autonomy.

Table 3

Theme 1: Excerpts, Interpretation and Analysis, and Emergent Themes

Excerpts	Interpretation and analysis	Emergent themes
AD1: "We have to support teachers in designing good problem or projects, then develop those routines so they're comfortable." AD2: "If a teacher doesn't believe in it, they're not going to do it. They'll fight it in every way. We have to get our teachers on board, get their ownership in any process. It should be a grassroot effort. We have to support the ones who are willing to jump off the cliff with a big parachute - and it's going to be fun." AD2: "[We need to] give teachers extra professional development and time to develop those skills."	Teachers need to feel they have ownership in their teaching to embrace educating children in new and innovative ways.	Preparing teachers through professional development or simply giving them autonomy from the onset will help teachers trust their administrators, partner teachers, and use PBL.

Overall, Theme 1, equipping teachers with autonomy, shows that administrators believe autonomy is necessary when applying PBL to math in Southcentral states. This not only builds teacher buy-in, but can also lead to more equipped, effective teachers, who then help students learn better.

Theme 2: Engaging all Students in Real-World Learning

One of the themes that arose among all school administrators was that PBL can help students understand the relevance of math to their futures. As noted above, teachers want the best for their students, and knowing students have a desire for real-work, knowledge about authentic learning, and how,PBL can facilitate that, can increase buy-in.

AD1 describes the problem that many students and teachers face in the classroom when learning or teaching math by stating,

> You might do this project in 7th grade and then you don't do the project again in life, sure, but somebody does! Without that career path our world doesn't function without looking at all the different options. To increase relevance, we can incorporate as many different career paths as we can so every kid has a chance to have an assessment that relates to them in something they could see themselves doing.

Teachers and administrators alike want to see students thrive and using PBL for real-world learning is noted by all administrators interviewed as an effective way to increase the relevance of math. Students who are disconnected from their learning are less likely to retain and truly understand the information, while students who receive authentic training that can be utilized in their futures have better outcomes.

AD3 suggests that PBL "would naturally help bring more relevance [to math] and bring more…thought around how to solve [problems], because [math classes] wouldn't be so focused on "churn it out."" In turn that would "open the door for us to spend more time on explaining, thinking and reasoning and those kinds of pieces." Learning the application of math skills like reasoning is a primary benefit of PBL, which can help combat some more "antiquated" connections between math and real-life "like your gardener needs to know the perimeter," also noted by AD3.

Again, linking PBL in math to social constructivist theory, a PBL model of math learning and education allows students to develop critical thinking skills while deriving meaning from the content (Cloete, 2018). Administrators agree that PBL can build

relevance to skills that have been taught in similar ways for years; by adding real-world, relevant examples — instead of recycling “antiquated” examples — students will better understand the information and be more engaged; teachers are eager to build authentic relationships with students, and that can start by teaching authentic lessons (see Table 4).

Table 4

Theme 2: Excerpts, Interpretation and Analysis, and Emergent Themes

Excerpts	Interpretation and analysis	Emergent themes
AD1: "If students can take math and be able to describe it through relationships [and] in cause-and-effect patterns, then students are able to understand math as an application in the real world rather than just a problem that needs to be solved on paper." AD2: "I think we should start with the real world and give the situation, find out [what's going on], discover the relationships, and then go from there to use the math." AD2: "What students learn in middle school is really applicable to the real world and builds a strong foundation. We would be actually taking the concepts and ideas that are present and applying them to the real world." AD1: "You've got to practice but it needs to be an authentic learning experience. Let them know when they are going to use it! It's more exciting that way." AD5: "To be able to put something like math into a real-world situation, something that's engaging, [then] it's sticking."	Teaching students using real-world projects will engage them more fully and teach much-needed skills.	Having teacher engage students through innovative, real-world, authentic learning will enrich students, teachers, and the school system.

Theme 2, engaging all students in real-world learning, emerged to reflect the need to make math relevant for students. Administrators believe making math more tangible will result in increased learning of math.

Themes and Research Question 2

The second research question asked, "What are current math teachers' perspectives of teacher buy-in for PBL in middle school math in a Southcentral U.S. state?" Themes 3, 4 and 5 related to the broader themes of equipping and engaging and added a third broader theme of empowering. Theme 3 was about student confidence, Theme 4 was about teacher demands, and Theme 5 was about teachers' abilities to adapt.

Theme 3: Engaging Students to Build Confidence

All the teachers interviewed agreed that students often lack confidence in their math skills but having supportive teachers can make positive impacts on students, and PBL is a potential tool that can support students' shifting mindset around their skills.

One of the challenges all the teachers shared is that many of their students have a mentality that they are not good at math — T3 stated, "It's a challenge every year to get kids to let go of the "I suck at math" mentality." T2 stated that, for some of the students, "This is the first time they have been challenged." Regardless of whether students have been challenged previously, have a lack of faith in their ability to do math, or are facing other difficulties, each teacher has adapted to provide more support to their students, to shift their mindset, and to provide foundational skills to build student confidence.

"Math education in middle school is a big part of building confidence. The smallest victories are the most important," said T2. T1 uses peer tutoring to build confidence, noting, "I do a lot of peer tutoring because once they start, they learn it better

themselves; it builds confidence." This can be mirrored in PBL, because students are immediately applying their new skills to a project.

Each of these teachers wants to provide more support for their students, because math can be such a foundational skill, and having a lack of confidence in their skills could follow these students throughout their lives. By being supportive, these teachers instill their students with a sense of confidence; someone believes in them, so they should believe in themselves.

According to T5, "It's a huge confidence builder when kids know teachers are there for them. It's a big thing when we take tests. We need to tell students they have this — [they need to] see the silver lining."

PBL can boost student confidence by teaching them critical thinking skills, providing them with opportunities to practice their learning, and otherwise creating spaces where students are able to try new things. Even if they fail, they have supportive teachers who are able to guide them to success.

One teacher, T4, even drew this parallel in their interview, noting "Maybe PBL would help motivate them to want to learn…What's the answer to getting kids motivated to want to learn? Mindset?" PBL can be a motivational and confidence-boosting teaching and learning style, because it can motivate students to better understand their lessons and apply what they are learning. This, in turn, can lead to mindset changes, boost motivation, increase confidence, and lead to better outcomes as seen in Table 5. Teachers see the benefits of boosting confidence and can see how PBL is beneficial to that end.

Table 5

Theme 3: Excerpts, Interpretation and Analysis, and Emergent Themes

Excerpts	Interpretation and analysis	Emergent themes
T3: "Just helping them build that confidence and they grow. [When] they know more math than they came to me is a success."." T2: "I think it really depended on whether the kid [thinks] 'I'm creating this thing' and [then] they make their own connections." T5: "If you get those teachers that are really excited, and [who] get you excited to learn about things, then the students are more prone to actually do the work and they want to make you proud."	Engaging students to build confidence makes them more successful, and this can be achieved through PBL.	Taking the time to adequately guide students through the learning process in a thoughtful manner will create student success.

Engaging students to build confidence emerged to become Theme 3. Teachers are concerned about the lack of confidence students exhibit in math overall, but especially in connection with the implementation of PBL.

Theme 4: Equipping Teachers to Meet External Teaching Demands

One of the facts that all five interviewed teachers noted was the external demands of statewide expectations for both curriculum and test scores.

Teachers have specific testing benchmarks they are expected to reach, and many are assessed against the scores of their students. As T1 put it, "I know this year, my scores are my benchmark score…they were, like, five percent down from last year." If a teacher is experiencing lower test scores, adapting to a new style of teaching may not be a

priority when they have other concerns, even if the hope is that the new teaching style can increase test scores over time. Some may even feel that adapting to a new style, like PBL, causes lower scores in the interim.

Teachers experience a great deal of pressure from their states and schools to meet benchmarks. T3 said, “It's such a focus because of this testing, which everyone says not to worry about testing when that's all we really worry about.” Even though administrators and schools have good intentions, the alignment between standards and curriculum causes stress for teachers. This stress can impact other areas of teaching, and can be exacerbated by rapidly changing expectations, such as the switch to PBL. While teachers may not be inherently opposed to PBL, adapting a teaching style and curriculum takes time — time that they do not always have.

Adapting to PBL “does require time to sit down and to really look and to examine the–the information, the data — whether it be STAR and MAP and all the formatives — in communication with previous teachers,” said T5. The time this requires is in direct conflict with the vast number of topics teachers are expected to cover, as discussed by T2: “A challenge goes back to just having too many things to cover. Versus if you did less stuff then you can go deeper into it…It’s too wide of a scope.”

Teachers face many varied expectations from their administrators, schools, and states. From expected average grades to assess scores to curriculum, teachers may struggle to cover all the necessary topics while also adapting to a new teaching style. Even if they see the benefits of PBL in the long-term, the short-term demands — and consequences of failure — may be too high for them to feel committed to the change. These finding are further demonstrated in Table 6.

Table 6

Theme 4: Excerpts, Interpretation and Analysis, and Emergent Themes

Excerpts	Interpretation and analysis	Emergent themes
T2: “You can work on closing gaps if you have less to cover. You can push higher ones to where they need to be and continue to enrich them. Make sure the on-grade level ones are where they’re consistently able. Give enough time for the ones who need time to process, and slowly and repetitively build up those skills.” T3: “It's gotten to be so much; the teachers need a break. It's like trying to fill a spaghetti strainer and let it hold water. But here we are.” T3: “In a one classroom setting when you're trying to come up with a cookie cutter lesson, mm-hmm, there's no cookie cutter that fits all the different levels you're [dealing] with.” T5: “I think we should have extensions and accelerations that are targeted to meeting specific needs from looking at data. If we just do a blanket intervention, then that's not going to specifically target those students who really need it. We need to look at the data and say, okay, well Susie needs this, and Thomas needs this - really target it to where they can have the best success."	There are many students at different levels in a public middle school and no one, simple federal or state mandate can meet the needs of all students.	There are many external demands placed upon public, middle school teachers. Teachers need external support to adequately teach students at all levels.

Theme 4, equipping teachers to meet external teaching demands, was prevalent in the data analysis. Teachers express issues they feel need to be resolved in order to better support students.

Theme 5: Empowering Teachers to Adapt and Take Control

Teachers experience a great deal of burnout in their industry. From student disengagement to high expectations for results to little control over classrooms and curriculum, they often feel frustration. T3 explained, “Teachers are burnt out and frustrated from little silly behaviors, and they overreact to certain things. You cannot punish the way you used to or it's all you'd be doing. We are at a tipping point.” They accept that something needs to change, and they understand that they will be key for that change. “You have to have teacher buy-in to be successful,” said T1.

Teachers need to be given the opportunity to adapt and address their own frustrations. Instead of being punished for “little silly behaviors,” they need to be given the chance to have conversations with administrators and discuss the flaws of the curriculum or the reasons certain changes are not viable. T3 discussed the need for administrators to talk to teachers:

> Just having open conversations with your teachers where you're respecting what they're saying, like the teacher can say, “Hey, this is why this,” and if they have a good reason, like, “Hey, I can't cover this in 10 minutes, and it's not something I feel like I can break up.” This is what's going on.

Instead of punishing teachers for not adapting, teachers want to be given the opportunity to express their voices and their perspectives, then have administrators consider those perspectives in changing curriculum or adapting to PBL.

For many teachers, their students drive what they are and are not able to achieve in a classroom; adapting to PBL is not necessarily an effective approach when students are lacking foundational information. As T5 put it,

> Math is very vertical. I think middle school math is tough just because if we don't have that foundation of just their basic facts and knowing how to do those basic facts, it seems a lot harder. Um, it's almost like if you get stuck and you can't move forward. And so, teachers with middle school math, we have to go back and reteach a lot of things and try to catch up to the teachings that we need to get to.

Students without foundational math knowledge will not succeed in a PBL model, and teachers being forced to use PBL when it will not be effective are frustrated. Instead, teachers should be given the opportunity to build the strong foundation their students will need to be effective. Sometimes, they are able to achieve this, while Teacher 4 noted that sometimes "[teachers] still have just a struggle trying to get [students] to, um, I guess, achieve some levels of success without having a foundation."

If teachers are given more flexibility in when and how they use PBL, they may be more willing to approach this method. Teachers will be more willing to engage with PBL if they have a sense of control over their classrooms and their voices (see Table 7). Otherwise, they are not likely to be amenable to a change that makes their work less effective and their students less successful.

Table 7

Theme 5: Excerpts, Interpretation and Analysis, and Emergent Themes

Excerpts	Interpretation and analysis	Emergent themes
T3: "You're always going to have disadvantages from certain students that might not have the support at home, or just general background knowledge." T4: "I think they[teachers] would have to be trained for sure. You just can't throw them out there and say, 'Hey, here you go.' It is not going to go be successful." T5: "[You] have to check for understanding then address the issue. I need to be able to listen, observe, monitor, and adjust, to go back."	Students in middle school math often do not have the grade-level skills to succeed in math.	Teachers need to be able to identify what is needed in the math classroom, and to feel empowered to do what is necessary to ensure all children are learning.

Finally, Theme 5, empowering teachers to adapt and take control, materialized during the data analysis. Teachers expressed the need to be treated as professionals and to have some leeway in how they teach.

Discrepant Cases

In order to ensure all voices were heard, all data were considered in the research; as a novice researcher I coded all data, as Saldaña (2016) suggested. This research found a discrepant case, where a participant challenged the responses of other participants (Merriam, 2014). This did not constitute a contradiction in qualitative research (Hayashi et al., 2019). The findings included the administrators' responses, the teachers' responses, and the analytic memos and notes from initial coding and categorizing. Some did not fit the pattern of other responses, and those were carefully examined and discussed for

purposes of transparency and overall understanding of the findings (Merriam, 2014). Discrepant cases may even be necessary to ensure all voices are heard (Hayashi et al., 2019).

Discrepant cases could highlight flaws in data collection instruments or data analysis. They, also, provide opportunities for different perspectives (Saldaña, 2016) for a better understanding of current administrators' and math teachers' perceptions of teacher-buy-in for PBL in middle school math.

Data Quality

The data in this study were collected using interview best practices and following a set protocol. Doing so is important because it contributes to the quality of the data, which is important to be mindful of in a qualitative study (King & Brooks, 2018). In qualitative research scenarios, having a system in place and following it helps lend credibility and trustworthiness to the data collected and the inferences made about them (Merriam, 2014). If the interview protocol encourages participants to be upfront and honest, their answers can be assumed to be accurate (King & Brooks, 2018).

In order to support the quality of the data collected, I followed multiple practices to ensure data quality. First, I read each transcript multiple times, to ensure my own understanding of the content and to ensure accuracy as it related to the notes I had taken (Yin, 2018). Next, I conducted a member checking process with the participants, in which one of the participants edited their transcript. The edits were incorporated, then the participant had the opportunity to re-check, and then the transcripts were considered complete. Finally, I continuously reflected on my own biases, implicit and explicit, in order to be more objective in my findings; I kept a log of my own experiences in this

process, which allows researchers to better follow established protocols and consider alternative explanations to the research questions and findings (Galdas, 2017).

Conclusion

The analyzed data, collected through semistructured interviews with five teachers and five administrators, in the Southcentral United States revealed the five themes of (a) equipping teachers with autonomy, (b) engaging students in real-world, authentic learning, (c) engaging students to build math confidence, (d) equipping teachers to meet external teaching demands, and (e) empowering teachers to adapt and take control of their classrooms. Based on the research questions of "What are current middle school administrators' perspectives of teacher buy-in for PBL in middle school math in a Southcentral U.S. state?" and "What are current math teachers' perspectives of teacher buy-in for PBL in middle school math in a Southcentral U.S. state?" emergent themes discovered among both teachers and principals related to the need to equip and empower teachers for greater student engagement.

Project Deliverable

The project is a 3-day professional learning opportunity for middle school administrators and math teachers. The topic of the workshop is PBL in middle school math classrooms. The results showed five themes: Equipping teachers with autonomy, engaging students in real-world learning, engaging students to build math confidence, equipping teachers to meet external teaching demands, and empowering teachers to adapt and take control. All of these themes will be addressed with administrators and teachers in the professional learning workshop.

Section 3: The Project

The project that emerged from this study is a 3-day professional learning opportunity for middle school administrators and math teachers. The topic of the workshop is PBL in middle school math classrooms. PBL offers students many opportunities for critical thinking (Zhao, 2018). Surya and Syahputra (2017) found that the PBL approach improved high-level thinking skills for senior high school students. This project seeks to support middle school math teachers and administrators in developing and implementing a PBL curriculum which will have positive outcomes for their students. The COVID-19 pandemic negatively impacted learning in the project district. This unfortunate reality means that the middle school students today stand to benefit from effective PBL implementation even more than in the past. This project seeks to maximize the learning potential of PBL in middle school math classes by increasing educator efficacy through professional learning.

Components of the Professional Development Project

The learning objective of the 3-day PBL conference is to enable middle school math teachers and administrators to better implement PBL through understanding of the processes and increased planning ability. At the end of the 3-day professional learning workshop on PBL, staff members will demonstrate their improved understandings and implementation skills by planning a standards-based PBL lesson and sharing their plan for implementation of the lesson in the first semester of the 2022-2023 school year. The first half of the 3-day sessions will focus on supporting staff development by implementing a gradual release of responsibility. Presenters will model how to read and understand PBL lesson plans. District staff will then be supported in analyzing sample

PBL lessons. Professional learning facilitators will then model how to plan a standards-based PBL lesson that aligns with the middle school math curriculum. Staff will be supported as they plan a PBL lesson. The second half of the sessions will focus on student and teacher skills that need to be developed to maximize the efficacy of PBL instruction in the district's middle school math classrooms. In addition to the professional learning components of the gradual release of responsibility portions of the PBL conference, the workshop will also include:

1. Opportunities for questions/answers.
2. Collaborative activities such as small group brainstorming and shared analysis.
3. Frequent monitoring for misunderstandings and formative feedback, particularly through the lesson-planning processes.
4. Time for participant self-reflection and goal setting.

Goals of the Professional Development Project

The goals of this project are to improve middle school math teachers' ability to implement PBL into their instruction and to increase middle school administrators and math teachers' understanding of teacher and student roles in PBL. Implementing PBL is a district initiative. Five years ago, the district intended for PBL to begin in the middle school. To date, there has not been a solid implementation of PBL in middle school math classrooms. This project aims to support teacher and administrator understanding and build staff efficacy with PBL such that effective implementation can occur.

The professional learning sessions will provide administrators with a clear understanding of the components of PBL. In the first days, administrators will participate

as teachers. Administrators will observe middle school PBL math lessons being created, analyze existing PBL lessons, and draft their own lesson plans targeted to professional learning for their teachers aligned with the school goals. Participating in these processes will enable administrators to develop their understanding of PBL components and will enable them to better support teacher implementation as the administrators will know what the middle school math teachers have learned about PBL. The later days of the workshop will address student skills needed for PBL engagement and instructional coaching with PBL. Administrators will benefit from these sessions, particularly the day spent on instructional coaching strategies aligned with PBL, by improving their ability to evaluate and support teachers through understanding coaching moves that can be made with teachers as they work through PBL implementation.

Middle school math teachers can benefit from the 3-day PBL conference in several ways. First, the mathematics curriculum department has expressed lack of understanding about why PBL should be implemented in their classrooms. This professional learning opportunity will provide middle school math teachers with research to support implementation of PBL with their students. Teachers will benefit when facilitators present the why of PBL in middle school math classrooms. Second, the teachers will be much more prepared to implement a PBL lesson when they have been provided focused workshop on how to analyze a PBL lesson for their content area and supported in drafting a standards aligned PBL lesson for their classroom(s). Third, the workshop will provide teaching staff with clear understandings about the specific skills and behaviors students need to engage with PBL instruction. This learning will help staff as they have previously struggled with not knowing what the learning should look like

and how to support the students with engagement in PBL. Finally, the last day of the 3-day PBL conference will focus on instructional coaching strategies. This learning will benefit the middle school math teachers by increasing their ability to act as facilitators of learning and engagement, a keystone of PBL instruction.

Rationale

One-on-one interviews with administrators and middle school math teachers indicated a need for additional professional learning on the project district's initiative of PBL implementation. The RQs for this project asked about current school district administrators and current middle school math teachers' perspectives of teacher buy-in for PBL in the District's middle school math classes. Interviews yielded findings that administrators and teachers perceived teacher buy-in for PBL as significantly lower than levels of buy-in that would be most conducive to effective implementation. The 3-day PBL conference was designed, both in structure and content, to increase buy-in through improving staff understanding of PBL and staff ability to produce PBL lessons to implement.

Interview responses produced five themes related to teacher buy-in of PBL: (a) equipping teachers with autonomy, (b) engaging all students in real-world learning, (c) engaging students to build confidence, (d) equipping teachers to meet external teaching demands, and (e) empowering teachers to adapt and take control. The structure and content of the 3-day PBL conference are designed to address educator needs and wants for all five themes. Theme 1: Equipping teachers with autonomy will be addressed through professional learning by supporting teachers in planning and drafting PBL lessons of their own choice. Theme 4: Equipping teachers to meet external teaching

demands and Theme 5: Empowering teachers to adapt and take control will be attended to through the focus on instructional coaching strategies connected with PBL. Developing the capabilities of the teaching staff through providing them with coaching strategies will enable the middle school math teachers to better adapt to student needs and instructional needs. Teachers can take more control of their instruction and better meet the other demands of teaching when they have the coaching skills in place to facilitate student learning and engagement more and provide teacher-centered instruction less.

The research for this project produced two themes that are specifically student-centered. This project will support instructional growth related to Theme 2: Engaging all students in real-world learning and Theme 3: Engaging students to build confidence through increasing staff understanding of PBL and staff abilities related to instructional coaching. Dole et al. (2017) found that PBL produced engaged learning for middle grade students and this project aims to replicate and extend these findings through supporting effective implementation in middle school math classrooms. Thoughtfully produced PBL lessons drafted by the district's own middle school math teachers, after they received professional learning in the area, are more likely to connect to real-world learning. Such learning not only stands to be more engaging than traditional instruction but may spur student interest in STEM careers (Beier et al., 2019). The 3-day professional learning workshop on PBL that derived from this research study can improve instruction and learning in many ways.

Review of the Literature

Why PBL?

Students are often required to learn things in school without connecting them to real-life scenarios to support their understanding (Youngerman & Culver, 2019). Additionally, middle school students in the United States fail to excel in math compared to both their international peers and U.S. standards (Guglielmi & Brekke, 2017; OECD, 2018). Current educational strategies, like the traditional lecture-centered model, do not develop students' skills that are necessary for modern demands. However, student-centered instructional procedures, such as teaching skills for collaboration and PBL, could help address this gap (Craig & Marshall, 2019).

PBL is designed to engage students in real-world scenarios (Virtue & Hinnant-Crawford, 2019). During PBL students are faced with problems that require them to collaborate, investigate, gather information, pose questions, and solve problems that are relevant to the real world (Merritt et al., 2017). PBL engages students in real-world problems and allows them to remain competitive and knowledgeable with their 21st century skills by asking questions and finding solutions to the real-world problems (Zhang et al., 2017).

PBL is a learner-centered method in which learning is structured by tasking students to solve a problem, and teachers can further the students' capacity to creatively solve the problem (Erdogan & Senemoglu, 2017). Current research indicates that learner-centered approaches, like PBL, are more effective than teacher-centered approaches at higher grade levels, such as middle school (Dervić et al., 2018). Student-centered learning methods may help students develop beneficial 21st century skills like critical

thinking, problem solving, collaboration, and communication (World Economic Forum, 2018). Forms of student-centered learning and the use of PBL also enable 21st century students to come into meaningful contact with potential future employers (Huttell & Gnaur, 2017; Knowles, 2018).

Student-centered instructional techniques are significantly more successful in developing 21st century skills than teacher-centered instructional techniques (Dervić et al., 2018). Educators acknowledge the importance of developing such skills (Viro et al., 2020), but existing research exploring administrators' and teachers' perspectives on PBL in middle school math is limited (Hung et al., 2019; Merritt et al., 2017). Exploring current Southcentral United States administrators' and math teachers' perspectives on PBL in middle school math prompted the need for this study, as PBL appears to be a viable alternative to traditional teacher-centered instructional practices.

In line with Whannell et al. (2018), who advised schools to incorporate authentic inquiry in curricula to allow students to develop the skills necessary to be better prepared to handle the unique challenges of the future, the district implemented a PBL-like instructional model in middle school math classrooms. The district instructional model is unique and locally created, and the primary concepts include real-world connections to teach problem-solving and other skills the district deemed important. The district instructional model follows what Sasaki et al., (2017) found to be aligned with PBL - collaborative and student-centered learning that focuses on developing students' 21st-century skills. These skills include critical thinking, problem solving, collaboration, and communication. PBL, also, supports students understanding how to connect what they do in the classroom with the real-world by providing relevant problems to work through.

Effective Implementation of PBL

Students are not graduating high school with proficiency in math, as sixty-eight percent of community college students enroll in developmental math course (Royer & Baker, 2018). PBL could engage students and could change this pattern. There are roadblocks to the implementation of PBL, however, as research has shown that teachers have a negative perception of change that is imposed upon them (Lomba Portela & Pino Juste, 2020). This negative perception may stem from teacher beliefs and/or teachers' perception of an increased workload.

Teacher beliefs influence their perception of implementing PBL and other student-centered instructional techniques (Conner & Gomez, 2019). When teachers believe that direct instruction increases student understanding of concepts, they are unlikely to see the need to implement student-centered instructional techniques. However, when presented with the data and research on the positive effects of PBL and student-centered instructional techniques, teachers' perceptions may change, regardless of their opinions on the success of direct instruction.

Teachers are also more likely to be resistant to a change like this when there are multiple initiatives at once (Mrachko et al., 2020), meaning that there would be an increased workload with the implementation of the initiatives. Change in instructional techniques is complex, and one-day training for teachers is not enough (Li, 2019). Having teachers participate in a mandatory multi-day training where they learn a new way to teach could be considered increasing their workload, potentially causing teachers to be resistant to the change.

District Research

Effective instruction using PBL can be measured through three rubrics (RRR Rubrics) from the International Center for Leadership in Education ([ICLE], 2015): (a) the rigor rubric, (b) the relevance rubric, and (c) the learner engagement rubric. Each of these rubrics is intended to measure a different aspect of effective instruction using PBL and can equip teachers with autonomy and engage students in real-world learning. The rigor rubric measures effective instruction "based on rigorous expectations" (ICLE, 2015), the relevance rubric measures effective instruction "based on relevance of experience to learners" (ICLE, 2015), and the learner engagement rubric measures effective instruction by "creating and implementing an effective learner environment that is engaging and aligned to learner needs" (ICLE, 2015). Each rubric has three indicators by which effectiveness is measured, and the indicators are divided into two categories: student learning and instructional design.

The Rigor Rubric

The rigor rubric is broken down into three indicators: thoughtful work, high-level questioning, and academic discussion. The thoughtful work indicator is centered around students' ability to extend their learning past what would typically be acceptable. High-level questioning is when students develop in-depth questions related to the subject matter. Academic discussion is centered around students' classroom discussion staying on-topic and students consistently adding valuable points to the dialogue.

Thoughtful Work. The highest level of student learning under the thoughtful work indicator is achieved when "students develop their own learning tasks that stretch their creativity, originality, design, or adaptation" (ICLE, 2015). Under this indicator,

students are able to assess their own learning and ultimately decide when and how to adapt their knowledge to new activities (ICLE, 2015). The highest level of instructional design centers around self-discovery; when students learn tasks and extend their learning, they become inspired to pursue self-discovery (ICLE, 2015). The highest level of instructional design differs from the lowest beginning level in that it does not assign one way for all students to demonstrate their thinking, but rather it allows students to learn how they are comfortable, inspiring them to continue their learning past what the beginning-level students would.

High-Level Questioning. Student learning under the high-level questioning indicator is graded highest when students are actively "developing rigorous questions that challenge the thinking of their peers" and "are able to respond to rigorous questions generated by peers with little guidance from the teacher" (ICLE, 2015). This questioning, whether they are asking or answering, helps the students further develop their learning, as they are engaged with one another and with the material in an in-depth, beneficial manner. The highest level of instructional design in the high-level questioning indicator is when the "lesson is designed to inspire all students to engage in high-level questioning around the learning task with their teachers and peers" (ICLE, 2015). Under this indicator, the questions are not necessarily structured, but rather students who are engaged in the task are asking and answering relevant, high-level questions to further the learning of themselves and their peers.

Academic Discussion. The highest level of student learning in the academic discussion indicator is when students are leading the conversation. This indicator is graded "well developed" when "students primarily drive the discussion, consistently

adding value to the dialogue with their peers and teacher and respecting the opinion and thoughts of both" (ICLE, 2015). Under academic discussion, a conversation is had rather than a Q&A session. This conversation keeps students focused and engaged with the concepts, and the dialogue provides a space for students to use "content-rich vocabulary with their peers" (ICLE, 2015). The instructional design under the academic discussion indicator is graded highest when the "lesson is designed to inspire students to independently engage in dialogue and add valuable academic content around the learning tasks" (ICLE, 2015). When students engage each other in academic discussion, it keeps them focused on the task and also inspires them to pursue their learning further, as the task is now relevant to them and their peers.

The Relevance Rubric

The relevance rubric centers around the aspect of PBL in which the content is relevant and interesting to the learners. The three indicators on the relevance rubric are meaningful work, authentic resources, and learning connections. Meaningful work, according to the rubric, is when students are able to base their learning off of real-world tasks that are relevant to them. The authentic resources indicator focuses on students' ability to select materials that are both authentic and relevant to their problem-solving task. Learning connections is when students can find real-world connections to their content.

Meaningful Work. Student learning under the meaningful work indicator is well developed when "students think and act critically to curate content and apply information learned to address a range of cross-disciplinary tasks which are both creative and original" (ICLE, 2015). When students can find and apply content that is relevant across

a variety of cross-disciplinary tasks, the highest level of student learning has been achieved. Instructional design under the meaningful work indicator is well developed when the "lesson inspires students with an opportunity to think critically about new learning to create their own real-world, relevant tasks" (ICLE, 2015). In other words, when the lesson provides opportunities for students to create real-world tasks to apply their learning to, it is graded at the highest level on the rubric.

Authentic Resources. When "students engage with multiple sources of information, both primary and secondary, during a lesson/unit, including multi-format resources" (ICLE, 2015), the student learning category of the authentic resources indicator has been well developed. Under the authentic resources indicator, students are engaging with resources that are both relevant and reliable to aid in their learning. When the "lesson is structured around an essential understanding/question and relies on students to select multiple authentic texts and resources to engage in real-world problem solving" (ICLE, 2015), it is graded at the highest level on the rubric. Under the authentic resources indicator of the relevance rubric, students are able to find and apply "authentic texts and resources to engage in real-world problem solving" (ICLE, 2015).

Learning Connections. Student learning under the learning connections indicator is well developed when "students discover opportunities to apply content to their lives as well as real-world application" (ICLE, 2015). Additionally, student learning is graded highest when "students independently make thoughtful connections between content learned and real-world unpredictable situations" (ICLE, 2015). Instructional design of the learning connections indicator is considered well developed when the "lesson inspires students to create their own opportunities to connect content learned to their lives, as well

as real-world application" (ICLE, 2015). The learning connections indicator focuses on students' abilities to apply learned content to the real-world, in which situations are not always predictable. This indicator helps students stay engaged in their learning by allowing them to apply their content knowledge to real-world situations or life situations that are relevant to them.

The Learner Engagement Rubric

The learner engagement rubric is broken down into three indicators: active participation, learning environment, and formative processes and tools. The active participation indicator is focused on students' engagement in the learning environment, while the learning environment indicator is focused on the environment in which students are expected to learn and the typical procedures of that environment. The formative processes and tools indicator is focused on students sharing responsibility for their learning and being able to assess themselves. Each of these indicators "support teachers in creating and implementing an effective learning environment that is engaging and aligned to learner needs" (ICLE, 2015).

Active Participation. Student learning under the active participation indicator of the learner engagement rubric is considered well developed when "all students remain on-task and proactively engaged throughout the lesson" and when "students take ownership of learning new content, actively seeking new ways to improve their own performance" (ICLE, 2015). When the "lesson achieves a focus on student-centered engagement where the students monitor and adjust their own participation" (ICLE, 2015), it is considered well developed instructional design. Thus, when students are able to remain self-directed in their learning, seeking new ways to improve their performance

and being proactively engaged, they are acting as active participants according to the learner engagement rubric.

Learning Environment. Student learning under the learning environment indicator is considered well developed when "students are encouraged to take risks and persevere through productive struggle. Students are provided with effective feedback to guide them in their learning" (ICLE, 2015). It is also well developed when "students demonstrate respect for peers, teacher, and the learning environment" (ICLE, 2015). When "classroom learning procedures and routines are clearly established but remain flexible and fluid to adapt to the learning task as needed" (ICLE, 2015), the instructional design of the learning environment indicator is graded as well developed. Essentially, when students' learning and wellbeing are prioritized, the learning environment is considered well developed on the learner engagement rubric.

Formative Processes and Tools. When "students demonstrate mastery of content through opportunities to self-reflect, set learning goals, and share responsibility for their learning" (ICLE, 2015) and when "assessment results indicate that students are exceeding expected outcomes" (ICLE, 2015) the student learning category of the formative processes and tools indicator is well developed according to the learner engagement rubric. Instructional design of the formative processes and tools indicator is considered well developed when "results from formative processes and tools, along with effective feedback, are used to immediately adjust instructional pacing, plan differentiated instruction, and monitor progress" (ICLE, 2015). Overall, the formative processes and tools indicator is well developed according to the RRR Rubric when assessment results are exceeding expectations, and, if not, then they are used to adjust instruction to achieve

the expected outcomes. Using these rubrics to facilitate student learning in math can be very productive as each of the rubrics measures a different aspect of effective instruction using PBL and can equip teachers with autonomy and engage students in real-world learning.

District Cornerstones

As well as using the RRR Rubrics from the International Center for Leadership in Education ([ICLE], 2015), the district targeted in this project has the support and use of the district's own Cornerstones. These Cornerstones are compatible with conducting a 3-day professional learning workshop for middle school administrators and math teachers. To support middle school math teachers and administrators in developing and implementing a PBL curriculum, the district Cornerstones can serve to keep the focus on coaching with PBL and have positive outcomes for students. The Cornerstones allow for focus on student learning, student experience, community engagement, and resource stewardship as noted below.

Student Learning

- Profound learning for students occurs when we provide meaningful and relevant educational opportunities.
- In the district, we are preparing the dreamers to be the doers by developing engaged, collaborative learners who are equipped for success.

Student Experience

- A thriving student experience comes from an environment that engages and connects students to each other and with staff.

- In the district, we know students thrive when they are engaged in their learning and feel a sense of belonging in our schools.
- When students are provided enriching opportunities outside the classroom, they will find success not only in school but in their lives beyond our hallways.

Community Engagement

- We believe education is a shared responsibility between our district and the communities we serve.
- Community engagement is critical to the success of the district.
- Through intentional strategic partnerships at the campus and district level, we can tap into the deep well of community support for the district to forge stronger bonds with our stakeholders and develop relationships to benefit schools, local businesses and the community.

Resource Stewardship

- In the district, when we say we want to be good stewards of our resources, we are not just talking about taxpayer dollars.
- Resource stewardship is about three things: our time, talent and treasure.
- Strike a positive work/life balance with our time;
- Nurture our talents as educators through meaningful professional learning;
- Manage our treasure in a fiscally responsible way while still meeting student needs.

Many of these district Cornerstones relate directly to the teaching of PBL and supporting teachers in their role. Both Student Learning and Student Experience are vital

to the role teachers play in coaching their students to learn using PBL. Providing students with the tools they need to be engaged with the world around them, in a supportive and enriching environment, serves to foster the teaching and learning possible through the use of PBL.

Student Skills

Student-centered learning approaches such as PBL are more effective in students' learning and development at higher grade levels than teacher-centered approaches (Dervić et al., 2018). This may be because PBL furthers students' capacity to creatively solve problems (Erdogan & Senemoglu, 2017), and integrates 21st-century skills into their learning, such as critical thinking, problem solving, collaboration, communication, and engagement; these skills are necessary for students to succeed academically. With the PBL method, students are presented with an ill-structured real-world problem that they are tasked with working through. Working through real-world problems helps students develop their essential critical thinking, problem solving, collaboration, and communication skills by presenting them with an opportunity to exercise those skills in a real-world setting.

Another advantage of using PBL and other student-centered learning techniques is that students' motivation to learn more may be enhanced (Merritt et al., 2017). When students are presented with a problem that is set in a real-world context, they are more likely to have a better understanding of the problem initially than if the problem was set in a context other than the real world. This initial understanding, along with continued engagement, prompts students' positive attitudes toward the problem, and thus their positive attitude toward learning.

The district's instructional model is collaborative and student-centered, and it focuses on real-world situations based on Sasaki et al.'s (2017) PBL structure. This model provides students the tools to gain a deeper understanding of the concepts they are learning, as well as developing their essential skills of critical thinking, problem solving, collaboration, and communication. The district's model is also designed to keep students engaged in their math education, and to create students' positive attitudes toward learning.

Critical Thinking/Problem Solving

PBL may be a way to help students employ critical thinking and problem-solving skills in the math classroom. PBL engages students in meaningful, real-world activities and encourages them to work collaboratively and discuss ideas to produce a final product. Thus, the use of PBL requires students to do more than simply receive knowledge; instead, students must apply what they have learned to a problem. This application of students' knowledge is what results in the development of their critical thinking skills (Ismail et al., 2018), and students who are developing their critical thinking skills become more autonomous learners and take greater responsibility for their own learning (Cole, 2017). The need for students to have developed critical thinking and problem-solving skills is increasing, as those skills are increasingly assessed on standardized tests across the United States.

Student-Teacher Collaboration

Learning should provide a way for students to be actively involved in their learning and build their knowledge by requiring them to ask and answer questions (Husni, 2020). Student-teacher collaboration and student-centered instructional strategies

(like PBL) are a way that students can be actively involved in their learning. Student-centered instructional strategies promote meaningful, relevant learning that integrates cross-disciplinary content to support students' life-ready skills (Zhao et al., 2017) by actively engaging them in their learning.

Student-teacher collaboration is not a traditional way of teaching math. It begins with presenting students with a problem, and the teacher simply facilitates the students' learning, not directly lecturing them. This structure increases students' capability to creatively solve problems (Erdogan & Senemoglu, 2017). The student-teacher collaboration structure also allows students to gain a deeper understanding of real-world ideas and enhances their social skills (Sasaki et al., 2017).

Communication

Communication among students is essential to their ability to thoroughly learn concepts. Students who are equipped to understand, apply, and speak about mathematical concepts are more likely to have a thorough understanding of the topics (Anderson-Pence, 2017). The NCTM (2018a) supports this idea and recommends that students engage in discourse.

Writing in particular is a beneficial way students can engage in such academic discourse. Students can better understand mathematical theories/concepts and express their ideas using communication tools (Brozo & Crain, 2018). Using communication tools, such as digital writing, allows students to collaborate and share their ideas and what they learn in writing with each other and their teachers. This student-student collaboration and student-teacher collaboration allows students to be actively engaged in

their learning and encourages them to pursue a deeper understanding of mathematical concepts.

Engagement

Standard math instruction, or traditional learning strategies, do not effectively prepare students for the demands of passing standardized math tests or excelling academically (Kingsbury, 2022; Wijnen et al., 2017). Effective math instruction can be categorized when students are engaged in their learning; if students are disinterested in math classes, they are less likely to take math classes, and even less likely to be engaged in their learning. Public math education has been criticized for lacking student engagement (Beier et al., 2019). Engagement is important to students' learning as it affects their achievement (Ayçiçek & Yanpar Yelken, 2018). When engagement occurs, positive correlating emotions also occur, which play a major role in the efficacy of math learning (Liu et al., 2018).

To increase student engagement, the NCTM (2018b) suggested teachers implement motivating projects. PBL and other student-centered learning strategies promote engagement by implementing motivating, real-world problems that are related to students' interests. According to Mun and Hertzog (2018), PBL and other student-centered learning strategies result in higher engagement in class, which increases student understanding. Student-centered learning strategies that use students' interests encourage learning and are more motivating/engaging than traditional learning strategies (MacMath et al., 2017).

Summary

The use of an inquiry-based educational method perpetuates active student participation in a cooperative learning setting, in which students can actively engage in tasks requiring the use of problem-solving and critical thinking skills, collaboration, communication, and engagement (Hendry et al., 2017). Student-centered instructional strategies such as PBL supports students learning skills relevant to the outside world (Zhao et al., 2017). Teachers who have been trained in PBL and understand the outcomes have found PBL to be beneficial for students (Noble et al., 2020). The district believes this is worth teaching.

Professional Development: Learning to Coach

Administrators are responsible for teachers learning new programs, as they send teachers to train for the programs and ensure that learning and change occurs as a priority (Hanssen, 2022). Therefore, both administrators and teachers need to be trained on the PBL model before it can be implemented. A one-day training for administrators and teachers is not enough, as change is complex (Li, 2019). Teacher buy-in should also be considered when teachers are learning how to coach students using PBL because it could result in a more successful implementation of the student-centered learning strategy (Boden et al., 2020).

Educators are instrumental in the success or failure of curricular implementations; therefore, ownership is a key component of the process (Sengai & Mokhele, 2020). If administrators and teachers do not at least appear to fully support the initiative to students, the implementation will likely fail. However, if teachers and administrators take

ownership of the initiative by supporting and properly delivering the promises of it, the implementation is more likely to succeed.

Professional Development

Professional development is intended to help educators improve their professional practice and effectiveness, and uses specialized training, formal education, or professional learning to accomplish those goals (Smith & Robinson, 2020). Professional development for all school leaders, such as teachers and administrators, to create a thriving school environment (Parrish et al., 2020). It is also impactful for educators to have opportunities to participate in professional learning communities or professional development activities that foster a collaborative school culture to create a more student-centered environment (Martin et al., 2019).

Models of Coaching

One of the most important tools for teachers' professional development is coaching. When done appropriately, coaching has the potential to positively impact the role of the teacher. The most common types of coaching methods available to teachers will be covered in this analysis, and a detailed look at the common characteristics of each method will be discussed.

One system of coaching that garners positive results depicts the four most important aspects of achieving success that work together in a specific manner (Joyce & Showers, 2002). This model follows the system, beginning with theory development, followed by demonstration, practice, and feedback. This system is important as the steps help teachers achieve success and embrace coaching for the improvement of the business.

For coaching systems to be implemented efficiently, steps must be taken while introducing the system. Such steps include establishing a role for the coach, building knowledge for teachers, choosing effective instructional strategies, making instructional plans, reflecting on instructional quality, and assessing teacher learning (Cobb & Jackson, 2021). These steps are common throughout each of the three coaching models outlined in this research, although each characteristic is implemented differently in each model to achieve a more specific goal (Harbour et al., 2022). Three common coaching models are:

- Mentoring teachers
- Peer coaching
- Cognitive coaching

These three models can be used by themselves or in combination with one another. Which model or combination of models is chosen largely depends on a variety of factors such as teacher population and number, teacher characteristics, and which other coaching models are being used.

Mentoring Teachers. In this approach teachers are paired with a more experienced mentor teacher, typically one-on-one, and the focus is on the teacher learning new skills in a new setting with new social norms. This approach generally creates a safe space for the teacher to ask questions and express frustrations (Dong et al., 2019). It also uses co-planning sessions to aid in the mentoring of the teacher. This method is most effective when the mentor and mentee are flexible and responsive (Harbour et al., 2022). The drawbacks to this method are that it tends to be expensive and may perpetuate the status quo rather than allowing the teacher to bring unique ideas in.

Peer Coaching. The peer coaching model is well articulated and heavily researched. It tends to act as a bridge between formal professional development and business implementation (Harbour et al., 2022). In this model, teachers who are already familiar with each other coach each other to address a previously identified specific problem. There is also an in-house expert identified to provide support with addressing the problem. The ambiguity around the types of problems peer coaching seeks to address means that the method does not embrace any particular strategies; however, in this method the entire staff is encouraged to participate and practice peer coaching.

Cognitive Coaching. The cognitive coaching model teaches coaches personal interaction techniques that are similar to those used by counselors and therapists (Harbour et al., 2022). These techniques give their students a framework for constructively discussing their thought processes. Cognitive coaching is most useful when coaches are collaborating with teachers in planning and instruction, building knowledge and skills such as listening and questioning skills, and exploring the quality of teaching.

Cognitive coaches often use conferences to help their students. These conferences are structured by a three-step process: planning the conference to discuss goals, strategies, and self-assessment (Ali et al., 2018), then gathering evidence in an observation, and documenting the strategies that are already practiced (Harbour et al., 2022), and finally reflecting on the conference, the purpose of which is to learn from the conference and potentially influence future coaching. These cycles of the conference—conference, observation, and reflection— allow coaches the insight to provide students with informed, constructive feedback.

One benefit of utilizing coaching is that it has demonstrated enough flexibility that almost any goal can work with its use. With that flexibility, however, there is ambiguity. Because the cognitive coaching approach does not specify how or what to teach, there is a possibility that teachers may choose goals that are inconsistent with the research, diminishing the effectiveness of the approach. Nevertheless, in the case of this study, using PBL as a teaching method is clearly outlined, giving strength to the cognitive coaching model.

Review of the three basic models of coaching methods has revealed some aspects of effective coaching. This analysis covered the most common characteristics that are universal to all coaching approaches to grant teachers the tools they need to instruct most effectively. While all the models have positive and negative qualities and can all be used in conjunction with one another or independently, it is up to those seeking to improve their teaching skills to choose which fits best. Coaching, in general, supports teacher success in improving their practice (Steiner, et al., 2022). In the case of this study, using PBL as a teaching method is clearly outlined, giving strength to the cognitive coaching model. However, using cognitive coaching as a means to engage students with PBL will facilitate student learning.

The search for the review of the literature was conducted by using the themes from the data analysis and connecting those to potential gaps in implementation. The themes were search terms included autonomy, real-world learning, student confidence, teacher empowerment, and supporting teachers. Search terms that were a natural extension from this included a reminder to staff why the PBL implementation, how effective implementation occurs, and resources the district currently uses – the

International Center for Leadership in Education Rigor, Relevance, and Engagement Rubrics. From that evolved research on skills students need to be successful, which focused on collaboration, communication, critical thinking, and creativity. Finally, planning for effective implementation and the requirement of a shift in mindset, different types of coaching was researched. In this research, it became clear that other relevant topics were necessary to include so mindsets would change. Those include collective teacher efficacy, listening, questioning, formative feedback, and participant choice. All research items were connected and derived from the findings from the data analysis.

Project Description

Purpose of the Project

The purpose of the project is to increase administrator and teacher efficacy with and buy-in for the District's PBL initiative. The 3-day conferences aim to help the middle school math department get back on track with the initiative as well as to support effective implementation of the initiative. The project also seeks to aide administration in their efforts to support teachers in PBL implementation.

Resources

Current staffing in the district means that the bulk of the resources required for this project are financial, specifically supply purchases. The 3-day conference will require purchasing breakfast and refreshments for all participants for all days. If the district has a professional learning area where the training will take place. The remainder of the costs for the conference will come from preparing the materials which attendees will use during the conference and take with them at the close of the conference. Some examples of such materials are notebooks for each attendee to use to record their thinking

during the conference and laminated copies of the d district's instructional rigor, relevance, and learner engagement rubrics from the International Center for Leadership in Education, known in the district as the RRR rubric (ICLE, 2015). Additional costs may arise if presenters or attendees need technology purchased to facilitate the 3-day workshop or the PBL lesson implementation.

Existing Supports

The district is able to offer the 3-day PBL conference, including a day spent on instructional coaching, at relatively little cost because of the existing supports in the form of highly trained district staff. The district has a Math Curriculum Coordinator who is able to plan and deliver professional learning on PBL and instructional coaching. The district also has a Director of Curriculum who is able and willing to offer to attendees and to facilitate this second attempt at PBL implementation for the middle school math department. Finally, the district has clear cornerstones of education, as well as the RRR rubric, which can be referenced and used as foundational pieces of the PBL planning process and instructional coaching growth.

Potential Barriers and Possible Solutions

Two potential barriers are apparent at this time. The first is that the 3-day PBL conference most likely will not provide enough support for implementation. PBL instruction requires a pedagogical shift for some teachers. The middle school math teachers have already shown that they are reticent to implement PBL, so having the opportunity to draft a lesson plan during the workshop may not be enough support for them to enact the lesson. Having the 3-day conference conclude with specific scheduling of PBL lesson implementation in the first semester will help to alleviate the possibility

that a lack of support causes teachers to not try implementing at all. Repeatedly offering instructional coaching for staff, especially around questions regarding the implementation of PBL. Reaching out and asking just before scheduled implementation for questions and concerns will also help to minimize the barrier of lack of support.

The second barrier to implementation is continued lack of buy-in by administrators and/or teachers. Middle school math teachers in the district indicate that their lack of buy-in to PBL to date was due to lack of understanding and implementation. The 3-day PBL conference will provide clear guidance on PBL in such a way as to minimize feelings of lack of understanding. Buy-in may still be a barrier as teachers expressed concerns with autonomy, as shown in responses generating Theme 5: Equipping teachers with autonomy. For this attempt at PBL implementation, teachers have the autonomy to select their topic for the PBL lesson for the first semester. Teachers also have the autonomy to decide when in the semester to implement their PBL lesson. I will support increasing buy-in through providing positive feedback after classroom observations.

Project Goals

To achieve the specific goals of improving teacher efficacy in PBL implementation and educator use of instructional coaching strategies, I intend to model and apply use of coaching strategies. I will develop trust with those who do not know me and build upon existing relationships by listening purposefully and assuming that all concerns or challenges brought to the dialogue come with positive intent to learn and grow. Maintaining a coaching stance will help me to provide specific support to individuals or groups through active listening and targeted questioning. My coaching

behaviors will also serve as a model for attendees as they work toward incorporating instructional coaching strategies into their practice. The workshop will also model the power of including participant choice as attendees will reflect on their own experience of having the option to design a PBL lesson on a topic of their choice.

Project Outcomes

Following the 3-day PBL conference, each middle school math classroom in the district will use PBL in the first semester. This use will mark the first time that all middle school math classrooms implement the district initiative. Through the PBL lesson implementation, the middle school math students will develop skills such as critical thinking that can be transferred to other lessons and subjects. The project will also facilitate district administrators and middle school math teaching staff improving their understanding and practice of instructional coaching with students and one another.

Target Audience

The 3-day PBL conference is intended to for middle school administrators who need a better understanding of PBL and instructional coaching. Middle school administrators who attend this professional learning opportunity will be better able to support staff implementation of PBL and to evaluate such implementation efforts. This workshop is also intended for middle school math teachers. This department did not implement PBL when much of the district did. Research for this project indicates that the middle school math teachers did not implement PBL to date because they are lacking an understanding of PBL and how to implement it effectively in their classes.

Roles and Responsibilities of Persons Involved

Facilitators

The professional learning will be organized and facilitated by the district Director of Curriculum, the Math Curriculum Coordinator, and myself. Our roles will include: (a) scheduling, (b) arranging for building use, (c) setting up the venue, (d) providing refreshments, (e) ensuring that the schedule is maintained as possible and adjusting as needed, and (f) monitoring participant behavior for signs of confusion or need of break. My fellow facilitators and I will also be responsible for tracking participant attendance. Following the 3-day conference, the facilitators will participate in classroom observations; we will also head the summative evaluation processes including creating, distributing, and analyzing surveys.

Presenters

The PBL conference learning will be led mostly by the presenters. The district Math Curriculum Coordinator and I are the main presenters. Presenters will be responsible for creating engaging content that introduces the topics to be explored. These topics include: (a) PBL research; (b) PBL lesson analysis, planning, and drafting; (c) student roles and skills in PBL instruction; and (d) instructional coaching strategies to be used with PBL. Presenters will also use the gradual release of responsibility model to support attendees in planning and drafting their own PBL lessons.

Timetable and Components

The professional learning opportunity is designed to occur over three days. The intent is for the workshop is to be delivered as a 3-day PBL conference occurring across three consecutive days. Each day will include six hours of professional learning and a

one-hour break during which attendees (administrators and middle school math teachers) will be responsible for getting their own lunch. Short breaks of 10 minutes each will be provided when the facilitators determine that participants need a break. Break times will be a more formal opportunity for attendees to partake in light refreshments which the facilitators will be providing each morning and maintaining throughout each day of the workshop. This will take place during required professional learning to ensure all middle school administrators and math teachers attend.

Following is an outline of the 3-day conference, each of the bulleted activities will be immediately followed by time for questions from attendees and/or a reflection period.

Day 1:

- Goal setting, agenda sharing, operational business (breaks, bathroom location, etc.)
- Exploring the research on PBL
- Learning how to read and understand a PBL lesson
- Observing how to plan and draft a standards-aligned PBL lesson
    - Including relevance, rigor, and intentional engagement activities

Day 2:

- Review of Day 1, goal setting, agenda sharing
- Planning and drafting a standards-aligned PBL lesson
- Learning student roles and needed skills for PBL engagement
    - Including collaboration, communication, critical thinking/problem-solving, and engagement

Day 3:

- Review of Day 2, goal setting, agenda sharing
- Identifying, viewing examples of, and practicing instructional coaching strategies
    - Including building trust/relationships, assuming positive intent, developing listening skills, effective questioning, providing formative feedback, and structuring learning to include participant choice
- Scheduling implementation of PBL lessons

Project Evaluation Plan

This project has two primary goals. The first goal is to improve middle school math teachers' ability to implement PBL into their instruction. The second goal is to increase middle school administrators and math teachers' understanding of teacher and student roles in PBL Short-term and longer-term assessment of the professional learning will occur in several forms. This subsection provides evaluation criteria for the project.

Project Goal 1

To check for improvement in implementation readiness and buy-in for PBL implementation, middle school math teachers' perceptions of PBL and their ability to implement PBL will be reassessed. The following criteria questions will be used to evaluate teacher progress for Project Goal 1. Responses to these questions will be given on a 5-point Likert scale where 1 = I am not confident about the item content (strongly disagree) and 5 = I am very confident about the item content (strongly agree).

Criteria questions for middle school math teachers are:

1. I am confident I have the skills to implement a PBL lesson in the fall semester.
2. I feel confident I can teach skills to students so they can be successful in a PBL lesson in the fall semester.
3. I know I need more:

Project Goal 2

Project Goal 2 focuses on teacher and administrator understanding of the roles of learners and teachers in PBL. Administrator perception related to their own ability to support teachers will be assessed for this goal during project evaluation. The following criteria questions will be used to evaluate administrator progress for Project Goal 2. Responses to these questions will be given on a 5-point Likert scale where 1 = I am not confident about the item content (strongly disagree) and 5 = I am very confident about the item content (strongly agree).

Criteria questions for administrators are:

1. I feel confident that I have the skills to implement a PBL session for professional learning for the teachers at my school.
2. I feel confident that I have the skills to give feedback to teachers on student learning during a PBL lesson.
3. I know I need more:

The purpose for choosing this type of evaluation, a Likert scale with an open-ended final question, will show the level of confidence the participant has in implementing PBL. The responses will show the type of support that the individual

participants perceive they need. Walkthroughs will be a separate indication of participant need.

Formative Evaluation

Formative assessment will be a critical component of the evaluation of this project. Formative assessment of workshop attendees will take place during the 3-day PBL conference through built-in periods for review, question/answer sessions, and participant self-reflection. The workshop attendees will also have the opportunity to provide the presenters/facilitators with formative feedback which will be used to modify portions of Day 2 and Day 3 as needed to best support attendee development. Formative feedback given to the facilitators at the end of Day 3 will be addressed through follow-up emails or clarifying conversations.

Following the 3-day PBL conference, formative assessment will occur through classroom observations and note-taking. Most of these observations will be brief visits commonly referred to as walkthroughs. The district workshop facilitator, the Director of Curriculum, the Math Curriculum Coordinator, and myself, will participate in district and campus walkthroughs. Building administrators presently conduct walkthroughs as part of the teacher evaluation system. The professional learning facilitators and presenters will work with the building administrators to ensure that they are ready and able to conduct walkthroughs focused on PBL learning and implementation.

Summative Evaluation

Summative evaluation for this project will take a few forms. Quantitative data will be available in the form of math STAAR scores, particularly for 6^{th} and 7^{th} graders. The project seeks to reduce or eliminate the gap between district middle school student

performance on the math STAAR and state average. These data can be disaggregated to compare different teachers' students' achievement relative to state average. Correlation between overall and individual PBL implementation and student assessment results will be assessed.

Stakeholder surveys will provide more quantitative data as well as qualitative data to be used in the summative evaluations. Administrator surveys will revisit the criteria questions presented in the discussion of Project Goal 2 above and will expand on these questions by including items addressing administrator perceptions of PBL implementation. Example topics for administrator surveys are administrator perception of teacher buy-in of PBL following the workshop, administrator observations of PBL lessons during walkthroughs, and administrator awareness of PBL implementation challenges and needs for the future. Teacher surveys will revisit the criteria questions presented in the discussion of Project Goal 1 above. Teacher surveys will also include items asking teachers to reflect on their implementation efforts and identify successes, challenges, and needs for continued PBL implementation, learning, and efforts. As Theme 2 and Theme 3 of the project relate to student engagement, student surveys will be given as part of the summative evaluation process. Student surveys will ask learners to reflect on PBL lessons in their math classrooms and comment on their perceptions of their own engagement in PBL lessons relative to other lessons. Student surveys will also ask students to name the real-world connections, if any, they found in the PBL lessons.

Evaluation Goals

The overall goals of the 3-day PBL conference are to improve middle school teachers' and administrators understanding of the roles of the teachers and students in

PBL and to increase middle school math teachers' ability to implement PBL. Formative and summative evaluation throughout the workshop and PBL implementation will provide data to support evaluation of the project. Reflection by all stakeholders will assist in evaluation of all aspects of the project. Successful implementation will be assessed through a critical examination of all project evaluation data.

Key Stakeholders

The key stakeholders for this project are middle school administrators and middle school math teachers. These are key stakeholders as they are the individuals who currently have perceptions of low teacher buy-in for PBL in the district of study. These individuals are also key stakeholders as they are the people who will receive three days of professional learning on PBL implementation. Middle school students in the district are also key stakeholders. Specifically, middle schoolers in their math classes are key stakeholders as they will be directly impacted by PBL implementation when their teachers enact the PBL lessons planned during the 3-day conference. Effective PBL implementation in the district's middle school math classes will impact the real-world learning for the students and is likely to increase engagement. Connected and engaged learning in middle school mathematics will benefit the students in the PBL classes and may have a positive impact on their educational experience in other courses as well.

Project Implications

To effectively implement PBL in the District, the potential roadblocks will need to be addressed. To address the teacher beliefs roadblock, teachers will need to be presented with data and research showing the positive effects of PBL on students' development, and how those positive effects can take place in their district. To address

the workload roadblock, teachers in the district will attend a three-day workshop in which they learn how to implement PBL in their math classrooms. While this may still seem to be an increased workload, it will be emphasized that the few days of training is necessary in order to ensure that PBL is implemented properly for the students' development.

This project is expected to improve middle school math students' critical thinking skills through increasing educator efficacy. Improvement in students' critical thinking skills will not only support remediation of skills negatively impacted by the disrupted schooling due to COVID-19 but will also increase opportunities for students in high school and beyond. There is no way to predict what new fields and careers will be available for the middle schoolers of today. Whatever field they enter, students are better able to navigate issues that arise when they have well-developed critical thinking, problem solving, collaboration, and communication skills by presenting them with an opportunity to exercise those skills in a real-world setting using PBL.

Another potential benefit of this project is increased student engagement because PBL fosters student ownership of work. Increased student engagement impacts student achievement and offers the possibility that the teacher can spend more time with the students in need of extra support. This project can help students by helping their teachers and administrators develop the skills to be more effective educators.

Section 4: Reflections and Conclusions

Project Strengths and Limitations

Strengths

My goal for this project was to strengthen middle school administrators and math teachers' understanding and benefits of PBL in middle school math, as well as practice skills to support its implementation. The project was valuable considering the impact of administrators in day-to-day learning on campuses play critical role in the actions of teachers and student learning outcomes. According to Levin et al. (2020) including principals in professional learning can support teachers in their learning. The Learning Policy Institute found a positive link among professional learning, teaching practices, and student outcomes (Darling-Hammond et al., 2017). As a result, professional learning standards developed from this research were embedded throughout the planning of this professional learning opportunity.

Some elements of effective professional learning include focus on content knowledge, opportunities for active learning such as collaborative planning, aligning with standards, collaboration between participants, and at least a semester of collaboration (Smith et al., 2020). Math teachers will have the opportunity to apply their content to the professional learning opportunity. Administrators should collaborate with teachers to improve learning, as well (Stosich, 2020). Administrators will be actively involved in this workshop in order to improve student learning and outcomes. Professional Learning Communities (PLCs) are embedded within the school district, and this has the potential to improve implementation of PBL (Turner, et al., 2019). The district is attempting to create a solid foundation for effective implementation of PBL in middle school math classes.

Limitations

A potential limitation of this project was that participants only consisted of middle school administrators and middle school math teachers. Administrator and teacher buy-in is important in implementing the district initiative; that is not guaranteed. Teacher readiness is integral to effective implementation of any change initiative (Hodges & Cullen, 2020). However, teacher readiness may not be at the maximum, but the district is attempting to alleviate that concern.

Creating a culture of trust is inherent in supporting educational change (Coenen et al., 2021). Moral and benevolent leadership supported instructional change and support, while an authoritarian leadership style negatively impacted that desired change (Cansoy et al., 2020). Positive interaction between administrators and teachers cannot be guaranteed. Varying styles of educational leadership by administrators cannot be guaranteed, either.

Gaps in student achievement in math vary, as well. The COVID-19 pandemic has increased the percentage of students not proficient in math in elementary schools; this creates a gap in learning at the middle school level (Bailey et al., 2021). The need for all educators to discover new ways to find success for students has increased since school closings from 2020.

An additional limitation is the fact that the district is implementing PBL in middle school math. Whether or not they should do that was not a consideration for this project.

Recommendations for Alternative Approaches

The local problem for this basic qualitative research study was current school district administrators' and math teachers' perspectives of teacher buy-in for PBL in

middle school math were unknown. The purpose of the study was to explore current school district administrators' and math teachers' perspectives of teacher buy in for PBL in middle school math in a Southcentral U.S. state. PBL is a district initiative, but it was not being implemented in math.

Research shows a variety of ways we can better support students learning math. Engaging students is especially relevant, and engagement strategies must be prioritized (Dussault et al., 2021). While this was included in the project study, it could have been more of a focus. One way that the problem could have been addressed differently is focusing on new ways of structuring school and engaging parents, connecting with families to better support students are needed, as well (Dussault et al., 2021). Including family and communities could have been an alternative approach.

An additional approach could have focused on acceleration. Students have larger gaps in math than reading, so accelerating math learning is beneficial (Lambert & Sassone, 2020). There simply is not enough time in the school day to remediate, so targeting gaps is imperative. The focus on embedding acceleration I math to narrow those gaps could have been a focus for this project study.

Ensuring learning engagement occurs is critical for academic success (Wang et al., 2021). Adding relevance to the math classroom can support engagement. A lack of relevance can result in lack of interest, or students actively disengaging with math content (Fitzmaurice et al., 2021). Students need exciting experiences that capture and speak to their interests both in school and beyond the classroom, sparking a lifelong passion (Frost et al., 2021). Including more of the relevance, or the real-world importance, of math can

be another alternative to teach and learn math and could have been an approach to this project.

Scholarship, Project Development, and Leadership and Change

This research has challenged me in many ways. I was required to hone research skills of which I thought I was proficient. Living in a growth mindset proved difficult but necessary. As a school principal, I spent most of my time focusing on school issues and not my personal goal of completing my research. When I made completing my research a focus, I started to make progress. Aligning my work with the checklists supported the academic focus in language and process, as well.

Research has helped me better understand that professional learning is an ongoing process, and that change in the classroom requires feedback and support. Administrators and teachers need this information, as well, so change and continuous improvement can be embedded in the culture of the school district. Engaging the learners – administrators, teachers, or students – is the first crucial step; make the learning relevant. Providing the tools they need to be successful in the implementation, and equipping the learners, is the next stage. Then empower the learners to take ownership of the learning is the ultimate goal. Teaching coaching skills to administrators and teachers will support this high goal.

Reflection on the Importance of the Work

I hope that my research will contribute to the existing literature in understanding how to support change a school district is attempting, but specifically PBL in middle school math. PBL has many potential opportunities for learning and increasing engagement in math. Since there are gaps from COVID-19, and understanding the U.S.

was behind most of the world in learning math before the pandemic, implementing effective change in math classrooms is an urgent need.

Educators need support – administrators and teachers – and not simply a short learning workshop. Ongoing support and feedback are imperative pieces of any effective change implementation. With ongoing support and feedback, the PBL implementation in middle school math will be more successful and student outcomes will increase.

Understanding that there is an effective process for change has been meaningful learning for me. As a change leader, I have implemented many changes in schools, but few have been effective and had long-lasting impact. Now I understand why and am excited to share it with the education community.

Implications, Applications, and Directions for future Research

Positive social change is the purpose of this entire project. With the three-day professional learning opportunity and ongoing feedback and support, ideally, student engagement and outcomes in math increase due to change in teacher practice. Findings indicate a need for change in teacher practice in order for student outcomes to increase. Focused professional learning with ongoing support and feedback, can support that change in teacher practice. The ongoing support and feedback from administrators will support positive social change, as well, because it will look more like coaching instead of telling. The improvements will require changes on both administrators' and teachers' parts.

Student learning in math increases when they are taught how to interact with the content and their peers more effectively. Thinking skills will be taught and learned, as well, and thinking processes will be more transparent for all stakeholders. Transparency

of the learning process will better support all students in their learning overall. This results in life-long learning of skills that transfer to other areas of the students' lives.

Implementation for any change that benefits students is a positive social change. Effective implementation by ensuring all participants' perspectives is included during the process is an important aspect of leadership and should not be discounted in any manner. The qualitative process ensured that the teachers' voices were heard, as well as administrators', and all were embedded within the professional learning opportunity.

A future recommendation for practice and, possibly, additional research is ensuring participants' input is part of the process from the planning to implementation steps. Adding this to current change research is a recommendation. Also, implementation research could be richer taking this study into account, as the voices of stakeholders are essential.

Conclusion

During this qualitative research study, I sought to understand district administrators' and middle school math teachers' perspectives of teacher buy-in for PBL in middle school math. Data collection and analysis resulted in findings that administrators had one perspective - that PBL was effective in math - and teachers had a different one - that PBL was not effective in math. Listening to the teachers, the people who implement the change, was significant in creating a professional learning opportunity for the district implementation of PBL. Involving school and district administrators to learn with teachers was integral in building trust and collaboration.

Educational leaders need to work beside teachers in implementation of PBL in middle school math. COVID-19 has brought challenges; listening to the teachers who

work closely with students every day is one way to increase effective implementation that will lead to increased student achievement in math. This, also, builds trust between administrators and teachers which engages, equips, and empowers all educators for increased student achievement.

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Appendix A: Project

Purpose

The Middle School Math PBL – Back on Track professional learning experience will provide an opportunity to re-ignite the school district's implementation of PBL in middle school math classes. This will bring administrators and middle school math teachers together to create a common understanding of PBL and the elements necessary to apply it in middle school math. This will equip both administrators and teachers to build trust better support students. At the end of the 3-day professional learning workshop on PBL, staff members will demonstrate their improved understandings and implementation skills by planning a standards-based PBL lesson and sharing their plan for implementation of the lesson in the first semester of the 2022-2023 school year.

Design and Structure

This will be a 3-day professional development opportunity. The sessions will last for six hours, with clearly defined purpose and collaborative experiences. The district math curriculum coordinator and the researcher will facilitate and present the sessions.

Agenda

Participants will be provided a breakfast and snacks for each of the three days. An agenda will be provided daily, with evaluation at the end of each day. The presentation will be shared with all participants at the beginning of Day 1 through google docs and presentation.

Agenda for Day 1

8:00-8:30 – Breakfast, sit with table groups (assigned)

8:30-9:30 – Introduce content, introduce participants to each other and interact

9:30-9:45 – Break

9:45-10:45 – PBL

10:45-11:30 – Research on your own

11:30-1:00 – Lunch

1:00-3:30 – Plan with your team, continue researching during planning

3:30-4:00 – Trio Groups/Conclusion

Overview – How this study came about

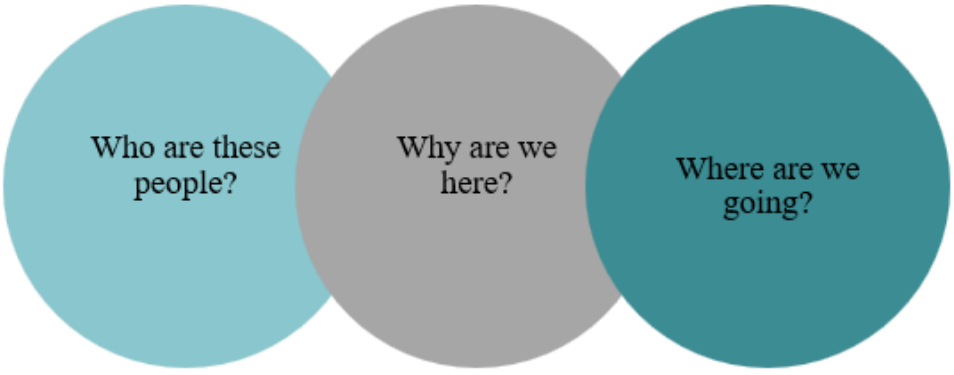
Basic Qualitative Research

Research Questions:

1. **What are current school district administrators' perspectives of teacher buy-in for PBL in middle school math in a Southcentral U.S. state?**
2. **What are current Math teachers' perspectives of teacher buy- in for PBL in middle school math in a Southcentral U.S. state?**

school math in a Southcentral U.S. state?

Professional Learning Research



Goal for the PBL Middle School Math Workshop

During the next three (3) days, Middle School administrators and math teachers will demonstrate their knowledge and application of PBL by planning a standards-based lesson and implementing it within the first semester.

Administrators – professional learning
Math teachers – standards-based math lesson

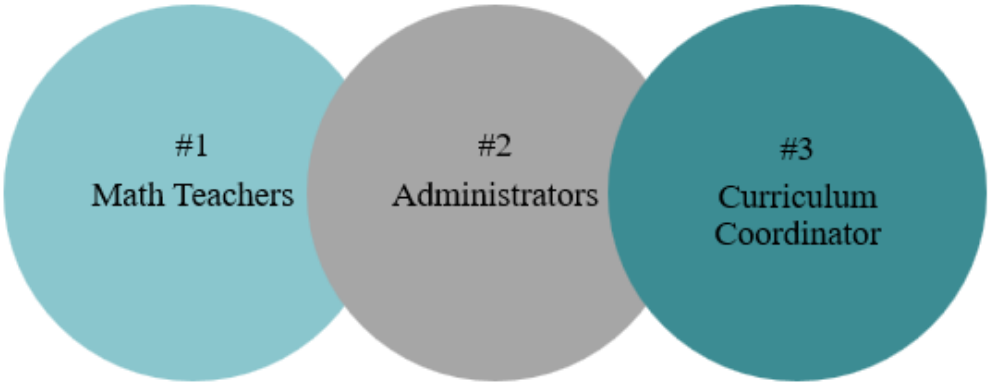
You will be able to:

1) **Plan and implement a standards-based PBL lesson using the ICLE Rigor/Relevance/Engagement Rubric;**

2) **Identify, define, and utilize skills students need to learn to successfully engage in PBL; and**

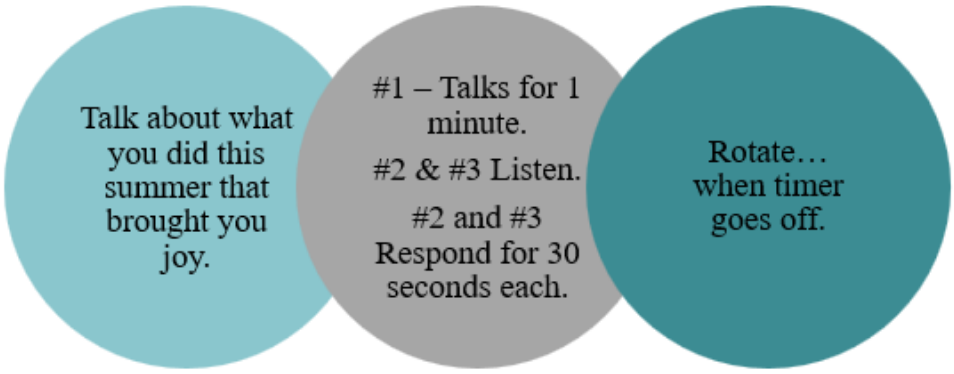
3) **Identify and implement instructional coaching strategies for administrators and teachers to learn so you are better able to support students and teachers.**

Who are these people?



Create a trio that includes 1, 2, & 3

Introduce Yourselves first!



Remember who is in your group!

Gap in Practice – Overview (reminder)

A qualitative study was conducted in the district to gain information about the following research questions:

- **What are current school district administrators' perspectives of teacher buy-in for PBL in middle school math in a Southcentral U.S. state?**
- **What are current Math teachers' perspectives of teacher buy-in for PBL in middle school math in a Southcentral U.S. state?**

Themes from research

1. **Equip teachers with autonomy**
2. **Engage students in real-world learning**
3. **Engage students to build confidence**
4. **Equip teachers to meet external demands**
5. **Empower Teachers to take control**

Research Foundation for today

After conducting research from district administrators and math teachers regarding their perception of teacher buy-in for PBL in middle school math, literature was reviewed to learn more about:

- **PBL in Math**
- **Using current cornerstone – RRR Rubric (ICLE)**
- **Skills to support PBL processes**
- **Instructional Coaching**

History in the District:

- **PBL is a District initiative**
- **Create an effective implementation (tried 5 years ago)**
- **We want to learn from our mistakes**
  - We didn't support administrators enough. ***We want them to understand components and benefits!***
  - We didn't support teachers enough. ***We want them to understand the why, the benefits, and the how!***

THIS workshop developed from the identified need and current reality

- Compared research findings and current reality of district; gaps were identified
- Learning Forward Professional Learning Standards and Best Practices guided the professional learning for adults
- Listened to what people said and targeted the need based on research!

Goal for the PBL Middle School Math Workshop

In the next three (3) days, Middle School administrators and math teachers will demonstrate their knowledge and application of PBL by planning a standards-based lesson and implementing it within the first semester.

Administrators – professional learning

Math teachers – standards-based math lesson

Overview of the Professional Learning

- Day 1 & ½ of Day 2 -- **Plan and implement a standards-based PBL lesson within the first semester of school**
- 2nd half of Day 2 -- **Identify, define, and utilize skills students need to learn while engaging in PBL**
- Day 3 -- **Identify and implement instructional coaching strategies for administrators and teachers to learn so you all are better able to support students and teachers**

Group Norms

- **Step Up! (Share your thoughts)**
- **Make Room! (Keep an open mind)**
- **Collect Wisdom! (Listen to others)**
- **Think and Speak in Drafts! (Continuous Improvement)**

Day 1 & ½ of Day 2:

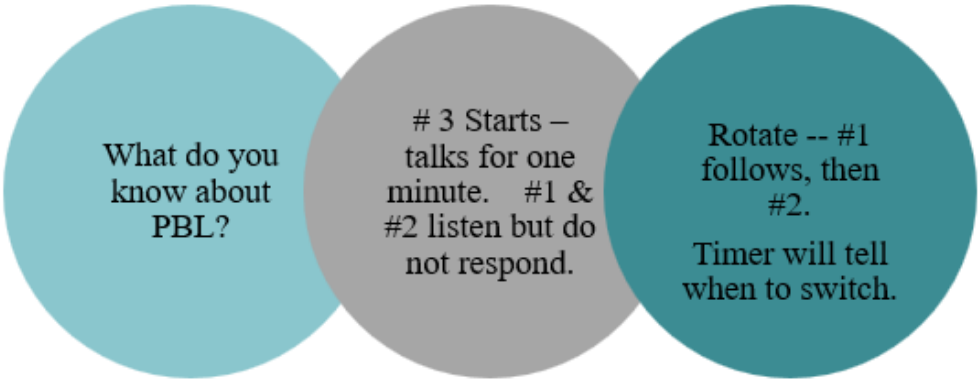
Plan and implement a standards-based PBL lesson within the first semester of school.

We will use the ICLE RRR Rubric and other websites.

Connect to Themes:

- *Equip teachers with autonomy*
- *Engage students in real-world learning*

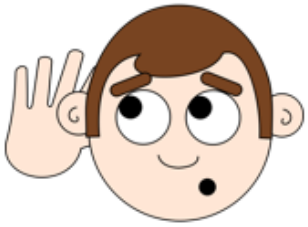
Get back in your Trio Groups:



Share…

What are some things you heard

that you would like to share?



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PBL!

What is it?

- **Standards-Based**
- **Driving Question**
- **Supports different ways of thinking**

Why is it beneficial?

- **Brings relevance to the math classroom**
- **Teaches skills employers say are necessary**
- **Supports student ownership of their learning**

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Developing a PBL Unit

- Examples HERE. Spend 45 minutes researching on your own.
- Think about:
  - standards from first semester (teachers) or
  - school goal (administrators) for the beginning of the year
- What are you already planning?

PBL Resources

RRR Rubrics

PBL Works

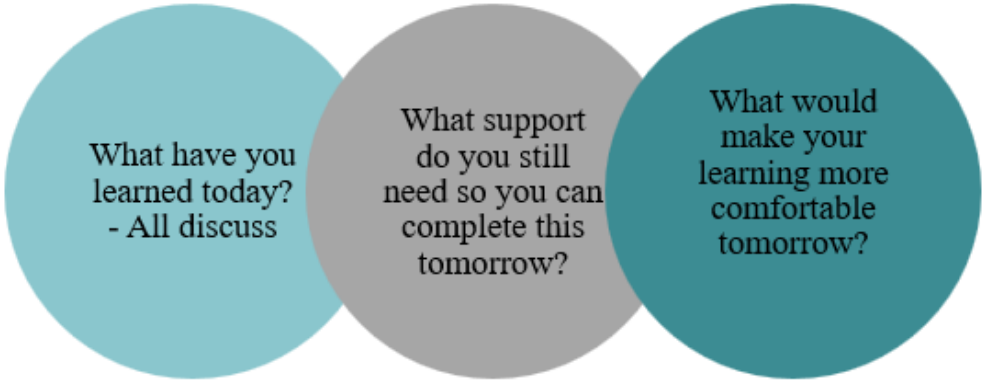
Edutopia

TeachThought Resources

Education World

Time for you to work with your team…

End of Day 1: Get back in your Trio Groups:



Agenda for Day 2

8:00-8:30 – Breakfast, sit with same table groups

8:30-8:45 – Review your learning with your trio group

8:45-10:45 – Continue planning and revising your PBL unit (take breaks as needed)

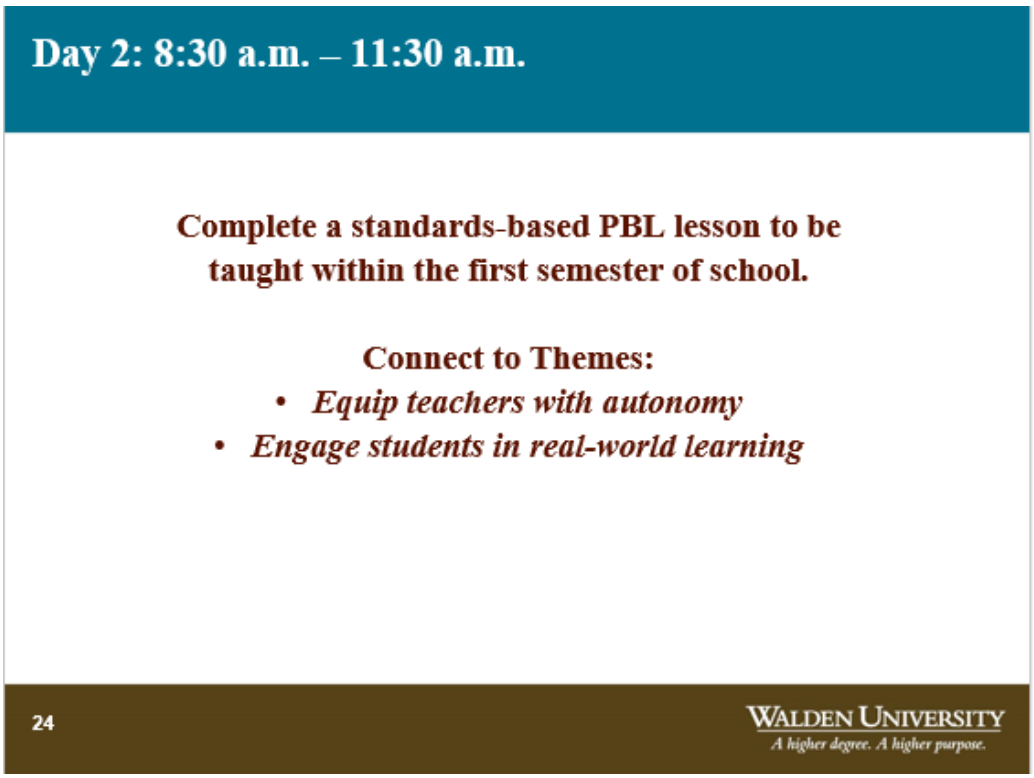
10:45-11:30 – Share with full training group

11:30-1:00 – Lunch

1:00-2:00 – Learn specifics of targeted skills

2:00-3:30 – Practice skills (Break at 2:45)

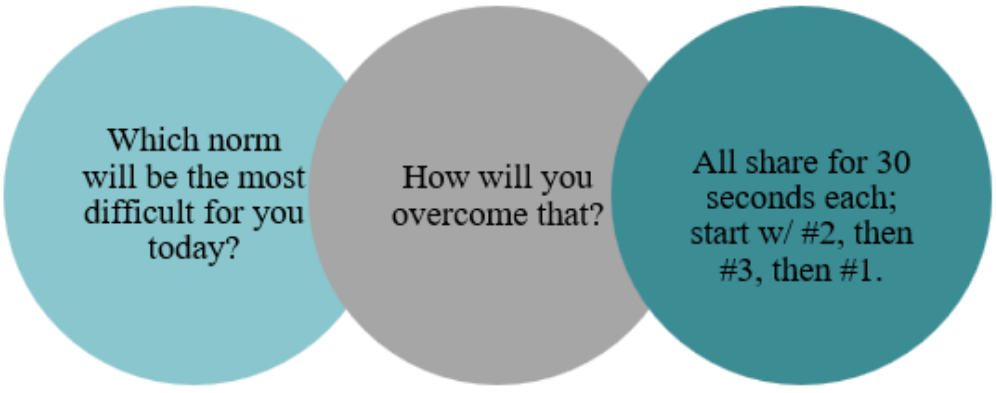
3:30 – Closing

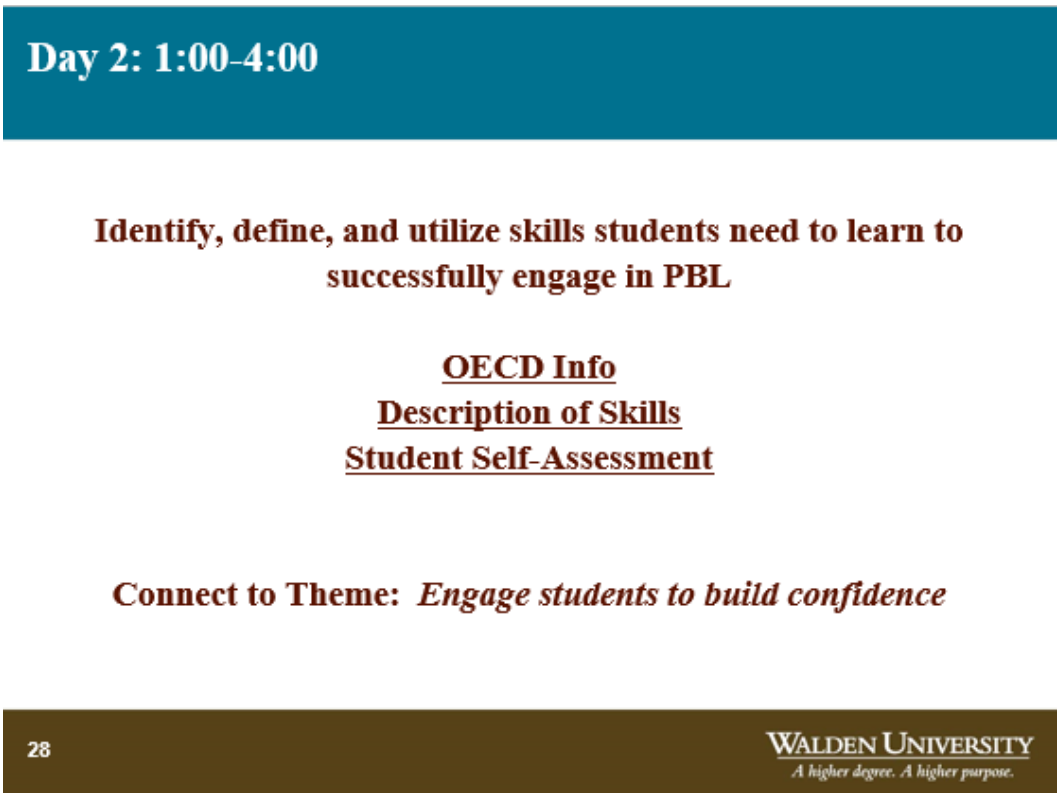


Group Norms - Reminder

- Step Up! (Share your thoughts)
- Make Room! (Keep an open mind)
- Collect Wisdom! (Listen to others)
- Think and Speak in Drafts! (Continuous Improvement)

Day 2: Get back in your Trio Groups:





Agenda for Day 3

8:00-8:30 – Breakfast, sit with same table groups

8:30-9:00 – Review Learning from previous days in trio groups

9:00-11:00 – Learn about Instructional Coaching

11:00 – 11:30 – Tabletop Discussion

11:30-1:00 – Lunch

1:00-3:30 – Role Play (Break at 2:30)

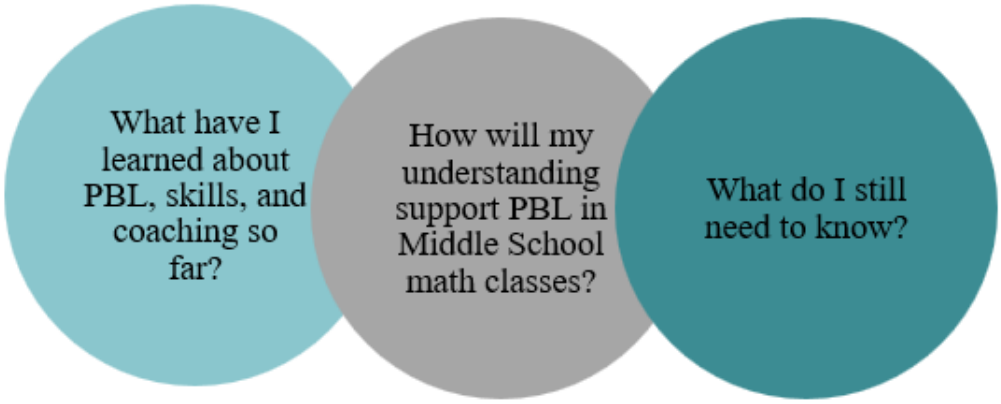
3:30-4:00 – Evaluation from Workshop

Day 3

Identify and implement instructional coaching strategies for administrators and teachers to learn to provide tools to better support students and teachers.

A.M. – Learn
P.M. - Practice

Day 3: Get back in your Trio Groups:



Day 3 – A.M. – Learn – Cognitive Coaching

Planning Conference
- Clarify Goals
- Choose Evidence
- Select Strategies
- Self-Assessment

Classroom Observation
- Gather Evidence
- Document Strategies

Reflection Conference
- Guided self-reflection
- Share Evidence
- Conclusions for Future

Resources

Spend the next 1 ½ hours learning on your own.
Be prepared to discuss your new learning.

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Day 3 – P.M. - Practice

- Role Play
- Scenarios from Bright Morning

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Summary – Past three days

1) Planned and implemented a standards-based PBL lesson using the ICLE Rigor/Relevance/Engagement Rubric;

2) Identified, defined, and utilized skills students need to learn to successfully engage in PBL; and

3) Identified and implemented instructional coaching strategies for administrators and teachers to learn so you are better able to support students and teachers.

Evaluation

- Please share your comfort level in implementing PBL
  - Administrator Link
  - Teacher Link
  - References

Thank You

Thank you for your time and attention during these last three days!

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Appendix B: Interview Protocol

I used the following interview protocol:

1. I will introduce myself to the participant as a Walden University doctoral student and inform him or her of the time and the reason for the interview.
2. I will make available to the participant a copy of the consent form to read and sign. I will ask the participant to retain a copy after signing.
3. I will inform the participant of my audio recording of the interview.
4. I will use the following research question to guide the study: What are administrators' and middle school math teachers' perspectives of the effects of PBL on middle school math students?

   Interview Questions:

   1. What are some of your beliefs of middle school math education?
   2. What is your perception of student success of middle school math in your school or district?
   3. What activities would you like to do, or see done, in middle school math to best meet the needs of middle school math students?
   4. What teaching strategies are effective for engaging students with the content taught in middle school math classes?
   5. How does your middle school math-related teaching experience influence the type of material/s you would like to see used in math classrooms?
   6. What is your perception of problem-based learning (PBL), as it pertains to middle school math?

7. What are some of the possible positive effects of the problem-based learning (PBL) in middle school math?
8. What are some of the negative effects of the problem-based learning (PBL) in middle school math? And, why might this be so?
9. What changes to the math program would help increase the success of striving (instead of struggling) middle school math students?
10. How has COVID-19 impacted student learning in math?
11. What more would you like to add that I have not yet addressed?

5. I will thank the interviewee for participating, stop the audio recording, and conclude the interview.

Appendix C: Interview Questions

1. What are some of your beliefs of middle school math education?
2. What is your perception of student success of middle school math in your school or district?
3. What activities would you like to do, or see done, in middle school math to best meet the needs of middle school middle school math students?
4. What teaching strategies are effective for engaging students with the content taught in middle school math classes?
5. How does your middle school math-related teaching experience influence the type of material/s you would like to see used in math classrooms?
6. What is your perception of problem-based learning (PBL), as it pertains to middle school math?
7. What are some of the possible positive effects of the problem-based learning (PBL) in middle school math?
8. What are some of the negative effects of the problem-based learning (PBL) in middle school math? And, why might this be so?
9. What changes to the math program would help increase the success of striving (instead of struggling) middle school math students?
10. How has COVID-19 impacted student learning in math?
11. What more would you like to add that I have not yet addressed?