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Rural Elementary Educator Perceptions About Mathematics Instructional Resources and Strategies

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Walden University
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Abstract

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M.Ed. Auburn University Montgomery, 2013

M.Ed., Troy University, 2012

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Project Study Submitted in Partial Fulfillment

of the Requirements for the Degree of

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Abstract

An increasing number of students in a rural elementary school have not met the mathematics proficiency benchmark. Educators in the rural school have made changes to mathematics instructional resources, types and levels of support, and the mathematics curriculum. Despite these changes, the data continued to indicate that an increasing number of students in Grades 3–6 had not met the mathematics proficiency standard. The purpose of this study was to investigate perceptions of elementary mathematics teachers in Grades 3–6 and administrators regarding instructional resources, strategies used to teach mathematics, and professional development for teaching mathematics. Archer and Hughes' concept of explicit instruction formed the conceptual framework that guided this study. The research questions for this study addressed rural elementary administrator and teacher perceptions about instructional resources, teaching strategies, and professional development to improve mathematics instruction. A basic qualitative design was used to capture the insights of 10 mathematics teachers of Grades 3–6 through semi-structured interviews. A purposeful sampling process was used to select participants. Emergent themes were identified through open coding, and the findings were checked for trustworthiness through member checking, detailed descriptions, and researcher reflection. A 3- day professional development project was created to assist with the identified problem based on the data collected from educators in the rural school district. This study has implications for positive social change because mathematics teachers will be provided support in practical implications for planning mathematics instruction, best practices and strategies for teaching mathematics, and technology application for teaching mathematics.

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Dedication

This study is lovingly dedicated to my parents, Arminta Woods-Anderson and the late Henry Anderson, Jr.

Acknowledgments

Thank you, Jesus! This doctoral study was one of the most challenging tasks ever put before me, and it was through the grace of God that I was able to complete it successfully. I would also like to acknowledge my family and friends who supported and pushed me to keep going when I wanted to give up. I would also like to express my sincerest gratitude and thanks to my committee chair, Timothy Lafferty. It was only through Dr. Lafferty's guidance and candid approach that I was able to complete this study. Thank you for your diligence, in-depth explanations, and willingness to help me successfully finish this project. I would also like to thank my second member, Dr. JoAnn Hinrich, and URR, Dr. Wade Fish. Your collective guidance and support have been unmatched.

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Section 1: The Problem

The Local Problem

The problem that prompted this study was that mathematics teachers and administrators of Grades 3–6 at a rural elementary school struggled to improve students' mathematics performance despite the program changes made by administrators. The assessment administered to students was the ACT Aspire. ACT Aspire is given to students in Grades 3–6 in the spring, and it measures students' abilities to abstractly and critically analyze multistep problems that incorporate engineering and mathematics (Poland & Plevyak, 2015).

The administrators made the following changes to enhance teacher instructional resources and to improve student performance in mathematics: (a) adopted a new mathematics curriculum, (b) purchased supplemental mathematics programs, (c) conducted frequent teacher observations that focus on student engagement, and (d) offered professional developmental activities for teachers targeted toward student mathematics engagement. Despite the changes made, there were no significant gains in students' mathematics assessment scores in the 3-year period of 2014–2017 (see Table 1). Table 1 shows a 3-year comparison of the percentage of students in Grades 3–6 who scored proficient on the mathematics assessment and the percentage of growth achieved by students who took the assessment (Alabama State Department of Education, 2018). The data indicated an increasing number of students had not met the mathematics proficiency standard at the local school (Alabama State Department of Education, 2018). The results from the initial assessment given in the 2013–2014 school term indicated that

61.3% of students scored proficiently in mathematics. After that, the percentage of students who scored proficiently in mathematics dropped to 52.05% and then to 50.66%. The decline continued as the number of students who scored proficiently decreased to 49.06% by the 2016–2017 school term (Alabama State Department of Education, 2018).

Table 1

Average Percentage of Grade 3–6 Students at the Local Site who Scored Proficiently in Mathematics

School Term	% of students in Grades 3–6 proficient in mathematics	% Growth +/-
2013–2014	61.3	*
2014–2015	52.05	-9.25
2015–2016	50.66	-1.4
2016–2017	49.06	-1.6

Alabama State Department of Education. (2018). Department of Student Data. Retrieved from http://www.alsde.edu/dept/data/Pages/assessment-all.aspx

During a 2017–2018 teacher in-service conference, the school superintendent stated that test scores in mathematics had been declining and that he believed the school district needed to make improvements to help students succeed. He further stated that the Alabama State Department of Education entrusts educators to figure out what tools and resources are needed to compete and perform academically and that improvement in mathematics is needed. The exact instructional tools needed to accomplish this were not specified. At the same in-service conference, the curriculum director reviewed the system's accreditation report from the 2017 school term and identified that mathematics differentiation and continuous mathematics improvement as two of the lowest scored areas. The curriculum director urged teachers to make daily use the instructional tools provided. During a breakout session of the 2017 conference, a fifth-grade mathematics teacher stated that the utilization of mathematics resources provided were not enough to meet the required benchmarks.

There appeared to be a gap in practice between the professional development and instructional resources provided to teachers of Grades 3–6 and the mathematics performance of students in these grades (see Table 1). During a district-wide administrator meeting conducted during the 2018–2019 school term, the curriculum coordinator stated that the school district needed to find mathematics resources that work best for teachers and students in order to assist students not meeting benchmark goals The curriculum coordinator also reported that the changes made to the mathematics curriculum, the supplemental mathematics programs, the teacher observation process, and the professional development offerings had not created the anticipated effect. The curriculum coordinator concluded by expressing that it would take a collective effort to find what teachers needed to assist students. During a school board meeting, the school superintendent stated that mathematics instruction has proven to be one of the major struggles for teachers and administrators in the school system and across the state of Alabama. According to the state superintendent, student math achievement across the state of Alabama is a crisis in the Alabama educational system, and the crisis must be addressed.

As a result of low mathematics performance, the Alabama State Department of Education (2017c) implemented a strategic mathematics plan focused on improving student math scores through the following initiatives: (a) teacher education programs, (b) professional development offerings, (c) standards for mathematical practice and accountability, (d) revised curriculum and instruction guides, and (e) evaluation programs that support mathematics education quality. At the Council for Alabama School Leaders Conference in 2018, the newly elected Alabama state superintendent argued that it is the responsibility of district-level administrators to ensure that the components of the strategic mathematics plan are implemented in every school across Alabama and that each component is implemented in succession to provide teachers with the tools they need to support continued student learning in mathematics.

During a 2018 administrator meeting, the school system's technology coordinator discussed data from a survey of teachers, stating that teachers believed that they did not receive professional development related specifically to their content area. At the same administrator meeting, the elementary school principal argued that there is a continued search for more appropriate resources to assist teachers and to help students perform successfully in mathematics. The elementary school principal added that more and improved professional development would be implemented.

According to the Alabama State Department of Education (2017a, 2017b), teacher instruction is an essential component to the success of schools across Alabama; therefore, it was important to investigate the problem in this study because administrators wanted to help teachers improve students' mathematic assessment scores. The gap identified in practice between the professional development and instructional resources provided by elementary school administrators and the third to six grade students' mathematics performance demonstrates the need to find approaches that may assist teachers in improving student mathematics scores.

Rationale

Mathematics education is provided to students to help them gain knowledge of quantity, structure, space, and change as well as to develop higher-order thinking skills so that mathematical reasoning becomes a repetitive daily function (Ozkaya & Karaca, 2017). Assessment data that did not identify student gains indicated that current instructional procedures were not sufficient to improve student mathematical academic performance (Koedel, Polikoff, Hardaway, & Wrabel, 2017). The rural school system where the problem existed has 1,900 students and is unique because student class groups remained the same from kindergarten through high school.

According to the Alabama Educator Quality standards, it is the responsibility of teachers and school administrators to make academic changes that help to increase student academic proficiency (Alabama State Department of Education, 2017a, 2017b). Alabama Educator Quality Standards additionally identify that an educators' inability to do so could be a reason for alternative placement or contract termination (Alabama State Department of Education, 2017a, 2017b). According to the Alabama state superintendent, it is imperative that the crisis in math education across the state of Alabama be addressed with data and culturally responsive pedagogy that will allow students to make an authentic connection to mathematical content presented in classrooms. The governor of Alabama stated that she is in the process of appointing an advisory council for the 2018–2019 school term to specifically address instructional tools and methods to increase students' mathematics performance because students' current academic standing in mathematics is unacceptable.

Alabama is not the only state that has identified a need to develop a plan to address low student mathematics performance (Dossey, McCrone, & Halvorsen, 2016; Koedel et al., 2017). As reported by Kitchen, DePree, Celed, and Brinkerhoff (2017), students' mathematics performance across the United States is generally low, especially students' in rural and urban areas. The researchers further added that U.S. students are not adequately prepared to achieve high levels of mathematics.

The purpose of this study was to investigate the perceptions of rural elementary administrators and mathematics teachers in Grades 3–6 regarding instructional resources, strategies used to teach mathematics, and professional development for teaching mathematics. There was an increased need to investigate this problem because school administrators and teachers implemented changes in professional development and resources over the last 3 years, but there was no improvement in student academic math proficiency scores (see Table 1).

Definition of Terms

ACT Aspire: A common core standards-based summative assessment that assesses the readiness of students in Grades 3–10 in mathematics, English, science, and writing. Assessment question types consist of multiple choice, constructed response, selected response, and technology-enhanced items to determine student academic proficiency in mathematics, English, science, and writing as well as indicate if assessed students are academically prepared to successfully further studies at the next grade level (American College Testing, 2018).

Benchmark: A point of reference score that indicates the dividing line between acceptable and unacceptable academic performance (American College Testing, 2018).

Instructional tools: Educational materials used to enhance student knowledge in order to increase the likelihood that the student will better understand academic material presented (Serdyukov, 2017).

Mathematics proficiency score: An academic score or level that indicates if students have met or exceeded the benchmark set in a tested area. Scores within the proficient range suggest that students have attained the required academic standards at a particular grade level and that they are capable of successfully proceeding to the next set of grade level standards (American College Testing, 2018; Baroody, Rimm-Kaufman, Larsen, & Curby, 2016).

Problem-solving: A learning skill used to find solutions to difficult or complex issues (Yuanita, Zulnaidi, & Zakaria, 2018).

Significance of the Study

The focus of this study was on instructional resources and professional development used by elementary mathematics teachers. Data collected through teacher and administrator interviews provided an original contribution. The findings of the study and resulting project may potentially provide teachers and administrators with approaches that could assist with the identified gap in practice that has existed over the last 3 years at the study site. All stakeholders may also benefit from this study because the findings could provide a solid foundation concerning: (a) instructional resources, (b) strategies used to teach mathematics, (c) and professional development. This study may foster positive social change through promoting instructional practices and resources that address identified teacher and administrator needs.

Research Questions

Over the last 3 years, schoolteachers and administrators have struggled to increase student mathematics proficiency in Grades 3–6 in a local school. The purpose of this study was to investigate the perceptions of rural elementary administrators and mathematics teachers regarding instructional resources, strategies used to teach mathematics, and professional development for teaching mathematics. The following research questions guided the study:

RQ1: What are rural elementary administrator and teacher perceptions about instructional resources and strategies used to teach mathematics?

RQ 2: What are rural elementary school administrator and teacher perceptions about professional development to improve mathematics instructional delivery?

Review of the Literature

Conceptual Framework

The conceptual framework for this study comprised the concept of explicit instruction, developed by Archer and Hughes. Archer and Hughes (2011) argued that explicit instructional practice is the most effective instructional approach for all students because it provides consistent support that gradually guides students through the learning process. The concept of explicit instruction reasons that all students, regardless of academic ability, can learn difficult information when the teacher provides instructional scaffolds in logical sequencing followed by manageable sections of educational material

(Archer & Hughes, 2011). This framework highlighted the significance of teacher instructional practices and assisted me in providing support to assist the local educational organization with the identified problem. The problem that prompted this study was that rural elementary mathematics teachers and administrators of Grades 3–6 at the study site struggled to improve student mathematics performance despite the program changes made by administrators.

The purpose of this study was to investigate the perceptions of rural elementary administrators and mathematics teachers in Grades 3–6 regarding instructional resources, strategies used to teach mathematics, and professional development for teaching mathematics. The concept of explicit instruction acknowledges that students can operate at a higher intellectual level with sound, intentional instructional guidance. In explicit instruction, teachers provide clear cognitive strategies, engage students in active participation, and continuously monitor student performance (Archer & Hughes, 2011). Explicit instruction supported this study because it indicated that meaningful and progressive teacher instruction is an essential and effective component of continuous student learning.

Review of the Broader Problem

To explore the topics related to the problem in this study, I used the Walden University Library to access the following educational and multidisciplinary databases: Education Source, ERIC, SAGE Journal, and ProQuest Central. Additional research was found using Google and Google Scholar. The following key terms were used to find information that related directly to the study: *instructional resources, mathematics,*

mathematics professional development for teachers, math instructional resources, elementary mathematics performance, best instructional practices for mathematics, and *elementary mathematics assessment performance*.

In the literature review, I highlight the main topics presented in research-based literature related to the study. To understand the groundwork associated with the efforts to improve student mathematics proficiency in Alabama, Common Core State Standards are discussed, including the steps that led to the adoption of Common Core in Alabama. This information provided the background knowledge necessary to address the need to identify instructional resources and strategies that may assist teachers in improving student performance in mathematics. The final component examined is best instructional practices for teaching mathematics.

Common Core Mathematics Standards

In 2009, the U.S. Department of Education (2015) encouraged educational organizations across the United States to consider the implementation of mathematics Common Core Standards because they provided a new approach to teaching and learning mathematics. The objective of promoting the implementation of Common Core Mathematics Standards was to provide a unified group of benchmarks that would (a) deepen students' understanding of mathematics concepts, (b) increase students' mathematical retention and performance, and (c) better prepare students for college or a career field (Speer, King, & Howell, 2015; U.S. Department of Education, 2015).

After the introduction of Common Core Standards in 2009, the Alabama State Department of Education (2016a, 2016b) researched different variations of mathematics standards to select a qualified set of academic requirements that would progressively build students‘ mathematics skills to enhance student academic performance in mathematics, compete with the demands of society as they relate to mathematics, and produce Alabama high school graduates who are prepared for postsecondary life. In 2010, the Alabama State Department of Education (2016a) pressed forward with implementing Common Core Standards. A 2-year strategic professional development process began that was geared towards preparing school leaders and teachers to implement the Common Core Mathematics Standards successfully through providing them with exposure to the fundamental practices of Common Core Standards (Alabama State Department of Education, 2016a). This exposure would potentially prepare educators to shift the focus of teaching mathematics (Osborne, 2015). This shift would focus on learning practices centered on students, including (a) making sense of problems and persevering in solving them, (b) reasoning abstractly and qualitatively, (c) constructing viable arguments and critiquing the reasoning of others, (d) modeling with mathematics, (e) using appropriate tools strategically, (f) attending to precision, (g) looking for and making use of structure, and (h) looking for and expressing regularity in repeated reasoning (Alabama State Department of Education, 2016a; Johns, 2016; Star, 2016; U.S. Department of Education, 2019).

In 2012, public schools across Alabama implemented Common Core Mathematics Standards in Grades K–12 (Alabama State Department of Education, 2016a, 2016b). Since Alabama adopted and implemented Common Core, there has been no improvement in students’ mathematical proficiency with Alabama assessment scores state-wide indicating a growing number of students who are not proficient in mathematics (Alabama State Department of Education, 2017a). According to the latest two assessment reports from the National Assessment of Educational Progress (2015, 2017), over 40% of students in the United States are not proficient in mathematics (Peterson, Barrows, & Gift, 2016).

In 2015, to further assist educational organizations with improving student mathematics achievement, the Every Student Succeeds Act (ESSA) was signed and implemented by President Barack Obama (U.S. Department of Education, 2015). The goals of ESSA were (a) to hold school systems across the United States more accountable for continued student academic progress, (b) to create educational equity to lessen achievement gaps, and (c) to create overall positive change in low performing schools (U.S. Department of Education, 2015, 2019; Young, Winn, & Reedy, 2017). To date, neither Common Core nor ESSA has had a significant impact on increasing the number of students who are proficient in mathematics because more than 40% of students in the United States and over 50% of students in Alabama have not met proficiency benchmarks (Dossey et al., 2016; Lynch, Chin, & Blazar, 2017; McGuinn, 2016; Ruiz-Alfonso & Leon, 2017). According to Star (2016) and Siegler (2016), the implementation of both reforms was not successful because they did not focus on the instructional resources that teachers need to engage students in the complex demands of the Common Core Standards. Siegler added that in order for the extensive list of expectations listed in Common Core and ESSA to be mastered, teachers must have access to instructional tools, strategies, and resources. Continued research is necessary to examine what educational resources and strategies can help educational organizations to decrease the number of underperforming students in mathematics reach the standards established (Brasiel et al., 2016). According to Archer and Hughes (2011), students can grasp complex concepts if provided explicit instruction that is engaging and presented with a systematic approach. Neither explicit nor engaging instruction can take place if teachers are not equipped with the necessary instructional resources and approaches essential of teaching mathematics.

Instructional Resources and Approaches to Teaching Mathematics

Teacher instructional resources are necessary to ensure all students are supported and supplied with what is needed to grasp mathematics academic content effectively (Ozkaya & Karaca, 2017). According to Huang (2016) and Brasiel et al. (2016), an effective way to ensure that students are grasping mathematical concepts in the 21st century is through the use of technology. Technological resources, such as computer programs and computer device applications, provide personalized supports that allow teachers to create different variations of mathematics resources to support student learning (Brasiel et al., 2016). Al-Mashaqbeh (2016) conducted a study in an urban elementary school to compare traditional instructional methods and instructional approaches using technology and technology resources. The results revealed that students who used technology grasped mathematics content more quickly and at a higher rate (Al-Mashaqbeh, 2016).

Similarly, D’addato and Miller (2016) completed a similar study in a rural elementary school to determine if technological resources increased the rate at which students grasped mathematics academic concepts. Their data revealed that with technological resources, students were more engaged in learning, confident in mathematics, and learned mathematics content at a faster pace (D'addato & Miller, 2016). According to Hoyles (2018), technology is the resource that bridges the gap between mathematics content knowledge and what students need daily because it provides students the ability to form a relationship between school and daily activity. Hoyles further added that K–12 teachers must have multiple digital tools and resources that provide the support to transform and enhance the student confidence when learning mathematical content.

In contrast, Schoenfeld (2016) and Uribe-Florez and Wilkins (2017) conducted studies with similar samples and found that technological resources used for mathematics instruction are not the most effective instructional tool for elementary students and that the use of technology takes away from learning the fundamental mathematical process, typically mastered with traditional forms of instructional resources, such as manipulatives and discovery activities. The National Council of Supervisors of Mathematics (2019) argued that to improve student mathematical proficiency, teachers must systematically integrate concrete manipulatives into classroom instruction.

Kontas (2016) conducted a study using 48 groups of adolescent student participants and aimed at determining if concrete manipulatives aided student proficiency in mathematics. Kontas concluded that students who were instructed using concrete manipulatives were more proficient in mathematical skills taught by the instructor. Chen and Lee (2015) conducted comparable research with fifth-grade students to determine if concrete manipulatives were useful instructional tools when teaching mathematics academic content. Their analysis indicated that students equipped with primary manipulatives and concepts developed the necessary mathematical skills needed to be proficient in mathematics and further added that the most effective instructional resources available are manipulatives that allow students to engage in hands-on learning (Chen & Lee, 2015). Chen and Lee explained that hands-on learning with the use of manipulatives allows students to make a connection with academic content through guided teacher instruction (Chun-Yi & Ming-Jang, 2015).

According to Yurniwati and Hanum (2017), guided discovery learning that incorporates manipulative items is the most effective instructional tool because it allows students to obtain the knowledge and skills needed to accurately problem solve. Their research was conducted in three cycles with fifth-grade students who received instruction on how to problem solve using manipulatives. Through the implementation of guided discovery learning with manipulatives, they found students were able to effectively communicate and correctly explain mathematical content. The result was that students' scores on the postassessment improved in comparison to student preassessment scores (Yurniwati & Hanum, 2017). According to Kablan (2016), the use of manipulatives in conjunction with traditional lectures in elementary mathematics is a valid approach to teaching students with different learning styles how to form a connection with difficult mathematical content. Kablan further added that manipulatives are especially beneficial for students in Grades 3–5 because the academic standards require students to begin to think abstractly about mathematical content. Additionally, through the continued use of manipulatives, students can develop adaptive flexibility in learning that fosters their ability to engage in a variety of mathematics content with the confidence needed to solve problems using more than one procedure (CITE).

Jitendra, Nelson, Pulles, Kiss, and Houseworth (2016) evaluated 25 experimental and quasi-experimental studies to determine if mathematical representation, such as manipulatives, was an evidence-based approach to teaching mathematics. Their results revealed that the use of manipulatives not only was the most effective approach in mathematical practice but allowed students to construct visual representations that proved to be essential to student academic mathematical development because the manipulatives fostered a variety of creative thinking mechanisms, such as summarizing, recording and reasoning, representing a numerical or functional relationship, and making abstract and concrete mathematical relationships (Jitendra et al., 2016). All these components are essential for student mastery of Common Core Standards, and they are listed in academic benchmarks in the Common Core Standards adopted by the Alabama State Department of Education (2016b). In disagreement, Bryant et al. (2016) and Doabler et al. (2014) argued that the students may benefit most from instructional approaches that incorporate teaching students mathematics through small group instruction.

Specific and intentional instruction delivered through small group is the most effective instructional tool for elementary students (Bryant et al., 2016; Doabler et al., 2014). Small group instruction is an instructional approach that provides teachers and students the opportunity to engage in academic discourse on differentiated levels related explicitly to academic content (Park & Datnow, 2017). Doabler et al. (2014) examined the relationship between student academic outcomes and small group instruction. The study involved approximately 2,220 students over 2 years; results from the study indicated that small group instruction is a practical and powerful instructional tool when attempting to improve student academic performance in mathematics (Doabler et al., 2014). Ing et al. (2015) and Dietrichson, Bog, Filges, JAaAaAeA, and Kli (2017) conducted a similar study in five elementary schools across the United States. Results from both studies identified small group instruction as an essential component in student academic development. Both studies additionally argued that small group instruction encouraged student-teacher academic interaction and indicated small group instruction as a successful instructional approach as 85% of students who participated in the study and received small group instruction improved in mathematical computation and comprehension. Moser et al. (2017) conducted a study with 123 student participants from 34 elementary class groups. Students were divided into two groups. One group of students were given small group instruction daily that consisted of necessary computation skills, place value, and mathematics operations. The other group was provided the same instruction in a whole group setting. Findings from the study revealed that students who received instruction in a small group setting scored significantly higher on post assessments when compared to the group of students who did not receive small group instruction. Multilevel regression analysis by Moser et al. added that small group instruction could reduce mathematical deficits of students who struggle grasping multistep problems.

Nagro, Hooks, Fraser, and Cornelius (2016) determined that small group instruction is a proactive strategy and approach that provides students with targeted instruction that is specifically related to individual student mathematics deficits. Nagro et al. added that when small group instruction is implemented routinely using instructional strategies that promote student engagement and reactivity, there is an increased possibility that students' mathematical comprehension, mathematical academic confidence, problem solving, and critical thinking skills will lead to improved student mathematics performance regardless of their cognitive ability level. In keeping with small group instruction improving student performance, Spooner, Saunders, Root, and Brosh (2017) argued that small group instruction could increase the problem-solving ability of all students especially that of students who have a severe deficit in mathematics. Problem-solving is one of the mathematical practices that is required for students to successfully master the Common Core Mathematics Standards (U. S. Department of Education, 2019).

While it is apparent that current research attests to many variations of instructional approaches and strategies for mathematics to improve student academic mathematics proficiency, U. S. students are still poorly rated in mathematics academically (Lynch et al., 2017). This discrepancy leads to an increased need to determine what approaches and instructional practices will best assist in improving student academic proficiency in mathematics.

Best Practices of Teaching Mathematics

Teacher instruction accompanied by best practices are essential for increasing student academic performance (Gabriele, Joram, & Park, 2016). Best instructional practices should be utilized continuously to provide students with optimal explanations of mathematics standards and material (Gabriele et al., 2016). Best instructional classroom practices provide standards-based instruction coupled with activities that allow students to explore mathematics content and incorporate real-world components (Hadar, 2017). Hudson, English, Dawes, King, and Baker (2015) conducted a 4-year study to explore what instructional practices best met the academic needs of students. The research identified project-based learning as an effective instructional practice because it incorporates audio and visual aids in conjunction with hands-on assignments that assist in student academic improvement (Hudson et al., 2015). The post questionnaire completed by student participants in the study revealed that through project-based learning students found instruction more enjoyable and easier to understand. The post assessment also showed that students who participated in project-based learning scored higher on assessments when compared to students who did not engage in project-based learning (Hudson et al., 2015). Ceker and Ozdamli (2016) argued that problem-based learning is the most effective instructional practice and learning method because it fosters and develops students' upper-level critical thinking skills necessary to learn difficult multi-step content found in mathematics. In concurrence, Vandenhouten, Groessl, and Levintova (2017) and Gravemeijer, Stephan, Julie, Lin, and Ohtani (2017) stated that problem-based learning is the only student-focused pedagogy that allows the learner to develop the intellectual independence needed to become proficient in mathematics in the 21st century. Similarly, Guzey, Moore, and Harwell (2016) argued that project-based learning allows struggling students to make real-life connections to academic content. Guzey et al. also demonstrated that while project-based learning is a highly effective instructional classroom practice, it is only most effective when concepts are presented in a cross-curricular manner, such as science, technology, engineering, and mathematics (STEM) education.

STEM is an instructional cross-curricular educational practice that combines aspects science, technology, engineering, and mathematics, to improve student academic performance. According to Moreno, Tharp, Vogt, Newell, and Burnett (2016), STEM is the most effective educational practices as it requires students to solve problems, create projects, engage in constructive academic discourse, and utilize technology effectively. Lesseig, Slavit, and Nelson (2017) added that STEM education provides students the opportunity to build real-life connections with difficult academic content, especially in mathematics. Lesseig et al. continued and stated STEM-based instructional practices in the rural school setting has proved to substantially increase student mathematical performance when implemented consistently at the elementary level. Shernoff, Sinha, Bressler, and Ginsburg (2017) agreed and supported this concept and discussed that without cross-curricular educational practices such as STEM students in the United States would not develop the problem solving or critical thinking skills needed to be deemed as proficient in Common Core Mathematical Standards successfully. Likewise, Gravemeijer et al. (2017), provided evidence that supports STEM education as an educational practice that will bridge the gap between mathematics standards presented by the classroom instructor and student conceptual understanding of mathematical procedures such as problem-posing, problem solving, and analyzation. Gravemeijer et al. further emphasized that STEM-based instructional practices are one of the leading project-based practices for students who struggle to meet state-mandated benchmarks. Collectively, Gravemeijer et al. (2017); Lesseig et al. (2017); and Shernoff, Suparna, Sikma, and Osborne (2014), provided research that identified STEM-based instructional practices as a pedagogical practice that allows the learner to translate mathematical procedures from unfamiliar printed text into manageable pieces of information that will lead to student academic improvements or proficiency in mathematics.

Scammell (2016) and Andersson and Palm (2017b) reported that while problem-based learning and cross-curricular project-based educational practices such as STEM-based instruction can be beneficial; it is not the most practical or efficient mathematics instructional practice. Mathematics is a complex subject area. For students to become proficient in mathematics, they must be able to use adaptive reasoning, strategic competence, conceptual understanding, productive disposition, and procedural fluency (Schoenfeld, 2015). Scammell and Andersson and Palm added the best instructional practices that develop and foster these mathematics skills in students is formative assessment.

Formative assessments are powerful informal or formal classroom instructional practices that provide the classroom instructor opportunities to (a) continuously check for student understanding, (b) modify instruction to meet the needs of students, and (c) better ensure student comprehension (Beesley, Clark, Dempsey, & Tweed, 2018). Beesley et al. (2018) conducted a 2-year study in seven urban middle schools where 47 teachers participated in determining if, through formative assessments, student mathematics performance would improve. The research required teachers to attend professional development that focused on critical aspects of formative assessments. The results indicated that through implementing formative assessments, teachers saw an improvement in student academic performance, student focus, and improved student scores on summative assessments (Beesley et al., 2018). Pinger, Rakoczy, Besser, and eme (2018) conducted a similar study with a comparable sample to determine if the implementation of formative assessment contributed to student academic performance. The results proved that the formative assessment improved student achievement in mathematics. Similarly, Andersson and Palm (2017a) found that implementing formative assessment in the classroom to be useful to both the teacher and students because it provided teaching and learning that included the three areas needed to enhance student academic performance in mathematics. The three areas identified were modification, engagement, and redirection.

According to Schoenfeld (2015) formative assessment is the most proven instructional tool that allows teachers to actively examine student academic achievement and provide direct and immediate feedback to improve student understanding of educational content. Rittle, Fyfe, and Loehr (2016) identified that student mathematics proficiency requires an understanding of central concepts and the ability to continuously adapt and find solutions. Beesley et al. (2018) argued that through formative assessment teachers can provide immediate differentiated instruction to students reducing the possibility of student misinterpretation and can increase student academic performance in mathematics. Similarly, Pinger et al. (2018) identified formative assessment is a vital component to teacher instruction that should be a continuous instructional practice exercised in the classroom to ensure progressive student academic performance. Schoenfeld (2015) and Scammell (2016) further argued that through formative assessments, teachers are afforded the opportunity to strategically assist students with individualized academic mathematics support that may increase the likelihood of student proficiency in mathematics.

Implications

Teachers must possess instructional tools, strategies, and approaches to effectively teach students to become mathematical thinkers (Grammer, Coffman, Sidney, & Ornstein, 2016). The goal of this study was to investigate the perceptions to investigate perceptions of rural elementary administrators and mathematics teacher’s in Grades 3-6 regarding instructional resources, strategies used to teach mathematics, and professional development for teaching mathematics. Through this study approaches, resources, and procedures were identified through teacher and administrator interviews. A professional development program will serve as the project to provide teachers, administrators, and students with practical and useful strategies to address the gap in practice at the local elementary school. Possible activities for this project are (a) professional development seminars, (b) after school programs, or (c) implementation of learning strategies and approaches. Such programs may have the potential to enhance student mathematical proficiency.

Summary

For 3 years, mathematics assessment scores of students in Grade 3-6 indicated that an increasing number of students were not meeting the mathematics proficiency benchmark. There was an increased need to explore what could be done to aid teachers and administrators as school-wide changes made to the mathematics curriculum, supplemental resources, and professional development appeared to have had little effect on student performance. The lack of student mathematics proficiency indicated a gap in the local practice because recent efforts of school administrators have not influenced teacher practices or student performance. The increased number of students who had not scored proficiently in mathematics has been mentioned by the state superintendent, school superintendent, curriculum coordinator, school administrators, and teachers. Each stakeholder identified the need to find what is needed in order to increase the number of students who score within the proficient range in mathematics.

The goal of this study was to investigate the perceptions to investigate perceptions of rural elementary administrators and mathematics teachers' in Grades 3-6 regarding instructional resources, strategies used to teach mathematics, and professional development for teaching mathematics. By exploring these perceptions through interviews, I gained feedback that provided approaches that could assist with addressing the problem.

Section 1 provided an overview of the study problem. Section 1 also identified the local problem for the study, the rationale, the definition of terms, the significance of the study, the research questions, implications, and a review of the literature. Section 2 provided information on the research design and approach, participants, data collection, and data analysis. This study was designed to investigate the perceptions of rural elementary administrators and mathematics teachers in Grades 3-6 regarding instructional resources, strategies used to teach mathematics, and professional development for teaching mathematics.

Section 2: The Methodology

Qualitative Research Design and Approach

I used the basic qualitative research design for this study. The nature of qualitative research is to explore and examine the human phenomenon through the views of others (Creswell, 2012). According to Merriam and Tisdell (2016), using the basic qualitative research design, a researcher takes the perceptions acquired and focuses on making meaning of the information gathered with a central goal of understanding how people make sense of their experiences. Lindlof and Taylor (2017) stated that basic qualitative research provides a true explanation and understanding of human thoughts, actions, opinions, and interactions. Merriam and Grenier (2019) added that qualitative research is an inductive process that provides the opportunity to understand the meaning that participants construct of experiences and further allows the researcher to build concepts based on the data gained from participants as they relate to the phenomenon.

I chose the basic qualitative research design for this study because it allowed a more in-depth examination of the perceptions of teachers and administrators with a central goal of understanding how people make sense of their experiences (see Merriam & Tisdell, 2016). The sole intention of the basic qualitative research design is to develop an extensive understanding of a phenomenon in the natural setting and make meaning of participants' perceptions through discovery, insight, and understanding (Lodico, Spaulding, & Voegtle, 2010; Merriam & Tisdell, 2016). The basic qualitative design proved to be the most useful form of qualitative research because data can be solely collected from participants through the interview process (see Creswell, 2014; Merriam

& Tisdell, 2016). The overall goal of the design is to construct the meaning from those who have critical knowledge of the information related to the purpose of the study (Lodico et al., 2010; Merriam & Tisdell, 2016). Other forms of qualitative research, such as a case study, narrative analysis, ethnographic research, and grounded theory, did not align with the research.

Case study research is typically used to perform an in-depth analysis of bounded systems, such as programs, events, or organizations (Creswell, 2012; Merriam & Tisdell, 2016). According to Yin (2014), cases study research requires specific focus on a *case* using multiple forms of data. Although this study took place at an elementary school, I was not seeking to investigate an event or program within the school. Although I completed an in-depth analysis of teacher and administrator interview responses, I did not observe or investigate a program or activity; therefore, the case study design was not appropriate for this study. The narrative design uses biographical, psychological, or linguistic information to evaluate one or more individuals' stories to construct meaning; consequently, it was not considered because I did not investigate personal stories (see Merriam & Grenier, 2019; Merriam & Tisdell, 2016). The ethnographic design was not considered for the research because the research design examines cultural groups over an extended period (see Lodico et al., 2010). At no point of the study were cultural groups observed. A grounded theory approach was also an option; however, because there was no intent to develop a theory that would be grounded in the data (see Merriam & Tisdell, 2016), grounded theory was not suitable for the study. After reviewing the characteristics of the qualitative design, I concluded that the basic qualitative design was the methodology that would assist in constructing meaning from the interview data collected from mathematics teachers of Grades 3–6 and administrators to answer the following research questions:

RQ1: What are rural elementary administrator and teacher perceptions about instructional resources and strategies used to teach mathematics?

RQ2: What are rural elementary school administrator and teacher perceptions about professional development to improve mathematics instructional delivery?

Participants

Criteria for Selecting Participants

I used a purposeful sampling approach to identify participants. A purposeful sample was selected based on the knowledge of the population and purpose of the study. The participants should be selected because of shared characteristics, which are presented as criteria for selection (Patton, 2015).

I asked mathematics teachers of Grades 3–6 and elementary school administrators to volunteer as potential participants for the study by e-mail. The total number of possible participants invited was 17; this number included 14 mathematics teachers in Grades 3–6, one principal, and two assistant principals at the local elementary school. If saturation or voluntary participation was not achieved with the invited participants, the invitation to participate in the research would have been extended to all mathematics teachers K–6. The invitation and the informed consent form were designed to explain the purpose and details of the study as well as the criteria for participation and ask potential participants for voluntary participation. To participate, educators must have met the following criteria: (a) they had to have a current state elementary education certificate or school administrator certificate, (b) they had to possess 3 or more years of teaching experience, (c) they had to teach or facilitate mathematics education in Grades 3–6 at the local elementary school, and (d) they had to be knowledgeable of current mathematics curriculum state standards. As stated in the elementary school's improvement plan, all mathematics teachers in Grades 3-6 receive yearly training on the mathematics curriculum, mathematics standards, and hold a current elementary certification. According to the school district's improvement plan for the 2018–2019 school term, all mathematics teachers at the elementary level had 3 or more years of experience in education; therefore, all potential participants invited met the criteria listed. To further ensure that educators met the criteria, educators self-selected to participate in the research. Twelve teachers and administrators participated in the study. Creswell (2012) stated that 10–12 participants are sufficient to reach data point saturation.

To ensure each participant was protected, I sent an informed consent form with the invitation e-mail to inform potential participants of the following rights as participants: (a) participants can decide to stop participating at any point of the process without repercussions, (b) participants can decide to not answer questions without providing a reason, and (c) participant identities will be kept confidential. Those who were interested in participating in the study were asked to send an e-mail reply to indicate that they agreed to participate with the words, "I consent." This solidified each respondent's acknowledgement of meeting the criteria and acceptance of the informed consent form terms.

Upon receiving approval from Walden University's Institutional Review Board (IRB) and the local school district superintendent and school principal, I invited potential participants and collected their consent for the terms outlined in the informed consent document. The IRB approval number was 10-04-19-0610854. The first 12 participants to volunteer were accepted; if data saturation had not been achieved or if a participant withdrew from participation, the invitation to participate would have been extended to mathematic teachers K–6.

Once all participants were identified, I conducted the interviews with them. All interviews were held at an offsite location at a time that was agreed upon by each participant to ensure confidentiality. Before conducting interviews with participants, an interview protocol was developed. This protocol included a brief and explicit explanation of the purpose of the study and how the results would be used to answer the research questions. The interview protocol also included a confidentiality statement to further provide participants with a written understanding of how the data will be used (see Lodico et al., 2010). The interview protocol was read to the interviewee before each one-on-one, semistructured interview. I used an audio recorder and interviewer notes during each interview.

Researcher-Participant Relationship

I conducted this project study to investigate the perceptions of rural elementary administrators and mathematics teachers in Grades 3–6 regarding instructional resources, strategies used to teach mathematics, and professional development for teaching mathematics. Before contact was initiated with potential participants, I obtained approval from Walden University's IRB. The potential participants and I established a working relationship through professional interactions within the school district. I served as the assistant principal at the high school in the local school district. As the high school assistant principal, I did not evaluate or supervise the teachers or administrators who participated in the study. In the invitation and the informed consent form, I informed participants of the voluntary nature of the study before they agreed to participate in the research (see Creswell, 2012). I further informed participants that their names would be kept confidential with all potential participants only referenced through use of a pseudonym to hide their identity. Lastly, I notified all potential participants that all data gathered would be kept confidential and secured on a password-protected computer and would not be used as an evaluation of any sort. As an added measure, I also told the potential participants that interviews could be rescheduled and conducted at an alternate offsite location to accommodate their schedule and improve their level of comfort during the interview process.

I had no prior engagement or interactions with potential participants related to the study before receiving permission to begin research from Walden University IRB. Throughout the study, potential participants were reminded of their rights as participants and reassured that all data gathered during the interview process would be held to the highest level of confidentiality and only be used for the intents and purposes of the study. I assured the participants of their ethical protection, which was established by (a) informing potential participants of the purpose of the study; (b) maintaining a secure location of all data gathered during interview process throughout the study; (c) utilizing ethical interview practices; (d) respecting interviewee perceptions and feedback; and (e) conducting interviews in a secured, designated location.

Data Collection

I gathered all data collected for this study through one-on-one interviews with mathematics teachers of Grades 3-6 and school administrators from the study site. Merriam and Tisdell (2016) stated that the goal of data collection in qualitative research is to gain an understanding of a phenomenon. Merriam and Tisdell further added that qualitative data can be gathered through interviews, observations, and examination of artifacts and documents to gain the most useful information; however, in a basic qualitative design, it is only necessary to use one method of data collection, which is typically a semistructured interview.

To address the research questions adequately and achieve the richest form of data, I chose one-on-one, semistructured interviews because they allowed participants to provide their perceptions of the phenomenon of teaching mathematics. Creswell (2014) stated that interview data should be collected from individuals who have first-hand knowledge of the identified problem. For this study, those individuals were mathematics teachers of Grades 3–6 and school administrators who served the school where an increased number of students had not met the mathematics academic benchmark. Through conducting interviews, I gained a deeper understanding of the perceptions of teachers and administrators regarding this phenomenon (see Creswell, 2014).

I conducted each interview at an offsite location that was agreed upon with the participant. The interviews were scheduled so there would be no interference with the regular school activities. Creswell (2014) stated interviewing individuals who had experienced the phenomenon offered the most relevant information. Quality data are a crucial component to achieving rich information in a manner to attain data saturation (see Merriem & Tisdell, 2016). All potential participants had been employed at the elementary school for at least 3 years and had the necessary background to provide trustworthy information concerning strategies, resources, and professional development for mathematics instruction.

Participant Interviews

I served as the primary data collection instrument during the semistructured, one-on-one interviews. Castillo-Montoya (2016) and Merriam and Tisdell (2016) suggested the researcher should act as the primary instrument for data collection because this would allow a more detailed description of the phenomenon based on the perceptions of the individuals who are most informed about the identified problem. Each semistructured interview was scheduled at a time that was best for the participant, and they lasted approximately 45–60 minutes. Interviews took place in a secured location that was offsite. Participants who were unable to meet during their scheduled time were provided with an alternative date and time that was more feasible. I also conducted a field test using the target population. After the interview data were transcribed, participants were asked to review the findings through the member checking process. Each interviewee was asked the same interview questions. According to Castillo-Montoya, all questions asked during participant interviews should align with the research questions posed. The 10 interview questions asked during each interview were aligned with the research questions.

Interview questions 1-5 were derived from the first research question and interview Questions 6-10 were derived from the second research question (see Appendix B). During each interview, a reflective journal was kept. Additionally, each interview was audio recorded to: (a) ensure that data were correctly recorded, (b) to assist in ensuring that personal opinion is kept separate from the data collected, and (c) to develop a project study that will have the most significant influence for the educational organization based on the perceptions of only the 3-6 grade mathematics teachers and administrators at the school (Creswell, 2014). A second audio recorder was on hand in case of malfunction. Audio recordings were used to ensure accuracy during transcription.

Role of the Researcher

My job title was high school assistant principal. My responsibilities were to provide instructional support, guidance, and professional development to teachers only at the local high school. The elementary school served as the site of this study and is in the same district as the school in which I worked; each school was located on a different campus with individual administrative teams. I did not supervise, evaluate, or manage educators at the local elementary school in any way.

I have 8 years of teaching experience as an elementary teacher and 3 years of experience as a high school assistant principal. My role as an assistant principal included the following responsibilities: (a) provide content specific professional development to high school teachers, (b) disaggregate high school student data to improve high school student proficiency, (c) develop institutional supports to increase the student high school graduation rate, (d) increase the number of students who are college and career ready when they graduate from high school, and (e) improve student attendance. The high school that I served and the elementary school where the problem was identified was in the same local school district. Before conducting interviews, participants were assured that all data obtained were confidential and was not used in any form of an evaluation of their performance as an educator.

Data Analysis Results

The purpose of data analysis was to organize the collected data and to code the data by identifying patterns, categories, and themes that capture the commonalities and discrepancies within the data; this helped me to answer the research questions (Bogdan & Biklen, 2007; Creswell, 2012). According to Creswell (2014), the steps in analyzing and interpreting data are: (a) exploring and organizing the raw data collected, (b) organizing and transcribing the data from spoken words to text information to begin data analysis, (c) reading through the data to code and segment the data to make sense of the information gathered, (d) validating the accuracy of the information, (e) identifying codes that overlap in the research to develop themes, (f) utilizing the themes identified to answer research questions, and (g) interpreting the results to find meaning.

For this study, data were collected by participants through one-on-one interviews. Interviews were recorded using an audio recorder so that the data were documented accurately. Once interviews were completed, the raw data collected were organized and transcribed by hand into word documents. Creswell (2012) described transcription as the process of converting audiotape recordings into text data. During transcription, the audio recordings of each interview were played back numerous times to assist with correct documentation. I read transcripts multiple times and compared each typed document to the audio recording it was created from. According to Creswell hand analysis is recommended when a small database is used because it allows the researcher to track and locate text passages. Therefore, hand analysis was used for the study.

All interview data collected from each interview were kept confidential in a password-required computer and were only used to answer the research questions that drive this study. Participant confidentiality was secured, as all participants were assigned pseudonyms to protect their identities.

According to Creswell (2014) in a qualitative study the researcher acts as the vital instrument for collecting data and in interpreting data, remaining focused on learning the meaning that participants hold about the identified research problem. In a qualitative study, data analysis and data collection are done simultaneously (Creswell, 2014). Therefore, during the data collection process, I also began data analysis by making notations in the margin of each transcript. Notes were taken during each interview and included the assigned pseudonym as an organizing tactic.

By thoroughly reviewing the 84 pages of interview transcripts numerous times, I was able to gain an in-depth sense and understanding. Once the interviews were transcribed, the data were coded by common words, patterns, and categories of information, those codes were then developed into themes (Creswell, 2014). To confirm the validity and accuracy of the data collected, I utilized the member checking process, which provided participants with the opportunity to review and verify the initial findings.

Research Accuracy and Credibility

My goal as the researcher was to make sure all data collected and findings from the data are dependable, credible, and transferable. Dependability was achieved through recording each one-on-one interview. Credibility was achieved through member checking. Transferability was achieved though presenting data in a rich, thick, and detailed description of the setting, participants, and findings.

Lodico et al. (2010) argued that dependability refers to whether the procedures and process used to collect and interpret data can be checked. Lodico et al. stated that dependability could be achieved through the use of an audio recorder during interviews. Therefore, to ensure dependability, each interview was recorded using an audio recorder, and each recording was used to generate each interview transcript. In addition to recording and transcribing each interview, member checking was conducted to check for credibility.

Creswell (2014) stated that member checking provides an opportunity for participants to review specific descriptions, the final report, or themes to determine if the participants feel that they are accurate. All participants were sent the themes via e-mail and invited to participate in a post-interview to discuss any feedback from all participants about the findings of the interviews to make sure that they were accurate, unbiased, and thorough (Creswell, 2014; Kornbluh, 2015; Merriam & Tisdell, 2016). According to Creswell and Merriam and Tisdell (2016), good qualitative research study contains researcher comments about how their interpretation of the findings are shaped, including assumption and dispositions. Researcher comments were discussed during post interview sessions. Confirmability was also determined by the coding process that I used during analysis and by the comparisons made of the data collected from the participants in the interview sessions. To clarify researcher bias, I created an open-ended narrative about how the interpretations of the findings were developed. A discrepant case analysis was also conducted to ensure that I identified any outlier data that were collected.

To ensure the transferability of findings, I presented thick, rich, and detailed descriptions of the setting and participants as well as the findings from the data. I also provided rich, thick details when conveying the results to assist the reader in better understanding the findings (Creswell, 2014; Merriam & Tisdell, 2016). Confirmability is a criterion of trustworthiness which verifies that the research findings are based on the data collected from the participants and are not derived from the biases of the researcher (Yilmaz, 2013). Lastly confirmability was determined.

Coding Process

According to Creswell (2014), coding is the process of organizing the data gathered into chunks of text and then assigning a word or phrase to the segment to develop a general sense of the information. Coding is an inductive process of data analysis that is necessary to examine the many small pieces of information collected and then abstracting a connection between them (Lodico et al., 2010). To ensure that this process was done correctly, I read each transcript multiple times and then designated codes that aligned with each research question posed. In each transcript, I looked for words and phrases that aligned to particular research questions. As an organization tactic, each research question was assigned a different highlighter color. Words or segments related to each research question posed were identified using the highlighter color previously assigned to the research question. I completed the coding process by hand. I went through each transcript and highlighted words or phrases related to the research questions and wrote various codes in the margins of each transcript. Each transcript was read and re-read to ensure that no information was missed or coded incorrectly. I went back through the identified topics several times and abbreviated them as codes to see if new categories and would emerge (Creswell, 2014; Hennink, Kaiser, & Marconi, 2017). No new codes emerged. Transcripts were cut and then sectioned off by each research question to better organize the data collected and to begin to develop themes.

Lodico et al.(2010) stated that a theme is the combination of several codes that describe the big idea and explains the learned information from the study. Creswell (2012) stated developing themes consists of answering the research questions forming an in-depth understanding of the central phenomenon. Therefore, I took the highlighted words, phrases, and segments for each research question that was continuously used and organized them into subthemes and then into themes. Member checks were conducted to ensure personal bias did not influence the data portrayed (Lodico et al., 2010).

Discrepant Cases

Patton (2015) described a discrepant case analysis as a component of the research that determines if the data gathered contradicts patterns or themes that emerged from the data analysis. Therefore, during the data analysis, I looked for evidence of discrepant cases. Merriam and Tisdell (2016) stated that discrepant cases are data that challenge or disconfirm expectations or emerging findings During this process, I compared patterns found in the data by reviewing and analyzing the identified themes to less prevalent statements and perceptions of participants to ensure data saturation (Merriam & Tisdell, 2016). I also went back and reviewed each transcript to intentionally find data that did not align with the emerging themes or patterns. During this examination, no alternative themes or patterns were found.

Findings

The problem that prompted the study was that rural elementary mathematics teachers and administrators of Grades 3-6 struggled to improve student mathematics performance despite the program changes made by administrators. The purpose of this study was to investigate the perceptions of rural elementary administrators and mathematics teachers' in Grades 3-6 regarding instructional resources, strategies used to teach mathematics, and professional development for teaching mathematics All participants were assigned a pseudonym and were referred to by the assigned pseudonym in all interview documentation to protect participant identities, views, thoughts, and perceptions. Based on careful analysis of the data collected, the participants believed that they were using a variety of strategies and resources made available to engage students, but they claimed that insufficient resources limit teacher options for instructional strategies. Participant data also revealed that participants believed professional development specifically related to mathematics instruction, such as mathematics centered professional development, STEM-related workshops, and technology must be provided regularly. Lastly, all participants believed that more professional development about mathematics could provide necessary instructional support.

In this section, all data collected was reported and discussed. The following themes were derived from one-on-one participant interview sessions. The two themes that evolved from the data collected were the following: (a) rural elementary mathematics teachers employ a variety of strategies and resources to engage students, but insufficient resources limit teacher options for instructional strategies, and (b) professional development that is specific to mathematics instruction needs to be provided regularly. The themes mentioned were derived from coding the collected data. Based on analysis of all data collected, categories of the data were discovered; from those categories, themes emerged which aligned with both research questions (see Table 2)

Table 2

Perceptions of Rural Elementary Administrators and Mathematics Teachers 3-6- Themes

Research Questions	Categories of Data	Themes
RQ1: What are rural elementary administrator and teacher perceptions about instructional resources and strategies used to teach mathematics?	**Resources:** • Technology-based tools • Teacher-made resources • Manipulatives • STEM instructional materials and lesson plans **Strategies:** • Small group instruction • Explicit instruction • Scaffolding	Elementary mathematics teachers employ a variety of strategies and resources to engage students, but insufficient resources limit teacher options for instructional strategies.
RQ2: What are rural elementary school administrator and teacher perceptions about professional development to improve mathematics instructional delivery?	**Professional Development**: • Math-centered PD • STEM-related workshops • Technology programs for mathematics	Professional development that is specific to mathematics instruction needs to be provided regularly.

Theme 1: Insufficient Resources Limit Teacher Options

Elementary mathematics teachers employ a variety of strategies and resources to engage students, but insufficient resources limit teacher options for instructional strategies. The data from which the first theme were derived showed that rural elementary mathematics teachers employ a variety of strategies and resources to engage students, but insufficient resources limit teacher instructional strategies. This theme was identified from the categories, resources and strategies. Resources that were identified by participants were: (a) technology-based tools, (b) teacher-made resources, (c) manipulatives and, (d) STEM instructional materials and lesson plans. Strategies that were mentioned were (a) small group instruction, (b) explicit instruction, and (c) scaffolding.

Rural elementary administrators and teachers in Grades 3-6 believed that insufficient resources limit teacher options for instructional strategies. I asked the study participants, What primary instructional resources and supports do teachers currently use when teaching mathematics? Participants shared that instructional resources are not consistent in Grades 3-6 and that teachers use resources they find online to teach state standards. Participants also shared that a significant amount of teacher time is lost searching for resources because teachers have the responsibility of locating resources to teach mathematics standards. Participant 4 stated:

> We have an incomplete set of older materials…, a hodgepodge of stuff that is outdated. If I need something related to what I am teaching, I have to go and

> create a makeshift version of the real thing so that the kids can use them to get the concept, which is time-consuming.

Similarly, Participant 7 stated, “I use hands-on resources that I find online that will help to teach the students the standards… nothing, in particular, it is whatever I can find to assist with teaching the standard.” Participants mentioned that the rural elementary school is in the process of purchasing digital and hardback versions of new textbooks. The school has only digital copies of textbooks, which are accessible through computer and internet access. Participants stated that because every student does not have daily accessibility to a laptop, many of the technology-based instructional resources are not regularly accessible. Participant 7 stated:

> Twenty years ago, when I started teaching, everything was book-based… you had the resources right there in front of you. Every child had a book. I understand that technology is the new wave, but it is not helpful if the kids don’t have access daily.

Participant 8 stated, “The best free instructional resources are those that teachers have found or purchased online from websites like Teachers-Pay-Teachers to help the students grasp content.“ Participant 1agreed:

> Technology resources, like games or drills that are found by classroom teachers, have proven to be the most useful instructional resources we have to teach the math standards. Still, they are only valuable when technology is available, which is not daily. Laptops are an invaluable instructional resource for mathematics teachers…the students can easily access online programs found.

Participant 2 stated, "While laptops are available, they are shared among two or three classrooms…and are not readily available when needed." Participant 7 said, "The problem with the laptops is accessibility, I cannot be consistent with laptops or doing more things with the laptops because of the limitations set with sharing the devices with other classes…every child needs a device." Participant 12 agreed, "For students to use the resources we find online, they have to have access to their device." Participant 3 stated, "We are the largest school in the district and the only school that does not have adequate laptop access for all students." According to Participant 11, there are a limited number of laptops on the elementary campus and the administrative team decided that an alternative to not having enough laptops would be to allow students to bring in personal devices, such as cell phones, tablets, or personal computers to school to use as an instructional tool. Participant 7 mentioned that, this was not a substantial change because many students do not have phones or technological devices. Participant 3 also mentioned that students are sometimes allowed to bring in cell phones to use as an instructional device, but due to the socioeconomic status of most students, purchasing other devices for school use is not possible. Participant 8 stated:

> I would like to have more technology tools and technology integrated resources; we are still using teacher-made manipulatives that are time-consuming and do not always keep the students engaged as technology does. When students are engaged, they are more inclined to learn the skills presented regardless of the difficulty associated with the algorithm.

Participant 7 stated, “More technology resources are needed because most free resources that are not teacher-made require consistent access to the internet and computer.”

The next question I asked was, “When teaching students mathematics, what type of instructional resources such as technology or manipulatives do students prefer most?” In each interview, all participants stated that students enjoy using technology more than manipulatives but saw the value in having and using both. Participant 2 said, “Eighty-five percent of students would prefer to use technology. However, I think that it is important to teach in different ways so that they can complete various tasks when technology isn’t available.” Participant 5 agreed and stated, “When teaching mathematics, I think that it is important for students to learn using both technology and old school manipulatives like blocks, fraction tiles, pull-a-part diagrams, and even sometimes non-traditional objects.” Participant 6 stated, “Students love hands-on activities, regardless if it is using a device or with traditional manipulatives such as blocks and charts.” Participant 7 said, “The problem is not choosing between technology or manipulatives... it is that we don’t have enough technology resources or an adequate number of go-to traditional manipulatives.” Participant 3 stated, “To make sure that students are engaged and learning without technology currently requires an exponential amount of time on weekends and during planning time creating manipulatives.” Participant 1 mentioned that aside from there not being enough technology or traditional manipulatives, the mathematics academic rigor is not enough. Participant 1 stated, “I have received several complaints that the current program that we have is not rigorous enough and that it does not align fully with the standards." Participant 2 mentioned that they are in the process of purchasing new curriculum.

Participants mentioned that they are an Alabama Math, Science, and Technology Initiative (AMSTI) school. AMSTI is a partially developed curriculum that is free to all teachers who go through AMSTI training. Participant 1 mentioned that ASMTI includes several manipulatives that allow students to touch, see, and feel. Participant 3 stated:

> Our core curriculum K-5 is investigations mathematics …AMSTI. Like any new program when you dive in and holes and weaknesses within the program. If you continue to use a program that you know is not solid, deficits grow. After a while, teachers noticed that AMSTI investigations wasn't enough and started to design their curriculum, tests, and find free technology resources to teach the standards. The AMSTI kits we use come with manipulatives related to science… and very few mathematics manipulatives.

Similarly, Participant 2 stated, "We are an AMSTI school…we use AMSTI mathematics manipulatives… but they are all outdated, so we have to be very creative when we are using AMSTI to teach the current standards." Participant 10 stated, "We lean on AMSTI quite a bit, but it isn't enough rigor in AMSTI to adequately teach the standards." Participant 12 stated:

> We have great teachers, but there is no continuity in our instructional resources or practices. We do not have a solid curriculum that has the rigor our kids need. It has been a continuous uphill battle for years.

Participant 10 and Participant 11 mentioned that the school would be phasing in Eureka Mathematics this year and that not all grade levels would have access to it until the later part of next summer. Participant 9 stated, "The new math program is going to be a great addition…however, it is not going to be a fix-all. Teachers have to have the resources they need to be successful." Participant 4 mentioned that the new Eureka mathematics program would include very valuable consumable workbooks and hands-on manipulates that are going to save a lot of teachers' valuable time. Participant 4 stated:

> For the past ten years, my weekends are consumed with building student's manipulative kits to make sure that I had what I needed to teach my kids. While I am excited about the new curriculum, I am an advocate for STEM education.

Participants interviewed mentioned STEM education and the need to incorporate STEM practices and lesson plans to increase student interest and performance in mathematics. Participant 11 stated, "We need STEM resources so that we can expose our students to STEM. It will help students to understand mathematics principles on a deeper level." Participant 8 stated that "STEM would allow the students to work cooperatively in groups …using manipulatives to work independently and force them to learn how to problem-solve." Similarly, Participant 4 stated:

> I wish we had a complete STEM program… it would allow teachers to integrate mathematics concepts across all disciplines, which would increase our student mathematics ability and attentiveness in mathematics. STEM is the new wave of the future… we are already behind.

Participant 1 mentioned that while teacher resources are limited, teachers who have gone the extra mile to teach STEM have seen gains in student data. Participant 1 stated:

> STEM-based learning is going to be the key. Teachers have expressed that STEM-based resources have helped their students learn how to decompose numbers, add, subtract, and effectively create representations of complex algorithms.

According to Participant 6, mathematics education has not been the school focus for years, and STEM could bridge the gap between the two subjects. Participant 6 stated:

> Reading has been the focus. If all mathematics teachers had a solid text curriculum, more technology, strategy guides related to standards that incorporated STEM and professional development specifically related to mathematics. I am confident that our students' mathematical reasoning and processing would increase…we have got to start teaching mathematics across the disciplines.

Participant 5 brought up an interesting perspective. Participant 5 stated, "As teachers, we always spend the bulk of our time focused on the students who are behind and never really provide enrichment to the students ready to move forward, STEM instructional resources would help with this." In likeness, Participant 12 stated, "We are failing students who are truly interested in math because we stifle their abilities and focus on the students who are behind; it is not fair. STEM instructional resources would provide those students with mathematical rigor." Participant 11 similarly stated:

> We need STEM resources, true STEM instructional resources so that we can serve all students. We do a disservice to the kids that understand by giving them worksheets or free time instead of making them dig deeper into the standard; STEM resources would provide this opportunity because of the application and critical thinking skills it requires.

Participant 5 stated, “Many times, I feel like we hold the smarter kids back because they already understand the grade-level content, and it is not fair, but it is how it goes.” Participant 1 stated, “STEM-based resources and practices like teaching across the curriculum and utilizing academic vocabulary…will assist with our struggles in math.” Participant 12 stated:

> Mathematics, for the last10 years, I know has been on an island, and reading has been the focus. If we had STEM instructional resources and materials, that would change. The foundation of cross-curricular integration that STEM provides will bridge the gap and help our students better understand math concepts.

While participants believe that STEM instructional resources and materials would be beneficial, participants also believe that a variety of instructional strategies to teach the diverse population of students in their classes is needed to assist teaching students.

The next question asked was, “Describe an ideal mathematics lesson and the classroom setting to support it.” Participants stated that the primary instructional model the school currently uses 3-6 in mathematics is Response to Instruction or RTI (Alabama State Department of Education, 2019). This instructional framework is referred to as RTI. RTI is a three-tiered instructional model that is intended to provide students the support needed to grasp standard related content by providing whole group instruction and after that, two tiers of small group instruction. Tier 2 is delivered in a small group and is on grade-level targeted skill-specific instruction (Alabama State Department of Education, 2019). Tier 3 refers to off-grade-level intensive instruction specific to the to the learners off-grade level deficits (Alabama State Department of Education, 2019). Participant 5 stated:

> We are required to use RTI. It is not a realistic solution with 28 students. RTI requires all students to go through at least one round of small group instruction. We have limited technology, and it isn't a feasible solution. We have a melting pot of learners. I have students who are two or three grade levels behind. I have students who can break down college algebra.

In agreement, Participant 12 stated, "The only thing that is offered as a solution to math was to use RTI, which was a turnaround training conducted by our reading coach. We need math strategies." Participant 11 stated:

> If we are ever going to see the strides, we need in mathematics education, we need content-specific instructional strategies that work and someone to consistently helps us learn and implement more strategies. I do believe that RTI is a great model to follow, but there has to be more.

Participant 4 stated, "Mathematics teachers need support…for students to learn effectively, teachers need to know and receive training in instructional strategies that work in math." Participant 6 stated:

> RTI is a great guide but, I think that as a teacher, I need a curriculum guide that provides different strategies for math that I can use with a variety of students …small group and scaffolding instruction is great, but there has to be more.

Participant 2 stated, "I see that math teachers need a continuous math instructional support system… more strategies and resources to push instruction into 21st-century learning." Correspondingly Participant 12 stated, "If teachers aren't strategically teaching, not only is valuable instructional time inadequately being used but students are not reaching their maximum academic potential." In agreeance, Participant, 11 stated, "Mathematics in itself is about learning the basics and then strategizing to get an answer, teaching math is no different we need proven math strategies and training to help our kids." Participant 6 mentioned that the school system may not know how to address the deficit in mathematics due to the focus on reading over the last several years. Participant 6 stated, "I really don't think they know how to help with math because our school system has been focused on reading for the last 5 years." Participant 10 stated, "In order to address the deficit in math, teachers need to be trained, trained on math instructional procedures that work." In addition, Participant 8 stated:

> Math teachers need training that is specific to math content… and specific to a student's mathematical needs. If our goal is to prepare students in math… it is time that we step our game up with instructional practices and with teacher guidance.

Participant 6 stated:

We need a consistent professional development community and time to meet with each other for longer than 30 minutes. We need a strategy guide and regular training so that we, as teachers, can quickly address difficulty when teaching mathematics. I need 21st-century academic support."

Theme 2: Professional Development Needed

Participants believe that professional development that is specific to mathematics instruction needs to be provided regularly. The data from which the second theme was derived showed that rural elementary mathematics teachers and administrators believe that there is a need for professional development that is specific to mathematics instruction. This theme identified a need for professional development. Professional development opportunities identified by participants were (a) mathematics centered professional development, (b) STEM-related workshops, and (c) technology programs for mathematics.

Participants were asked questions related to the professional development program the school has in place to improve mathematics instructional delivery. Participants mentioned that there is not a consistent professional development program to support mathematics instruction. Participants also said that they had not attended many professional learning seminars that were explicitly related to mathematics or that they believed to be useful to mathematics instruction. According to participants, professional development provided is related to Google software, reading, or a general overview of classroom management strategies.

Participant 1 stated, “To be completely honest, I have not had any professional development recently that was specifically related to mathematics. Technology training and reading training are what has been provided system-wide.” Participant 2 stated, “There is no professional development program that supports mathematics instruction specifically expect the monthly meetings where teachers are shown how to break down student data.” Participant 2 mentioned that the lead mathematics teachers are relied on heavily to find resources and current instructional procedures to use in their mathematics classes. Participant 12 mentioned that lead mathematics teachers are responsible for training the other mathematics teachers within their grade band on resources they have found to be useful. Participant 3 stated, “Reading has a very content-specific professional development plan. Math, on the other hand, we rely on lead teachers to find new instructional resources. As a group, we plan vertically at least a couple of times a year to look at standards.” Participant 4 stated:

> If we had a solid professional learning community that solely focused on math and math strategies that could be used. I know that we would see a drastic change in the way our students grasp mathematical concepts. In an effort to keep up with educational trends and to adequately teach or students we have to receive PD.

Similarly, Participant 5 stated, “We need a solid professional development program for teachers that focuses on 21st-century strategies and resources that can help teachers and kids on every level…of math.” Participants 5 and 1 mentioned that only lead teachers attend all off-site professional development due to financial limitations. Participants 12 and 11 mentioned that all teachers needed to receive continuous math professional development as it would create brainstorming and mathematics instructional conversations amongst peers. Participants 7 and 8 mentioned that there was no professional development related to mathematics over the last 3 years. Participant 9 stated, “The only mathematics professional development I can think of is when we as a math department with the middle school, high school, and elementary school…got together to see if we could do some unofficial vertical alignment during the weekend.” Participant 10 stated, “The most beneficial professional development we have participated in is with one another unofficially on weekends where we share what works and what doesn’t work to teach standards.” Participant 11 stated, “How can we be expected as teachers to continue to help kids move forward if we do not have the professional development we need to improve.” Participants mentioned that they would like to have a professional development program that is specifically related to mathematics content, strategies, and cross-curricular instructional methods such as STEM. Participant 12 stated, “I think that all teachers need to receive some STEM professional development, it seems to be bridging the gap between content areas in elementary schools.” Participant 1 mentioned that all classes in Grades 3-6 are departmentalized. Participant 2 mentioned that departmentalizing the elementary school was intended to get student ready for middle school and to ensure that students were taught every content area. Participant 11 stated, “Departmentalized does not mean that you are careless about other subjects and I think it has been taken that way. If we shift our focus to STEM and learn the implementation strategies of STEM, it could help all teachers.” Participant 8 stated:

> I think that all teachers regardless of content area need to sit at the table and discuss STEM. Although we are departmentalized, we are connected by a common group of kids that we all teach or have taught. I think STEM professional development is the way to go because it offers researched based rationale and cross-curricular learning which would help all students and teacher in every content area.

Participant 5 stated, “I would love to have PD on cross-curricular intervention strategies and STEM.” Similarly, Participant 2 said, “STEM professional learning and STEM integration would provide a more formalized to teaching teacher how to teach mathematics to students who have different learning styles and ability levels continuously across content areas by modeling and creating experiences.” Participant 1 stated, “STEM learning and professional development would bring back the hands-on aspect of elementary school and reinforce skills taught in all content areas.” Participant 10 said,

> Our school is so large that there are not enough opportunities for teachers to discuss and plan vertically and across content areas. I think STEM PD would show teachers how cross-curricular learning can increase our students’ academic abilities across the board.

Participant 9 stated, “STEM would be of great benefit, but to make it work we need someone to come and show us how to make it work in our classroom, we need the PD.”

Participants mentioned that in addition to STEM professional development, they needed professional development on technology programs that explicitly related to mathematics. According to Participant 12, “We as teachers spend an unsurpassed amount of time trying to find online resources that will help our students in math.” Participant 11 stated, “I think that it would be beneficial to have technology resources related to mathematics on-hand, programs that all mathematics teachers use to help students.” Participant 5 stated, “We need relevant math technology resources the students can use during school and with parents to practice skills.” Participant 6 said, “We need the math technology resources, but we also need math technology training so that we know how to use the resources provided effectively.” Participants mentioned that they did receive new classroom technology, such as interactive panel boards, a teacher computer, and digital projectors, but have not received training on how the technology can be used to teach student mathematics.

Discussion of the Findings

In this section, the following themes were discussed in connection to the data of the study and the literature: (a) elementary mathematics teachers employ a variety of strategies and resources to engage students, but insufficient resources limit teacher options for instructional strategies, and (b) professional development that is specific to mathematics instruction needs to be provided regularly.

Theme 1. The first theme revealed that elementary teachers believed that they employed variety of strategies and resources to engage students but believed that insufficient resources limited teacher options for instructional strategies. Participants identified small groups and explicit instruction as the strategies used to teach mathematics. Research literature demonstrated that small group and explicit instruction are useful strategies to assist student learning but are more successful when interchanged or combined with other instructional resources and strategies related to mathematics (Doabler et al., 2019; Tabach & Schwarz, 2018). According to Polly (2015), student achievement is empirically linked to the instructional resources and strategies teachers utilize during instruction. Participants believed that they had insufficient resources such as manipulatives, STEM-based instructional materials-lesson plans, and technology-based tools, which limited the instructional options for teachers. Research studies have stated that adequate instructional resources and strategies provide essential and effective teaching support and practices for teachers and students (Huang, 2016; Polly, 2015; Yaghmour, 2016). Participants believed that if they were provided adequate instructional resource options and opportunities to utilize more instructional strategies would increase. Yaghmour (2016) explained that there is a significant increase in student performance and student engagement when there is a consistent use of blended learning resources that incorporate technology and manipulatives related to the targeted objectives. Participants believed that STEM-based instructional materials and lesson plans would be fundamental incorporating different resources to improve student understanding of the standards during instruction. According to Hudson et al. (2015), STEM instructional materials and lessons would directly improve students' knowledge, ability, understanding of mathematics.

Theme 2. The second theme revealed that participants believed that professional development specific to the mathematics needed to be provided regularly. According to Polly (2015), consistent and content specific mathematics professional development for teachers is an essential component to ensuring mathematics education teachers are prepared to teach the cognitively demanding tasks of mathematics in the 21st-century classroom. Participants believed that in addition to mathematics specific professional development, STEM-related workshops were needed and would provide cross-curricular instruction, learning opportunities, and increase student academic performance. According to Shernoff et al. (2017), integrated approaches such as STEM provide opportunities for students to actively engage and form interdisciplinary connections with a deeper understanding of academic standards. Capraro et al. (2016) stated that a sustained STEM-oriented professional learning community would substantially provide the support needed for teachers so that teachers could provide high-quality mathematics instruction. Lastly, participants believed that technology programs specifically related to mathematics were a necessity. Brasiel et al. (2016) explained that mathematics educational technology and professional learning on mathematics technology has the potential to not only facilitate improved mathematics learning outcomes, but they act as a supplemental instructional tool for student differentiation to improve student academic performance.

The conceptual framework for this study was the concept of explicit instruction, designed by Archer and Hughes. Archer and Hughes (2011) argued that explicit instructional practice was the most effective instructional approach for all students, as it provided consistent support that gradually guided students through the learning process. The concept of explicit instruction states that all students, regardless of academic ability, can learn difficult information when provided instructional scaffolds in logical sequencing followed by manageable sections of educational material (Archer & Hughes, 2011). This framework highlighted the significance of teacher instructional practices and supported to assist the local educational organization with the identified problem. Moreover, this conceptual framework supported the need to equip teachers with information regarding research-based instructional strategies focused on explicit and intentional mathematics instruction accompanied by a professional development program that would provide regular mathematics instructional support.

The two themes showed that teachers believed in the importance of instructional resources and strategies to teach mathematics and that they wanted a professional development program that would provide regular support to mathematics instruction to expand options for instructional strategies. Participants discussed that they used scaffolding, explicit instruction, and small group instruction to teach mathematics. Participants believed that with improved resources such as technology-based tools, manipulatives, and STEM instructional materials-lesson plans, options for instructional strategies would improve. Participants expressed the need for professional development that is specific to mathematics instruction. The types of professional development participants mentioned were focused on mathematics, STEM-related workshops, and technology programs for mathematics.

Conclusion

In obtaining the perceptions of rural elementary administrators and mathematics teachers in Grades 3-6 regarding instructional resources, strategies used to teach mathematics, and professional development for teaching mathematics, I addressed the two research questions for the study. The research questions addressed rural administrators and mathematics teachers in Grades 3-6 perceptions about instructional resources used to teach mathematics and their perceptions about professional development to improve mathematics instructional delivery.

> RQ1: What are rural elementary administrators and teachers' perceptions about instructional resources and strategies used to teach mathematics?

Theme 1 indicated that elementary mathematics teachers employ a variety of strategies and resources to engage students, but insufficient resources limit teacher options for instructional strategies. Participants shared the strategies used to teach mathematics and believed that with more instructional resource options, options for instructional strategies would improve.

> RQ2: What are rural elementary school administrator and teacher perceptions about professional development to improve mathematics instructional delivery?

Theme 2 indicated that teachers recognized the need for a regularly scheduled professional development program that was specific to mathematics instruction. Participants indicated that they believed mathematics centered professional development, STEM-related workshops, and professional development on mathematics technology programs would improve mathematics instructional delivery.

Based on the findings, rural administrators and mathematics teachers in Grades 3-6 need instructional resources to teach mathematics and mathematics professional development that is provided regularly. I propose that a mathematics professional development program be developed and that the program provides teachers with mathematics instructional resources and instructional strategies to improve mathematics instruction. In Section 3, I will utilize the information from the findings to provide a project that will offer mathematics instructional resources and professional development to rural administrators and mathematics teachers in Grades 3-6.

Section 3: The Project

Introduction

The project I developed consisted of a 3-day professional development training to address the following two themes identified from the study: (a) elementary mathematics teachers employ a variety of strategies and resources to engage students; however, insufficient resources limit teacher options for instructional strategies and (b) professional development that is specific to mathematics instruction needed to be provided regularly. The 3-day professional development training will directly address participants' need for professional development related to mathematics instruction. The 3-day professional development training will also address the first theme because mathematics instructional resources and strategies related to explicit instruction, technology, and STEM will be embedded over the course of the training seminar. The professional development seminar will also provide teachers with a self-made strategy guidebook that includes strategies and resources for teaching mathematics common core standards specific to their grade level.

The purpose of this study was to investigate the perceptions of elementary mathematics teachers in Grades 3-6 and administrators regarding instructional resources, strategies used to teach mathematics, and professional development for teaching mathematics. Through data collection, I captured these perceptions and the emergent themes revealed rural educator perspectives about mathematics instructional resources, strategies used to teach mathematics, and professional development for teaching mathematics. The two emergent themes indicated that participants needed professional development that focused on mathematics, including instructional resources and strategies to teach mathematics.

In this section, I discuss the project that was developed to offer mathematics instructional resources and strategies through a 3-day professional development training that will be provided to rural administrators and mathematics teachers in Grades 3–6 to improve teacher instruction. I present a project description, the objectives of the project, rationale, implementation, potential barriers and resources, and existing supports to assist teachers. To develop a rich understanding of the themes identified in this study, I conducted a second review of the literature to support the content of the project and themes. This section concludes with an evaluation of the project and a summary of possible social change implications.

Project Description and Goals

The project I developed is a 3-day professional development training for mathematics teachers in Grades 3-6 who want to enhance their knowledge about instructional resources and strategies used to teach mathematics. The project was created from the identified themes, which revealed that participants (a) believed that they employed a variety of approaches and resources to engage students but that insufficient resources limited teacher options for instructional strategies and (b) believed that professional development specific to the mathematics needed to be provided regularly. The primary goal of this project is to provide knowledge about mathematics instructional resources and strategies used to teach mathematics. The secondary goal is to provide teachers with a guidebook that includes content and grade-level-specific instructional guides that can be used regularly to improve teacher mathematics instruction. As a result of participation in the 3-day professional development training, it is anticipated that teacher instruction will be enhanced and include research-based practices. Before attending the training, teachers will be asked to bring a laptop computer or Internet-capable device.

On Day 1 of the professional development (PD), I will present an overview of the 3-day PD schedule. All teachers in Grades 3–6 will be grouped and assigned to tables. Seating at each table will be randomized. Once all participants are seated, the training will begin with the introduction of the speaker, welcome, and overview of 3-day professional development training. Teachers then participate in an icebreaker activity. During the icebreaker, teachers will develop student-friendly statements derived from one or more common core mathematics standards. Teachers will have to identify: (a) what grade level the standard is from, (b) what mathematics content would the standard be categorized, and (c) determine what prerequisite skills are needed. As a culminating activity to the icebreaker, teachers will participate in a technology game-based activity where they will be required to answer various questions related to common core mathematics. Once all responses are submitted the correct answers will be shown. After the time has elapsed, randomly selected participants from two or more groups will be chosen to share how the activity they participated in can be integrated into an elementary mathematics classroom. Once ideas are shared, teachers will participate in a brief preassessment on their knowledge of common core, instructional strategies, and resources to teach mathematics. After the assessment, I will present research-based information on understanding common core mathematics and student mathematical practices. During the presentation, teachers will be provided research about approaches that can be used to assist the students with understanding mathematical content and strategies that can be used to teach mathematics. After the presentation, participants will be provided with a copy of the common core standards for their grade level. Here teachers will work collectively by table and grade level to discuss and decompose mathematics content standards for their grade level using the graphic organizer provided (see Appendix A). Participants will be guided on collectively identifying: (a) the common core standards, (b) prerequisite skills needed, (b) academic vocabulary, (c) formative assessment, and (d) student mathematical practices (see Appendix A). The materials that will be provided for this activity are binders, sharpies, index cards, copies of graphic organizers, scissors, multi-colored highlighters, post-it notes, and sheet protectors. After the activity, teachers will be instructed to choose a binder to organize and store all materials. This binder will be used throughout the training and will be identified as a strategy binder. The training session for Day 1 will conclude by teachers completing an exit ticket.

On the second day of professional development, teachers will sign in and report back to their groups from Day 1. Once seated, participants will complete a brief review of the information presented on Day 1. Once this review is over, teachers will be instructed to begin the icebreaker activity. The icebreaker assignment will be to design an in-class activity for the third common core standard of their grade level as a group. Each group will be allowed to use their toolkits and will be provided charting paper to design, describe, and explain their activity. Each group will also be provided a copy of the course of study. The activities that are developed must incorporate the components identified in the graphic organizer used on Day 1. The identified elements are the: (a) common core standard used, (b) prerequisite skills, (c) academic vocabulary, (d) formative assessment, and (e) student mathematical practices. Teachers will be encouraged to use the strategy guidebooks created on Day 1. A timer will be set for 10 minutes, and once this amount of time has elapsed, randomly selected groups will be chosen using equity sticks to present. Once all groups present, participants will be instructed to individually vote on the activity they believe to be the best.

Then, I will provide teachers with research-based information on mathematics instructional approaches and strategies. During my presentation, teachers will engage in several hands-on activities and add instructional activities and procedures to their strategy binders together in groups. These additions will include cross-curricular learning activities, STEM components, and specific, measureable, appropriate, realistic, and timely (SMART) goal setting. As a culminating activity for Day 2, participant groups will create a video slide that explains the elements of a mathematics lesson using the information learned from Days 1 and 2.

On the third and final day of professional development, I will review all information covered from Days 1 and 2 with the group. I will also provide teacher participant groups extra time if needed to finish the culminating activity from Day 2. Selected videos will be viewed as a whole group. After watching these videos, I will present information regarding technological tools and software that can assist mathematics teachers in building mathematics-specific professional learning communities. After my presentation, teachers will be guided to add technology resources and hands-on projects to their strategy guidebooks.

By the end of the 3-day professional development, training participants will have increased knowledge about instructional approaches and strategies for teaching mathematics. Participants will also have a partially completed strategy guidebook that focuses on mathematics content standards, instructional strategies, plans, and technological tools that can be used to teach mathematics and continue professional mathematics learning. As a culminating activity, participants will complete the written evaluation of the training. All evaluations will be collected at the end of the training session for Day 3.

Rationale

The problem that prompted this study was that rural elementary mathematics teachers and administrator of Grades 3-6 at the study site struggled to improve student mathematics performance despite the program changes made by administrators. The findings from the study revealed that participants believed that (a) insufficient resources limited teacher options for instructional strategies and (b) professional development specific to the mathematics needed to be provided regularly. Therefore, I developed a 3-day professional development training to meet the needs identified by participants.

Kohen and Borko (2019) stated that the lack of content-specific and practice-based professional development programs heavily contribute to instructional deficits that can appear in student academic performance. Kohen and Borko suggested that a sustained, content-based professional development program is the best possible instructional support for mathematics teachers. Bowe and Gore (2017) stated that for professional development to make a corrective impact, it must address the needs of the audience and provide conventional approaches to teaching practices. The goals of the professional development training project will be to address the described participant needs that were revealed during the data collection through providing mathematics teachers with content specific (a) instructional practices for teaching mathematics, (b) knowledge of instructional approaches for teaching common core mathematics, and (c) information to enhance student achievement. The objectives of the professional development training sessions are to (a) improve instructional practices, (b) evoke more collaboration and support among mathematics teachers in Grades 3–6, and (c) create a sustainable positive professional learning community among teachers (see Bowe & Gore, 2017).

I created this project with the sole intention of addressing the participants' expressed needs to increase teacher knowledge of instructional resources and strategies to teach mathematics in Grades 3–6. Through participation in the professional development session, teachers will be provided with realistic approaches to address the needs they identified during the interview process. According to Martin, Polly, Mraz, and Algozzine (2019), mathematics professional development that is developed from the perspectives of educators who are currently in-practice is more likely to provide and promote fundamental constructs that will produce more effective teaching and improved mathematical knowledge.

My decision to select the genre of professional development was based on the identified themes of this study. Participants desired to have more options for instructional strategies and professional development that are specific to mathematics. To ensure that the project developed is beneficial to teachers, the themes derived from the findings of the study were used to create the project study (see Martin et al., 2019). The layout of each day of the 3-day professional development training incorporates realistic mathematical instructional approaches and includes a collaborative model that can be used to promote further teacher face-to-face planning and preparation related to mathematics instruction (see Kohen & Borko, 2019; Martin et al., 2019).

I designed the 3-day professional development seminar using a transformative model. The transformative model supports the idea that professional development delivered in a collaborative setting based on the needs of the audience is most likely to provide authentic teacher learning, which will foster improved teacher instruction and pedagogical application (Bonghanoy, Sagpang, Alejan, & Rellon, 2019).

The project developed is based on the data analysis derived from the one-on-one interviews. The data analysis highlighted the categories of the data and themes about the instructional resources, instructional strategies, and professional development used to teach mathematics. Each professional development session described supports mathematics teachers in Grades 3-6 and administrators regarding instructional resources, strategies used to teach mathematics, professional development for mathematics teachers, and resources that may improve instructional delivery of mathematics.

I created PowerPoint presentations for this study that will outline the learning objectives and outcomes of the 3-day professional development. The PowerPoint includes the icebreakers, probes for teacher discourse, group activities, classroom activities, and resources. The presentation was developed to assist teachers with instructional strategies and resources to teach mathematics in Grades 3-6. Over the 3-day training, each participant will be given a printed copy of all PowerPoint presentations, mathematics state standards, mathematics strategies, mathematics resources, and examples of mathematics activities that correlate with mathematics state standards. On Day 1, teachers will (a) be assessed on their knowledge of instructional strategies and resources for teaching mathematics, (b) participate in group activities focused on mathematics learning, activities, and strategies, (c) gain knowledge on understanding mathematics common core content standards, and (d) begin assembly of their strategy binder. On Day 2, teachers will (a) participate in group activities utilizing a variety of mathematics instructional approaches, (b) gain knowledge on mathematics instructional methods, and (c) add mathematics instructional strategies and approaches to state mathematics content standards in their strategy binder. On Day 3, teachers will (a) continue to develop their strategy guidebook in groups, (b) gain knowledge on resources that can be used to teach mathematics, and (c) add mathematics resources to their strategy guidebook. At the end of Day 3, teachers will leave with their individually created strategy binder equipped with (a) mathematics activities, (b) mathematics instructional strategies, and (c) instructional resources that align with the mathematics content they are responsible for teaching. Before exiting, the participants will complete an evaluation to assess the 3-day professional development.

Review of the Literature

In this literature review, I searched for and reviewed research studies that are aligned with instructional resources and strategies used to teach mathematics. To guide the literature review, I searched for peer review literature using the Walden University Library and Google Scholar. The databases used included Education Source, The Journal of Education, Education Research Complete, Math Education Journal, and SAGE Journal. When conducting the searches, the following words were used: *mathematics instructional strategies for teaching, common core mathematics, teacher learning and mathematics, technology applications for mathematics, best practices for teaching mathematics, mathematics, mathematical reasoning,* and *teaching mathematics.* The review of literature allowed me to explore my findings and helped me link the following themes with research topics:

- planning for teaching mathematics
- best practices and strategies for teaching mathematics
- technology application for teaching mathematics

In the following literature review, I present scholarly research that connects to the study themes and supports the professional development activities developed.

Planning for Teaching Mathematics

American public schools have been criticized for students' low achievement levels and significant achievement gaps in mathematics and the lack of rigor outlined in state educational standards (Lee & Wu, 2017). As a result, in 2015, common core standards were adopted by the majority of states in the United States with the central goal of deepening student understanding and to increase student critical thinking to generate students who will be prepared for college or careers (Common Core State Standards Initiative, 2020; Walker & Sherman, 2017). More specifically, the mathematics common core curriculum was intended to shift teacher instruction and students' knowledge from basic mathematical practices and understanding to a more complex curriculum. That could increase student mathematical reasoning and foster student utilization of mathematical communication (Common Core State Standards Initiative, 2020).

According to Lee and Wu (2017), the adoption of the uniform and rigorous standards was accomplished to better prepare American students for college and career readiness K-12. Boser and Brown (2016) added that one of the most identified characteristics of the common core adoption was the idea that students at the end of each grade level would be equally prepared for the next level of education just as students in other countries. Since the adoption of common core, researchers have examined the relationship between common core and student academic performance across American schools to identify if the implementation of common core standards in mathematics has improved students' academic achievement in mathematics (Lee &Wu, 2017). While perceptions of common core implementation vary, it is undeniable that researchers all agree that 21st century teacher instructional practices and procedures classrooms K-12 to be an obligation and essential element (Boser & Brown, 2016; Jiao & Lissitz, 2016; Lee & Wu, 2017).

According to Merritt, Palacios, Banse, Rimm-Kaufman, and Leis (2017), raising proficiency standards without properly training teachers is not sensible as teachers need current instructional skills that foster current mathematical practices. Merritt et al. and Lee (2016) described current mathematical practices as those that incorporate the use of mathematical communication, cross-curricular learning, and proactive planning. Without teacher training that addresses these instructional practices, a rigorous curriculum change like common core will prove to be an unproductive change that will lead to a further decline in student proficiency. In likeness, Santagata, Yeh, and Mercado (2018) argued that student achievement is only generated by prepared teachers who have a central goal of deepening the learning capability of students, who can combine content knowledge with differentiated instructional practices.

Ing et al., (2015) conducted a study that examined if implementing a variety of instructional approaches when teaching elementary common core mathematics would affect student achievement. The study was conducted in an ethnically and socioeconomically diversified school. Data from the study were collected for 6 months and involved 71 student and teacher participants and six classrooms. Before data collection, each teacher was required to attend a professional learning series that focused on (a) how to engage students in mathematically grounded discourse, (b) how to incorporate strategies that reach student of different learning styles and (c) how to break down common core mathematics standards to determine what students were expected to learn. After the professional learning sessions, teachers were observed randomly one or two times weekly to ensure implementation. The findings from the study revealed that teachers who consistently implemented the instructional approaches and strategies saw a significant increase in student academic achievement, attitudes toward mathematics, and student engagement in mathematics (Ing et al., 2015). The study also identified a significant link between student participation and student achievement, as students who were engaged in the lesson saw a more considerable increase in their summative assessments (Ing. et al., 2015).

In likeness, Myers, Swars, Smith, Smith, and Fuentes (2020) argue the lack of elementary teacher knowledge to teach mathematics with coherence, precision, and systematic instructional strategy are a result of the achievement decline and stagnancy of elementary mathematics students. Myers et al. continued in stating that this decline is no fault of the teachers but is a direct reflection of the generalist instructional approaches elementary teachers are provided. McDuffie et al. (2017) agreed and added that there is an increased need for teacher knowledge through content-specific training as it is the only way to give students a possible chance of achieving the objectives required by common core standards. When teachers are taught effective strategies and approaches that are specifically related to (a) mathematics common core standards, (b) best practices for teaching mathematics, and (c) engaging students in interdisciplinary mathematics activities; student proficiency in mathematic will increase (Ing et al., 2015; Lee, 2016; Myers et al., 2020).

Best Practices and Strategies for Teaching Mathematics

Prabawanto (2019) conducted a study using a quasi-experimental design to determine if mathematical communication had the potential to increase student mathematical ability. The study included 120 elementary level student participants. All participants took the same unit preassessment to test their mathematical communication skills before learning cycles and data collection. Once all participants were assessed, student participants were divided randomly into two groups. Both groups received mathematics instruction using common core mathematics standards. However, one group received instruction that incorporated intentional mathematical communication instructional practices. The results yielded from the study revealed that students who received mathematics instruction with embedded mathematical communication activities scored significantly higher on their postassessment.

Researchers defined mathematical communications as engaging in activities that involve writing or communicating with others about mathematics (Prabawanto, 2019; Suwangsih, Budiarti, Ruskandi, Hendawati, & Majid, 2019). The sole purpose of mathematical communication is to enable the students to understand mathematical processes on a deeper level and effectively make mathematically sound decisions (Prabawanto, 2019; Suwangsih, et al., 2019). According to Walker and Sherman (2017), for the original goal of common core mathematics to occur, students must possess a broad understanding of mathematical operations and mathematical reasoning of which are skills gained from mathematical communication. Kuennen and Beam (2020) and Richland, Begolli, Simms, Frausel, and Lyons (2016) argued that for students to understand mathematical operations and mathematical reasoning effectively, the students must be able to correctly utilize mathematical academic language and learn to communicate using the mathematics academic language learned. According to Patterson, Parrott, and Belnap (2020), effective teacher instructional practice is not only teaching students to solve a problem but teaching them to make mathematician-like decisions and explain those decisions using academic language verbally and in written form.

Mundia and Metussin (2018) and Patterson et al. (2020) argued further that mathematical communication is a multifaceted learning process and begins with mathematics teachers (a)gaining a broad understanding of common core mathematics standards, (b) frequently using of mathematics academic vocabulary, and (c) being well-trained in using mathematic instructional approaches that require students to exercise mathematics communication and critical thinking continuously. For instructors to gain an in-depth understanding of common core mathematics, they must be able to decompose standards according to the mathematical domains (Common Core State Standards Initiative, 2020). As stated in Common Core State Standards Initiative (2020), the mathematical domains are (a) identifying prerequisite skills needed for new skill mastery, (b) implementing research-based instructional strategies to differentiate instruction as needed, and (c) cultivating mathematics-related student discourse (Common Core State Standards Initiative, 2020). In agreeance, Richland et al. (2016) argued that explicit pedagogical practices that involve the areas mentioned are essential components of effective mathematics instruction and student mathematics development and achievement. For students to be most successful in common core mathematics, mathematical communication must be a part of mathematics instruction (Patterson et al., 2020; Richland et al., 2016).

Kosko and Gao (2017) conducted a study that evaluated common core mathematics standards, student achievement, and mathematics. The findings from this study revealed that students who were taught by teachers who required the use of academic vocabulary and mathematical communication regularly in the classroom performed better on high stakes achievement assessments and were better able to communicate their mathematical reasoning upon request (Kosko & Gao, 2017). Kosko and Gao found that common core mathematics standards are not being taught to fidelity if mathematical communication and academic language are not utilized. They noted that over 70% of common core standards in K-12 programs require deep conceptual and abstract understanding. Powell, Driver, Roberts, and Fall (2017) agreed and stated that consistent use of academic vocabulary is imperative to student academic growth and proficient in mathematics. Powell et al. added that one overlooked component of teaching mathematics is identifying the necessary prerequisite skills of each standard taught to students. The researcher describes this component as a fundamental detail when in pursuit of student mathematics skill mastery. According to Bernander, Szyk, and Seaman (2020), effective mathematics instruction includes identifying what prerequisite skills that are needed to grasp new content.

Bernander et al. (2020) expounded further and argued that the likelihood of a student successfully achieving mastery of a new common core skill decreases by 80% if they do not have a real understanding of the skills that are required to understand newly introduced information. Bernander et al. argued further that teachers must fully understand the components of common core mathematics standards and be able to disassemble said standards into focus categories to better prepare and engage students in mathematic content. Researchers argued that to elicit student mathematics understanding and improve teacher instruction, teachers must be able to read and analyze common core mathematics standards and interpret those standards to students using instructional practices which incorporate multiple approaches conducive to student learning and engagement (Bartell, Wager, Edwards, Battery, Foote, & Spencer, 2017; Walker & Sherman, 2017). Blazer (2015) and Lynch et al. (2017) found that students learn more from mathematics teachers who have had content preparation and who can incorporate instructional approaches like STEM that foster communication, collaboration, and critical thinking.

Over the past decade, researchers have investigated how to improve student mathematics achievement in the elementary sector (Blazar, 2015; Courtney, 2018). Researchers have dually sought to identify classroom instructional practices that will continually support students' interest and continued growth in mathematics (Blazar, 2015; Courtney, 2018). According to Ring, Dare, Crotty and Roehrig (2017) STEM education is the most effective instructional strategy that has been shown to improve student achievement, proficiency, and interest in mathematics.

Ring et al. (2017) examined different instructional approaches to determine which instructional practices would provide teachers and students with continual, effective, and differentiated instructional approaches. The research was conducted in an urban and suburban area that involved 2,500 student participants and 48 teacher participants K-12. Teacher participants were trained on how to implement STEM practices such as hands-on and cross-curricular learning into their classes at a 3-day professional learning seminar. Once trained, teacher implementation began. Over 4 weeks, teachers were observed as they implemented STEM activities into their daily instructional practices. The data collected from the study revealed that students K-12 improved in their ability to understand difficult mathematical and scientific concepts. The result also provided statistically significant evidence that students who are involved in STEM activities also improve in non-STEM related content areas such as reading and English. In likeness, Peterson and Ackerman (2015) stated that cross-curricular instructional methods such as STEM is a powerful instructional approach to increase student achievement and is, even more, when classroom STEM activities and integrated teacher components are developed form content standards.

According to Toma and Greca (2018), STEM education is an educational approach that cohesively integrates science, technology, engineering, and mathematics by creating an educational environment that facilitates problem-solving to improve learning (Toma & Greca, 2018). Chiu, Price, and Ovrahim (2015) added that STEM is a problem-based instructional approach that enhances students' cognitive ability because it forces students to utilize peers and their creative genes to figure out solutions rather than relying on the classroom instructor knowledge. Chittum, Jones, Akalin, and Schram (2017) conducted a study to determine if STEM effectively improved student achievement in mathematics. The findings from the research revealed that students not only enhanced in mathematics but improved their academic performance in other disciplines. In likeness, Donegan-Ritter (2017) added that STEM education supports learning for all students regardless of identified or unidentified exceptionalities. Donegan-Ritter stated that STEM (a) provides students with opportunities to experience academic success amongst peers through communication, (b) fosters an environment that will capitalize students' interest, and (c) stimulates the use of academic discourse among students and teachers.

McFadden and Roehrig (2017) conducted a study with elementary and primary teachers to determine if STEM was a useful and practical instructional approach. The findings from the research revealed that teachers believed STEM integration to be one of the most effective instructional practices in the elementary sector (McFadden & Roehrig, 2017). Findings also revealed that teachers felt more confident with STEM after they received professional development that allowed content teachers to actively develop the STEM-related activities collectively (Chalmers, Carter, Cooper, & Nason, 2017; Herro, Hirsch, & Quigley, 2019; McFadden & Roehrig, 2017). Herro et al. (2019) stated that while STEM integration is a highly effective instructional approach, in order for it to most successful, teachers must actively participate in planning STEM activities. McFadden and Roehrig added that STEM activities are also a great way to differentiate instruction as STEM cross-curricular instructional lesson requires teachers to consider and incorporate multiple academic ability levels.

For teachers to be effective, they must be consistently aware of students' ability levels and make data-driven decisions that incorporate differentiated instruction and the implementation process (Park & Datnow, 2017). Faber, Glas, and Visscher (2018) defined differentiated instruction as leveled decision making that occurs during education that maximizes the opportunity for all students to learn. Faber et al. continued and stated that to best ensure that differentiated instruction is useful, it must be implemented by the teacher regularly, and the teacher must be proactive in planning and create S.M.A.R.T. goals. The acronym S.M.A.R.T. stands for specific, measurable, attainable, realistic, and timely (Faber et al., 2018). Prast, Weijer-Bergsma, Miocevie, Krosbergen, and Van Luit (2018) examined the differentiated instructional approach to determine if practiced in conjunction with cross-curricular learning could increase student proficiency and student learning. The findings revealed that cross-curricular learning and differentiated instruction were, in fact, the most effective instructional tools for 21st-century learning. Prast et al. also stated that teacher instruction and student achievement improved when teachers were provided the opportunity to build and develop instructional activities collectively that intertwine cross-curricular learning, student group activities, and opportunities to differentiate instruction.

Raftu (2016) identified leveled grouping as a significant component of differentiated instruction. According to Raftu and Valiandes and Neophytou (2018), for differentiated instruction to be a sufficient instructional approach, students must regularly participate in homogenous leveled groups so that they learn to cooperate and engage in academic discourse that fosters critical thinking. Valiandes and Neophytou added that the effectiveness of leveled grouping and differentiation are dependent upon the teacher’s preparedness and understanding of differentiation strategies. Young (2017) added that technology enhancements strengthen teachers’ ability to differentiate student learning and incorporate interdisciplinary instructional methods.

Technology Applications for Teaching Mathematics

Over the past decade, research has confirmed that a teacher's ability to connect classroom content with a students' interest and daily activities are more inclined to have a student who is engaged (Blazer, 2015). Since the late 1960s, technology has boldly and progressively equipped educators with resources that expand beyond the classroom (Blazer, 2015). The instructional functions of technology have consistently improved students' mathematic achievement for the last several decades and have provided teachers with easily implemented differentiated instructional options (Young, 2017). While each teacher's educational resources differ, it is crucial to student mathematics achievement in the 21st century that technology be an addition to daily classroom instructional practices and procedures (Geesa, Izci, Song, & Chen, 2019). Common Core Standards in mathematics require students to critically think and requires teachers to provide differentiated instruction that will assist students in meeting the goals identified in common core (Young, 2017). One goal of mathematics common core K-12 standards, to use technology in teacher preparation and student instruction, is often overlooked (Young, 2017).

In the era of common core, quality instructional procedures require the integration of technology enhancements especially in the mathematics classroom (Higgins, Huscroft-D'Angelo, & Crawford, 2019). According to Cullen, Hertel, and Nickels (2020), the use of regularly used technology in a mathematics classroom significantly improves teaching and learning as it (a) promotes cycles of learning, (b) fosters connections from the student to the content, (c) presents multiple representations for learners, and (c) serves as a remediation or acceleration tool for students. Geesa et al. (2019) added and argued that the components aforementioned are fundamental and foundational elements students and teachers need to ensure continuous and progressive mathematics learning in the 21st century classroom.

Mundia and Metussin (2018) conducted a study to determine if technology integration and enhancements in a mathematics classroom could improve mathematics achievement. The findings from the study revealed that not only did the mathematic technology resources increase student achievement, but it also improved students' attitudes, coping skills, and interest in mathematics. According to Toma and Greca (2018) and Woodward and Hutchison (2018), the best way to integrate technology is through developing technology integration learning communities among teachers. Toma and Greca argued that technology integration learning communities could and effectively be developed by providing teachers with time to plan with peer teachers to integrate technology resources into their daily instructional practices.

Toma and Greca (2018) researched to determine if technology integration learning communities were productive. The participants were three fifth grade mathematics teachers. All teachers went through a 3-day training that focused on instructional goals, instructional approaches, technology tool selection, instructional approaches, and instructional delivery. During the training, teachers were provided (a) participation guidelines that focused on understanding mathematics content standards, (b) instructional goals to ensure that teachers were on pace and focused, and (c) time to plan lessons with peer teachers share technology integration ideas and to ensure that technology integration was a component of each lesson planned. After the training, teacher participants reported that they were (a) better prepared to teach mathematics, (b) found it easier to implement technology, (c) saw an increase in students who were engaged in the lesson, and (d) saw a significant decrease in time spent re-teaching mathematics content (Toma & Greca, 2018). According to Young (2017), technology enhancements are only beneficial if they maximize the instructors' instructional time. Young stated further that the only way to maximize instructional time is to provide time for teachers to assemble and engage in meaningful planning that specifically targets the needs of the students and concerns of teachers.

Project Description

Potential Resources and Existing Supports

Consistently improving core instructional practices has been the aim of American school districts for decades (Huang, 2016). In order to ensure that this occurs, teachers must periodically receive formal training on research-based practices to ensure that the discipline of education and instructional practices are effective (Polly, 2015). By offering this 3-day professional development training, teachers will be provided with research-based instructional approaches, strategies, and resources to add to their repertoire that may increase student achievement in mathematics. Essential resources will be required to ensure the successful implementation of the project.

A meeting will be held with school administrators and lead teachers to discuss the results of the study and present the daily agendas of professional development training sessions. During this meeting, permission will be asked to provide the training to teachers during the scheduled professional learning blocks identified on the school district's master calendar and to send an e-mail invitation to mathematics teachers in Grades 3-6 and ask that administrators urge teachers to participate in the professional development training. The training will be conducted while teachers are under contract as the school has days built into the schedule for professional learning. The times on the calendar for professional training are at the beginning and end fall semester and at the end of the spring semester. Once permission is granted, e-mail invitations to all mathematics teachers in Grades 3-6 and school administrators. The 3-day professional development training will be held in the school system's conference building adjacent to the local high school where all district meetings are held. The conference building is equipped with Wi-Fi and adequate space for an excess of 325 people. District administrators will be asked to assist with providing copies of all resources, charting paper, binders, post-it notes, staplers, multi-colored high lighters, sharpies, sheet protectors, index cards, scissors, and school-issued laptops for teachers who do not have a portable device. I will provide common core standards, pencils, pens, notebook paper, a projector, name badges, and poster markers.

Potential Barriers

One potential barrier may be that school administrators lack support for the project because they may believe that the time spent training teachers could be used in another capacity. The administrators may also be uncertain that the training will positively impact teachers' instructional practice and student academic achievement. To address these barriers and gain the support of the school administrators, I will present an in-depth overview of the findings from the study. I will also review the student data from the last three years and review the district's improvement plan, which identifies mathematics as a weak area that needs improvement. I will also offer to schedule private meetings as needed for administrators who have additional questions or need additional clarification.

A second potential barrier may be that teachers are reluctant to participate as it will require active participation and constant reflection. In order to address this barrier, I will inform teachers that (a) the training sessions are specifically related to mathematics, (b) the training in its entirety addresses the concerns teachers and administrators identified during the data collection process, and (c) they will leave the training with mathematics resources related to their grade level.

In order to ensure that participants are fed breakfast and snacks, I will ask the district superintendent to provide funding. If the superintendent is not able to provide funding, I will ask the school administrators for funds to provide teachers with breakfast and periodic snacks. As a last resort, I will provide teachers with snacks, and they will be asked to bring their breakfast. Lunch will not be provided. Teachers will be allowed to bring their lunch or purchase their lunch from neighboring restaurants.

Proposal for Implementation and Timetable

Planning for implementation will take place during the academic school year. The planning will include administrators, lead teachers, and me. The details of the proposed project are (See Table 3).

Table 3

Proposed Timeline

Date	Task	Person	Deliverable
July/ August	Meet with district administration, school's administration and lead teachers	school administrators, district superintendent, and researcher	PowerPoint Presentation
August	Plan meetings	school administrators, and researcher	District e-mail announcement
August/ September	Generate invitation and send out participant invitation e-mails	Researcher	E-mail
September/October	Develop and send out master list of participants Send master lists to administrators and lead teachers Gain venue permission and date from district superintendent	Researcher	E-mail
October/November	Share all PowerPoint presentations with district administrators and school administrators	Research	E-mail
December	Conduct 3-day PD	Researcher	Face-to-Face

My Roles and Responsibilities

My responsibility and role will be to (a) organize all meetings with administrators and teachers, (b) facilitate communication between all administrators and teachers, (c) present the information at all professional development session, and (d) ensure that all resources, equipment, and location outlined are available and secured. The district superintendent will be asked to provide permission to conduct professional learning sessions on one of the available dates listed on the school district's master calendar. School administrators will be asked to support the 3-day workshop by encouraging and assisting teachers to implement the instructional improvements that are part of the presentation.

Several interactive activities, question and answer times, guided partner discourse, and application components were included in daily presentations to ensure the success of the professional development training. I will additionally provide feedback to teachers and utilize several instructional strategies during the presentation to keep participants engaged. At the end of each day, teachers will complete exit ticket activities to ensure that instructional practices during professional development training sessions address the needs of the audience.

The exit tickets will be reviewed daily and used as a formative assessment, and additional copies of materials will be provided to participants as needed. Electronic copies of all resources will be sent at the conclusion of Day 3. Even though this will be a well-planned professional learning experience, I recognize that I will need the support of school and district administrators. I recognize that I will be asking for employee time, instructional space, and collaboration when educators may have other priorities and obligations to fulfill. However, the presentation of the project will prove to be an essential vehicle for improving mathematics instructional practices in Grades 3-6.

Project Evaluation Plan

Formative Evaluation

Formative assessments are an instructional tool used throughout a lesson to gauge student learning (Houston & Thompson, 2017). It is argued that summative assessments cannot be valid if there are not formative assessment opportunities or tools that periodically gauge engagement and if an audience is learning (Kibble, 2017). Houston and Thompson (2017) argued further that summative and formative assessments should be intertwined and that both formative and summative assessments are needed to increase learning. In order to ensure learning and engagement, formative assessments such as structured question and answer, guided peer discourse, group projects, and exit tickets are embedded into each day’s presentations and will be used to gauge participant understanding and guide instruction for the next presentation.

On Day 1, all participants will be divided into collaborative groups to answer structured questions to access their knowledge of Common Core State Mathematics Standards. During the break on Day 1, I will review participant answers to the questions to gauge participant prior knowledge and use it to guide day one instruction. At the end of Day 1, teachers will participate in an exit ticket activity. The exit ticket activity will consist of structured questions and reflection. I will use this information gathered to guide Day 2 instruction.

At the beginning of Day 2, teachers will participate in a review activity. The activity will involve guided peer discourse and end with participants creating a classroom activity. I will provide participants with activity guidelines and assist each group in creating a classroom activity that encompasses the information learned on Day 1. I will also answer questions and facilitate peer discourse through intentional questioning to foster participant engagement. I will use the discussions and questions of participants to guide instruction for Day 2. As a culminating activity on Day 2, participants will use the information from Day 1 and 2 to create an instructional video on how to create a research-based mathematics lesson. Teachers will be provided additional time at the beginning of Day 3 to complete this project.

At the beginning of Day 3, teachers will be provided time to complete their videos. I will observe and answer questions as needed to ensure that all videos incorporate the researched-based practices taught during Day 1 and 2. All videos will be viewed as a group. I will use the video footage to determine what information needs to be revisited before providing teachers with new information. At the end of Day 3, participants will complete a summative evaluation to assess the 3-day training. All summative evaluations will be used to improve and guide future professional learning sessions.

Summative Evaluation

At the end of the 3-day professional development, training participants will complete an evaluation to determine if they found the information presented was useful and of quality (Houston & Thompson, 2017). I will use the information to determine what went well and what components could be improved. The questions on the summative evaluation are:

1. How would you rate the overall quality of the PD?
2. How well did the presenter state the objectives?
3. How well did the facilitator keep the session alive and interesting?
4. What is your overall rating of the facilitator?
5. How well did the PD program accommodate your background/needs?
6. How useful were the handouts?
7. How will you use what you have learned?
8. What was the most valuable part of this professional development? Why?
9. What was the least useful part of this professional development? Why?
10. What additional professional development/support do you need?

The answers to these ten questions will serve as an ending to the project. I will analyze the summative assessment data to determine how to structure future PD work sessions to assist teachers in being successful in the classroom.

Evaluation Goals

The evaluation methods that will be used for this study are of formative and summative nature and directly align with the goal of the 3-day professional development training, which was to increase teacher knowledge of instructional resources and strategies to teach mathematics in Grades 3-6. Teachers who participate in the professional learning sessions will engage in a myriad of hands-on activities that can be used in their classrooms. Formative assessments are included in each session by embedding structured question and answer times, guided peer discourse, group projects, and exit tickets. After the 3-day professional development seminar, teachers will be asked ten evaluative questions to determine if the information provided during the training was useful. I will collect the responses from each participant at the end of Day 3. The feedback from the evaluations will be used to improve future professional development training. I will also use the overall data from the evaluations to determine if professional development specifically related to mathematics has a positive impact on teacher instruction and teacher learning.

Key Stakeholder Groups

I created this 3-day professional development seminar based on the finding for the one-on-one interviews conducted with rural administrators and mathematics teachers in Grades 3-6. Based on those findings, it was clear that to ensure success; multiple stakeholders would have to be involved. As a result, it will be essential for me to include all stakeholders in conversations related to the project. Participants for the professional development seminar will be mathematics teachers in Grades 3-6. School-level administrators and district-level administrators will be invited to attend but will have the option not to participate all 3 days. However, all school administrators will be asked to assist with ensuring all participants attend the sessions offered, sign-in each day, and are issued a name badge. I will also encourage school-level administrators to attend the last day of training so that they can observe what the teachers have worked on and potential instructional implementations in mathematics classes in Grades 3-6. It is indicated when stakeholders will be invited into the planning and implementation process.

Mathematics teachers in Grades 3-6. All mathematics teachers in grades 3-6 will be invited to participate in the program. The only additional group will be administrators who volunteer to attend. The focus of the 3-day professional development training will be to increase teacher knowledge of instructional resources and strategies to teach mathematics in Grades 3-6. Participants will engage in hands-on activities, structured question and answer opportunities, guided peer discourse, and group projects. The information learned has the potential to encourage further collaboration and evoke continued instructional success of mathematics teachers.

School administrators. District superintendent, school principal, and assistant principals will form the administrative team that will be crucial to the success of the 3-day professional development training. I will include the district superintendents in all planning and discussions (see Table 3). To further improve the success of the 3-day professional development training, I will invite administrators to share their thoughts on what they observed and what they hope to see in mathematics classrooms in Grades 3-6. Through observation, it is expected that administrators will pay close attention to what high-quality planning and instruction should look like in mathematics and seek further to assist teachers by providing additional times to plan collectively. Administrators attending a session will also provide teachers with an understanding of what is expected by the administrative team.

Project Implications

Implications for Social Change

This project has the potential to positively influence the mathematics instructors, lead teachers and school administrators at the local site, as the project was created solely from the perspectives of individuals who work tirelessly to improve student mathematics academic success. Over the last 3 years, mathematics instructors, lead teachers and school administrators have struggled to determine what measures could be implemented to improve mathematics instruction. The information provided within this project includes research-based solutions to the problem areas identified by invested teachers and administrators. Through participation in the professional development program, teachers will be provided with (a) practical implications for planning mathematics instruction, (b) best practices and strategies for teaching mathematics, and (c) technology application for teaching mathematics. Participation could provide an opportunity for teachers to collaborate and learn new strategies that could support continued teacher learning and student achievement.

Importance of the Project in Larger Context

In the broader context, I believe that this project has great potential for assisting teachers, students, and school districts in mathematics instruction. As I have stated repeatedly in the review of literature, mathematics instruction in the 21st century requires education that involves cross-curricular teaching, real-life application, technology, and instructional strategies that reach incorporate multiple modalities of learning (Bartell et al., 2017; Lee & Wu, 2017; Powell et al., 2017; Toma & Greca, 2018). Therefore, it was my goal to create a project that intertwined the components identified as useful in research studies. The project presented is designed to continuously be restructured and updated as needed for future presentations needed to improve instructional practices.

The information provided in the project can also be adjusted to apply to middle and high school mathematics teachers. The expansion of the project would then be a district-wide initiative to assist teachers in providing research-based mathematics instructional resources and strategies, which would give all teachers cohesive instructional practices across all schools in the district. Lastly, I plan to share this study's initial findings with my colleagues in local and state curriculum organizers to lead conversations about the results may be useful to teacher and school districts across the state.

Section 4: Reflections and Conclusions

The problem that prompted this study was that rural elementary mathematics teachers and administrators of Grades 3-6 at the study site struggled to improve student mathematics performance despite the program changes made by administrators. This problem impacted mathematic assessment scores from 2015–2018 with the scores indicated that an increasing number of students in the rural school district had not met the mathematics proficiency standard. The findings from the study revealed that teachers were employing a variety of strategies and resources to engage students and teach mathematics, but insufficient mathematics instructional resources limited teacher options for instructional strategies. The findings also revealed that professional development specifically related to mathematics was needed. As a result of the findings, I developed professional development sessions to provide teachers with professional development focused on instructional resources to teach mathematics.

Project Strengths and Limitations

Project Strengths

The strengths of this project are related to the research and analysis included in the findings. Archer and Hughes (2011) argued that explicit instructional practices are the most effective instructional approach for all students because explicit instruction provides consistent support that gradually guides students through the learning process. The foundational argument of Archer and Hughes led the way for continued research. In agreement, Ing et al. (2015), Kohen and Borko (2019), Young (2017), and Toma and Greca (2018) added that explicit instructional practices in the 21st century are those that intertwine multiple modes of learning opportunities in the classroom. Kohen and Borko additionally stated that explicit classroom opportunities are most effective when they are implemented by well-trained teachers who participate in professional learning opportunities that focus on content creating differentiated learning opportunities. Following their suggestion, I designed a 3-day professional development program to specifically address the findings of the study that teachers believed they needed instructional resources to teach mathematics as well as professional development that was specifically related to math.

By participating in professional development sessions, teachers will have the opportunity to collaborate with peer teachers and colleagues to discuss best practices for teaching mathematics. Through interacting in the various activities during each professional development session, teachers will be able to create explicit lessons; share instructional practices, strategies, and resources; develop solutions; and plan for continued collaboration (see Bates & Morgan, 2018). These conversations can also spark further interest in district administrators to create more professional learning opportunities for mathematics teachers and continued opportunities for teachers to collaborate on how to improve teacher instructional practices (Andersson & Palm, 2017a). Participants will also be provided with research-based information to enhance their knowledge and understanding of best practices for planning and teaching mathematics.

Project Limitations

One limitation associated with the project involves ensuring continued collaboration among mathematics teachers in Grades 3-6 regularly. To further support the project, teacher collaboration must remain continuous because the effectiveness of instructional practices and the success of student academic achievement heavily depend on teacher planning (see Polly, 2015). While I do believe that teachers will find the information learned very useful, it may be difficult for teachers to achieve the same level of collaboration experienced during the professional development training sessions. To support the continuation of teacher collaboration, I suggest that school administrators organize, plan, and implement regular grade-level and cross-grade level meetings with teachers throughout the school year. According to the Alabama State Department of Education (2016a), it is the responsibility of school administrators to develop implementation guidelines that foster and support the collaboration of teachers. Establishing meetings specifically for teacher planning will provide teachers with an opportunity to effectively plan explicit lessons that incorporate 21st century, differentiated student learning opportunities (Bates & Morgan, 2018).

Recommendations for Alternative Approaches

One alternate approach would be to explore parent perceptions of home resources and support for elementary mathematics students. An accompanying project would be to create parent curriculum nights that occur periodically during the school year to provide parents with (a) resources that are available to help their students in mathematics at home and (b) instructional support and practices that reinforce classroom instruction. For example, at the end of each grading period or 9-week term, teachers and school administrators host a parent night or parent expo. During the events, parents would attend mini-instructional seminars led by classroom teachers. The objective of each seminar could be to (a) frontload new information, (b) provide parents with technology resources to accelerate or remediate student learning, or (c) foster 21st-century thinking and application. This project would (a) foster teacher collaboration and planning, (b) foster teacher and administrator collaboration, (c) provide the opportunity to develop the skills learned in class, and (d) form a cohesive parent and teacher relationship to support continued student learning.

Alternate Definitions of the Problem

The problem that prompted this study was that rural elementary mathematics teachers and administrators of Grades 3–6 at the study site struggled to improve student mathematics performance despite the program changes made by administrators. Twelve rural elementary administrators and mathematics teachers of Grades 3–6 participated in one-on-one interviews and provided their perceptions of instructional resources, strategies used to teach mathematics, and professional development for teaching mathematics. The data obtained from each interview revealed that participants believed they used a variety of strategies and resources to engage students but felt that insufficient resources limited teacher options for instructional strategies. The data collected also indicated that participants believed that professional development, specifically related to mathematics instruction, needed to be provided regularly.

To address the emergent themes, I designed a project to support the areas participants explicitly identified. The project supports teacher and administrator collaboration through a myriad of activities that can be used in daily classroom instructional practices. The project also provides professional development specifically related to mathematics. Regardless of how well aligned the project is with the data collected from participant perceptions, I understand that there will be some teachers who will only choose to participate during the 3-day professional development training and who will not use the instructional practices provided from the training. The following items are alternative definitions for the problem:

1. Teachers need opportunities to collaborate and engage in collaborative instructional planning to improve instructional practices for teaching mathematics.
2. Teachers need opportunities to network and learn from teachers of other school districts to share instructional resources and strategies used to teach mathematics.

These alternative definitions support the problem that prompted the study because they will provide teachers with alternative avenues to gain learn instructional resources and strategies used to teach mathematics.

Alternative Solutions to the Local Problem

Teachers who work in schools where the opportunity to collaborate is not available will benefit from alternative solutions. I intended the alternative solutions to assist groups of teachers who would like to connect and collaborate with other teachers about instructional resources and strategies used to teach mathematics. Alternative solutions are also ways to assist teachers who need additional support.

One way teachers can engage in collaborative instructional planning to improve instructional practices for teaching mathematics is to support continuous teacher and student development. When teachers are not provided opportunities to collaborate, teacher instructional practices can become outdated and can lead to ineffective instructional practices. If this were to occur, teachers can participate in grade-level meetings led by lead teachers or administrators. Before each meeting, the lead teacher or administrator responsible for the meeting would meet with other teachers to discuss dilemmas and areas of interest. The lead teacher or administrator would then gather resources and develop a plan of action or presentation to address the areas of concern that were reported. The information would then be presented during grade-level meetings. These meetings can occur monthly and offer an opportunity to discuss areas of weakness and strength. These meetings can also provide an opportunity to discuss student assessment data and differentiated teaching options that have been successful or exchange instructional strategies, materials, or resources to support student academic remediation and acceleration. School administrators would be invited to attend these meetings, even if they are not the presenter, but will not be required. However, administrator attendance can support continuous collaboration while gaining an understanding of the issues that teachers face in the classrooms. After these meetings, teachers would be responsible for debriefing with other grade-level teachers.

To develop networking and learning opportunities, teachers can connect with educators from other school districts to share instructional resources and strategies used to teach mathematics. Sharing ideas with teachers and administrators from other school districts would offer an opportunity to share information and possible solutions to present and future problems associated with student mathematics performance. This collaboration can dually act as a component of the school districts' improvement plan to support continued teacher collaboration and learning. This collaboration can also be completed using a variation of technology devices.

Many schools have a variety of technological enhancements; therefore, the opportunity to expand teacher collaboration through technology is extensive. Since the time to sit down face-to-face is often interrupted, participating in a virtual meeting, phone conferences, and social media may be more feasible because they provide alternative options to gain knowledge from other educators. These growth opportunities can be offered on a monthly schedule of virtual meetings and phone conferences. To further support teachers, these meetings can be recorded for those who are not able to attend or miss parts of the meeting. Social media can be used to create teacher chat groups or teacher strands that allow teachers to share and discuss instructional practices, resources, and strategies. Engaging in such activities can provide teachers with continuous support and instructional knowledge on a broader scale that is easily accessible.

Scholarship, Project Development and Evaluation, and Leadership and Change

I investigated the perceptions of rural elementary administrators and mathematics teachers in Grades 3–6 regarding instructional resources, strategies used to teach mathematics, and professional development for teaching mathematics. In this study, I gathered and analyzed the data, finding that teachers needed instructional resources and strategies for teaching mathematics. As I engaged in conversations with participants, I learned about administrator and teacher beliefs concerning the instructional resources and strategies used to teach mathematics as well as professional development for teaching mathematics.

As a scholar, I had to remove myself from the roles of former teacher and assistant principal and focus solely on being the researcher. During this process, I reminded myself continuously to focus on the research and to create a project that directly and explicitly focused on the needs expressed by the participants because it was the only way to address the problem (see Kohen & Borko, 2019).

The challenges that I faced during this process were setting up times that worked best for participants and getting participants to expound on answers during the interview process. To address these challenges, I made myself available according to participant schedules and asked probing questions during each interview to gain the most information from participants. According to Creswell (2014), asking a probing question during the interview process is a practical approach. In my review of literature, Bates and Morgan (2018), Gabriele et al. (2016), and Hoyles (2018) provided evidence that teachers find value in professional learning opportunities when the information given directly addresses teacher needs.

To investigate the perceptions of the educators in practice, I interviewed 12 rural elementary administrators and teachers at the local site. I was very excited to collect data and was even more excited to find that teachers were willing to participate in the research voluntarily. Soon after the invitations were returned, I began to schedule one-on-one interviews. Once data collection was completed and findings were developed, I began to design my project in the form of a 3-day professional development training. While undertaking this process, I used the findings to guide the development of professional development sessions because the goal was to provide teachers with professional learning that was guided by research and included strategies and resources that addressed the needs they identified.

The 3-day professional development program that was developed may enhance teacher instructional practices and equip them with resources and strategies for teaching mathematics. In my capacity as the researcher, I found that by exploring more research-based information, I could offer more knowledge to participants and provide the opportunity for them to collaborate and share their ideas to help them grow as classroom educators. By developing this project, I grew not only as an administrator but as a researcher who is committed to continuous learning.

Reflection on Importance of the Work

Once I gained confidence in being an interviewer, my faith and excitement about completing the research grew. I became more cognizant of quality instructional practices and began to develop ideas that could be implemented at a later date to improve the growth of educators in the district.

Growth as a Scholar

As I began to organize and analyze the data, I deemed myself a researcher. I saw a difference in how I thought and was impressed with my newfound ability to remove personal bias from situations and focus on what was factual and was research based. One occurrence that I remember vividly was during the transcription process. To delve into the research, I decided to transcribe each recording by hand using Microsoft Word. Before beginning, I had no idea of the amount of patience, detail, and review that was required to ensure that all transcripts were accurate.

The transcription process required repeated playbacks and intentional listening of each interview recording. Although this was a very time-consuming process, I found that the transcribing activity improved my ability to focus and to attend to detail. The transcription process was essential to my research because I wanted the project to be meaningful to the participants who voluntarily choose to participate. Once all transcripts were typed in a Word document, I printed each one. I dedicated weeks of reading and highlighting documents to identify codes, patterns, and themes. The member checking process was completed to ensure that no personal bias was interjected into the findings. Through this detailed analysis, I was able to learn participant perceptions and develop a project that directly aligned with the needs of the individuals who helped me become a researcher.

Growth as a Practitioner

The knowledge and experience I have gained from this process is unmatched and has impacted my daily practices as a school leader and educator. Through this process I have become vigilant and focused on research-based practices. Through this research, I was able to reconnect with the initial desire that pushed me to become an educator. As an assistant principal, it is easy to lose sight of what is required to ensure teachers are effective. Teachers and students deserve a school leader who listens, reflects, researches, and who continuously seeks to find solutions to their areas of concern.

As a result of this study, it will be my continued goal to be an instructional leader who fosters teacher learning and student academic success. In my investigation of the perceptions of rural elementary administrators and mathematics teachers in Grades 3-6, I gathered data and developed findings to develop a meaningful professional development project. As an assistant principal of the neighboring high school, I have had the opportunity to observe and support teachers. I have also seen and experienced firsthand the struggles that teachers encounter when teaching mathematics. However, through this process, I was able to acquire a deeper understanding of quality planning and best practices for teaching mathematics.

As I engaged in conversations with participants, I was able to gain a real understanding of what teachers needed. I learned about teacher beliefs. I learned about teacher frustrations and inadvertently learned what teachers needed from administrators to feel supported. As a scholar, I had to remove myself from the role of being a high school administrator and position myself as a researcher. I had to make sure to withhold my biases and opinions; this was not difficult for me because I have experienced the challenges and successes as a former mathematics teacher and a current school administrator. I experienced the desire to be heard and have had moments where I felt unsupported. Therefore, I made sure to actively listen without bias and analyze the data gathered to guide the project.

Shernoff et al. (2017) and Tabach and Schwarz (2018) provided evidence that when teacher needs are met, their instruction and quality of teaching improves. Throughout the research, I reminded myself to focus on the needs of the participants and to develop a project that would prove to be meaningful to the participants and the school district. As the researcher, I found that through expanding my knowledge in research-based content, I noticed a shift in my professional focus as a school leader. This shift has ignited a passion for continuously engaging in conversation with a wide variety of practitioners and for seeking research continually.

Growth as a Project Developer

One of the many joys I find in education is planning events that support educator development. Creating this project helped to fulfill that desire as I was able to provide useful information and professional development to the elementary mathematics teachers in the district I serve. To create this project, I had to focus on the data collected, research, read, and reflect. The findings from the data revealed that participants believed they needed mathematics professional development and instructional resources and strategies for teaching mathematics. Therefore, I developed a professional development project that concentrated on mathematics resources and strategies and that provided teachers the opportunity to collaborate and design goal-oriented lessons.

Through creating the 3-day professional development project, I am able to offer teachers an opportunity to increase their knowledge of mathematics resources and strategies. To make sure that all sessions provide meaningful information, I conducted an extensive search for research that focused on meaningful professional development and best practices for teaching mathematics. Through researching, I learned that for teachers to actively engaged in professional learning, the information presented must be practical, hands-on, and specific to participant needs. I took this information to develop practical sessions that fostered peer discourse and thought-provoking collaboration that would provide teachers with materials they could use for future teaching and planning. As the project developer, I was pleased to finish a project that directly aligned with the needs of the participants.

Implications, Applications, and Directions for Future Research

This study contributes to the literature about exploring teacher perceptions regarding instructional resources, strategies used to teach mathematics, and professional development for teaching mathematics. By collecting data from 12 rural administrators and mathematics teachers in Grades 3-6, I captured their perceptions, thoughts, and experiences about instructional resources and strategies used to teach mathematics and about professional development for teaching mathematics. When I analyzed the data, two themes emerged. The two themes were (a) rural elementary mathematics teachers employed a variety of strategies and resources to engage students, but insufficient resources limited teacher options for instructional strategies, and (b) professional development that is specific to mathematics instruction needed to be provided regularly. These themes were used to shape and create a 3-day professional development project.

Potential impact for Social Change

At the level school, teachers and administrators have the potential to alter the trajectory of students' academic performance. This can be done by providing students with research-based effective instructional practices like those identified in the project. This study, in its totality, offers useful resources to equip teachers and administrators with research-based practices that explicitly focus on mathematics instruction. By providing teachers with research-based instructional practices, teachers and administrators will be offered an opportunity to gain a deeper understanding of best practices for teaching mathematics and collaborate, which has the capability to aid the school's problem of students' mathematics performance (Capraro et al., 2016).

The project developed has the potential to positively impact social changes as it has the potential to increase teacher knowledge and understanding about effective instructional strategies and resources for teaching mathematics that can be implemented into their mathematics classrooms. Professional development participants are offered an opportunity to collaborate and plan useful lessons that foster the development of critical thinking skills needed to teach and learn mathematics in the 21st century, (Common Core State Standards Initiative, 2020). Participation in professional development also provides practical hands-on activities and peer discourse opportunities that can be embedded into daily mathematics classroom instruction. By taking advantage of the opportunity to participate in the professional learning project, school leaders and teachers are presented with the opportunity to increase student mathematics academic performance that could change the way students learn mathematics (Andersson & Palm, 2017a). Moreover, the project created for this study may serve as a model for the development of other professional development programs.

Methodological, Theoretical, and Empirical Implications

This study has significant methodological, theoretical, and empirical implications as the research focuses on mathematics instructional resources and strategies to assist teachers with instruction and could promote student learning. The probable solutions were developed from the experiences and ideas of rural elementary administrators and teachers in Grades 3-6 and are supported by scholarly research. The methodology used for this study was a basic qualitative design. This design was most appropriate because it allowed the exploration and examination of the phenomenon through the views of participants and allowed a more in-depth analysis of the perceptions of teachers and administrators with a central goal of understanding how people make sense of their experiences (Merriam & Tisdell, 2016).

The conceptual framework used for this study was the concept of explicit instruction, designed by Archer and Hughes. Archer and Hughes (2011) argued that explicit instructional practices are the most effective instructional approach for all students, as it provided consistent support that gradually guides students through the learning process. While developing the project, I systematically and consistently analyzed data and searched for ways to assist teachers with instructional resources and strategies for teaching mathematics. The theoretical implications of this study suggest that providing teachers with instructional resources, instructional strategies, and professional development for teaching mathematics it would increase teacher instructional practices.

The empirical implication of this study is that rural elementary administrators and mathematics teaches in Grades 3-6 are reliable sources of information about their mathematics instructional practices and experiences. The data confirmed that teachers possess some resources and strategies to engage students in mathematics learning but believed that insufficient resources limited teacher options for instructional strategies. The data also confirmed that teachers thought they needed professional development that was specific to mathematics. In an effort to attend to the items mentioned, teachers must be exposed to professional development that explicitly focuses on instructional strategies and resources for teaching mathematics. One empirical implication of this study is that additional studies be conducted that focus on administrator and teacher perceptions as they may prove to beneficial to school districts that aspire to enhance teacher mathematics instructional practices or student mathematics proficiency. Such studies could also provide additional examples of useful resources and strategies that teachers use to improve their knowledge and growth.

Recommendation for Practice and or Future Research

In the field of education, there are several opportunities for future research that focus on the practices, experiences, and expertise of elementary administrators and teachers. The findings from this study demonstrated that teachers wanted effective instructional strategies and resources for teaching mathematics and professional development that focused on mathematics. Teachers believed that to prepare students adequately, they needed more support. The research focused on providing teachers a professional development program that would offer practical resources and strategies for teaching mathematics. Additional research that examines rural elementary educator perceptions about mathematics instructional resources and strategies could be useful because it could offer teachers other strategies and resources for teaching mathematics.

Conclusion

The problem that prompted this qualitative study was that rural elementary mathematics teachers and administrators of Grades 3-6 struggled to improve student mathematics performance despite the program changes made by administrators. To investigate the problem, I invited rural elementary teachers and administrators to share their perceptions and experiences regarding instructional resources, strategies used to teach mathematics, and professional development for teaching mathematics. As I obtained and analyzed data, I worked tirelessly to develop a project that would be practical, and assist the local school, teachers, and students.

All participant data were collected from one-on-one interviews. Through the interview process, I was able to gain vital information from the rural elementary administrators and mathematics teachers in Grades 3-6 about instructional resources and strategies for teaching mathematics and about professional development for teaching mathematics. When I analyzed the data gathered, I sought to answer the two research questions that guided the study. Those questions were:

> RQ1: What are rural elementary administrator and teacher perceptions about instructional resources and strategies used to teach mathematics?
>
> RQ2: What are rural elementary school administrator and teacher perceptions about professional development to improve mathematics instructional delivery?

The findings from the data analysis revealed that teachers believed they needed instructional resources and strategies for teaching mathematics and that they needed professional development that was specifically related to mathematics. This study is essential because it highlights the perceptions of elementary administrators and teachers in the district where the problem exists regarding instructional resources and strategies for teaching mathematics. The project developed provides a foundation for the school district and also provides a foundation for continued professional development related to teachers' perceptions.

Teachers struggle with teaching rigorous mathematics standards. To support the struggling educators, research that seeks their perceptions regarding instructional challenges is essential. Therefore, it is imperative to the improvement of mathematics instruction for teacher beliefs to be understood and considered when creating school improvement programs. It is the dexterity of each teacher that enhances student and school improvements.

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Appendix A: Professional Development

Session Schedule Day 1

Time	Activity	Method
8:30 – 9:00	Sign-in, PD material pick-up, and group assignment	**Conference Room A.** Sign-in at the front table before entering the room. After sign in teachers will pick up pick-up PD materials and table assignment.
9:00 – 9:30	Continental Breakfast	The rear of **Conference Room A.**
9:30 – 10:00	Welcome, Introduction, Overview of 3-day PD, and Goals and Learning Outcomes	Lead by PD facilitator using PowerPoint Presentation
10:00 – 10:40	Ice Breaker – 'Break it Down'	Review group ground rules with participants; Group Kahoot! - activity
	5 Minute Break	
10:45 – 12:00	Understanding Common Core Mathematics	Lead by PD facilitator
12:00 – 1:00	Lunch	On your own
1:00 – 2:00	Group Activity	PowerPoint Presentation-presented by PD facilitator;
2:00– 2:30	Closing Session	Reflection: Exit Ticket

Professional Development Facilitator Notes

Day 1

- Teachers' names will be organized alphabetically. Participant sign-in sheets will be grouped according to their grade level.
- Upon sign-in teachers will receive their name tag and a packet that includes all handouts. Each name tag will have a colored sticker on the back that indicates what table he/she will be initially assigned.
- Each table will be provided with a tool kit. These items will be utilized throughout the training. Tool kits should be prepared the day before the training. In each tool kit will be the following items:
    - 4-6 Binders
    - Post-it notes
    - Pencils
    - Pens
    - Stapler w/ staples
    - Multi-colored highlighters
    - Sharpies
    - Sheet protectors
    - Index Cards
    - Scissors
    - Mathematics common core standards

- Share all PowerPoint presentations electronically and provide each participant with a printed copy of all PowerPoint Slides and additional graphic organizers.
- A dry erase board should be located at the front and rear of the room, to provide a space for writing questions and relevant information
- The participants will be provided 2 short breaks during the sessions.
- Post rules for the 3-day training in at least two easily visible locations.

Facilitator Recommendations:

- Welcome, all participants to the training session.
- Ensure all participants are seated at the correct table.
- Introduction of Facilitator
- Welcome and introduce administrators that are in attendance
- Provide an overview of the 3-day professional

The goal of this 3-day training session is to provide you all with mathematical approaches and strategies for teaching math. feel free to ask questions and take pictures. On the center of your table, you will find a tool kit that you will use over the next three days to build your strategy guides.

- Review ground rules for the training.
    - Listen respectfully to others and do not interrupt
    - Listen actively and be open to the views of others
    - Allow everyone to speak
- Explain the objectives of overall training *(see PowerPoint)*
- Explain learning outcomes *(see PowerPoint)*

- Ice breaker Activity Explanation (*See PowerPoint)*
- Countdown from five and reveal each standard one-by-one.

The goal of this icebreaker is to get the students to work together. In a classroom, you would need to set basic guidelines. Ask teachers what guidelines they would set for their students in the classroom and what ways this activity could be used.

- Explain Kahoot! (see PowerPoint)
- Participants can access this technology assessment through any technology device. Click on the link to share access code
- Confirm that all participants are signed in and begin the game.
- Answers to all questions will be revealed once the timer goes off on the game.

BREAK – 5 minutes

Now begin reviewing PowerPoint slides:

Let's talk Common Core Standards

These standards define what students should understand and be able to do in their study of mathematics. But asking a student to understand something also means asking a teacher to assess whether the student has understood it Common Core concentrates on a clear set of math skills and concepts. Students will learn concepts in a more organized way both during the school year and across grades. The standards encourage students to solve real-world problems.

Overview of Alabama mathematics Common Core Standards

Ask participants:

- *How this visual could assist teachers with planning?*

- *What are areas do you notice that overlap?*

ALCOS Standard Example

Content Areas are broad areas of instructional focus

Clusters are objectives that need to be learned to master the content areas listed

Student Mathematical Practices

Mathematical practices describe what students should be able to do. Teachers should be provided an opportunity for these components to be practiced during daily instruction and class time.

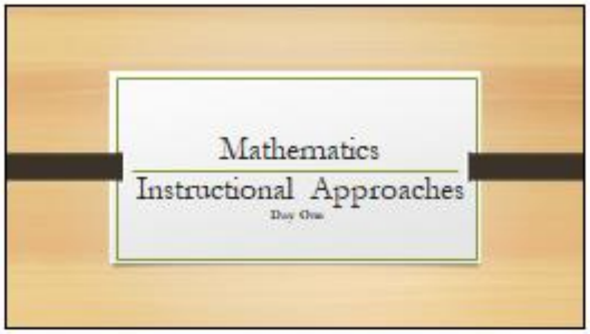
Guided Activity *(see PowerPoint slides 12-19)*

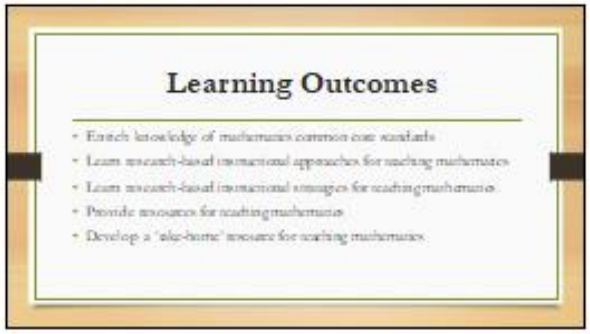
After giddied activity teachers will work in groups to decompose their grade-level standards. (set a timer using https://www.online-stopwatch.com/classroom-timers/ *The facilitator should walk around the room and assist groups as needed and guide academic discourse among teachers.*

It's a wrap!

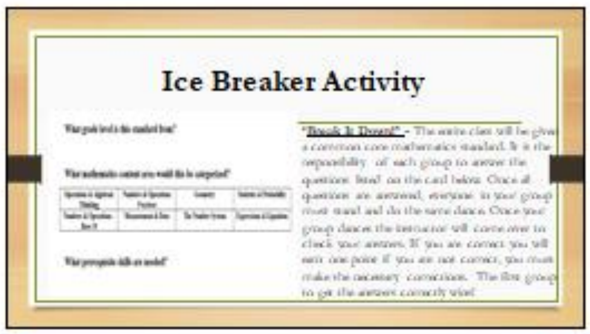
The culminating activity for groups (see PowerPoint slide 20-21).

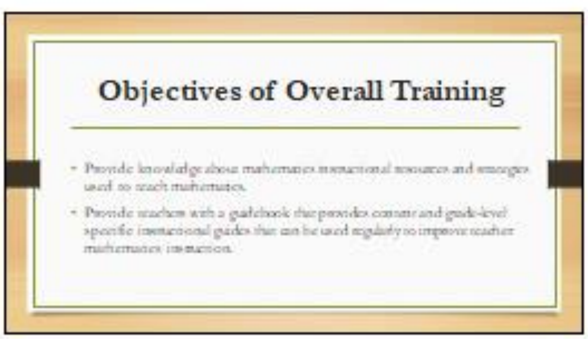
PowerPoint presentation slides begin on the next page.


Mathematics
Instructional Approaches
Day One


Learning Outcomes
Enrich knowledge of mathematics common core standards
Learn research-based instructional approaches for teaching mathematics
Learn research-based instructional strategies for teaching mathematics
Provide resources for teaching mathematics
Develop a "take-home" resource for teaching mathematics

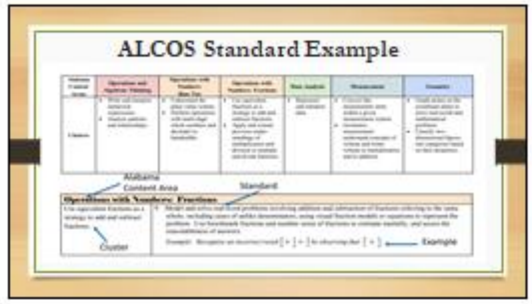

Welcome
Introduction of Facilitator
Welcome
Overview of 3-day professional development training


Ice Breaker Activity
"Break It Down!" - The entire class will be given a common core mathematics standard. It is the responsibility of each group to answer the questions listed on the card below. Once all questions are answered, everyone in your group must stand and do the same dance. Once your group dances the instructor will come over to check your answers. If you are correct you will earn one point if you are not correct, you must make the necessary corrections. The first group to get the answers correctly wins!

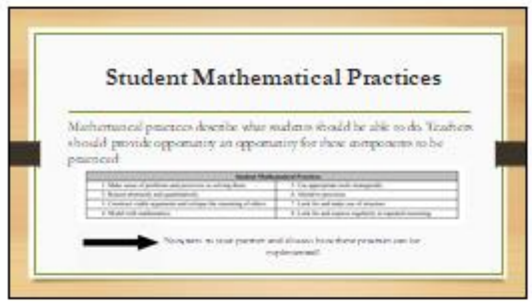

Objectives of Overall Training
Provide knowledge about mathematics instructional resources and strategies used to teach mathematics.
Provide teachers with a guidebook that provides content and grade-level specific instructional guides that can be used regularly to improve teacher mathematics instruction.

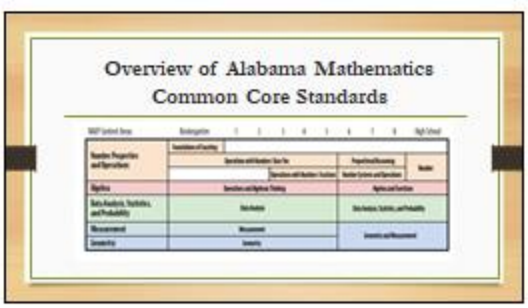

Break It Down!
Multiply one-digit whole numbers by multiples of 10 in the range 10 - 90 (e.g., 9 x 80, 5 x 60) using strategies based on place value and properties of operations.
Fluently add, subtract, multiply and divide multi-digit decimals using the standard algorithm for each operation.
Fluently add, subtract, multiply and divide multi-digit decimals using the standard algorithm for each operation.


Kahoot!
Kahoot!


ALCOS Standard Example
Alabama
Content Area
Standard
Operations with Numbers: Fractions
Cluster
Example

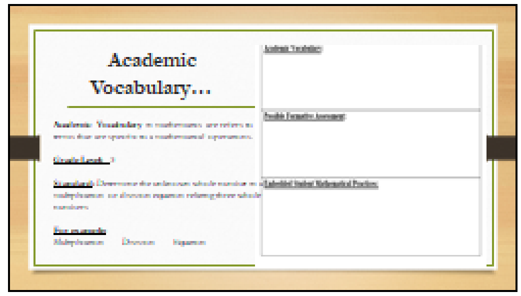

Let's Talk Common Core…
Common
Core

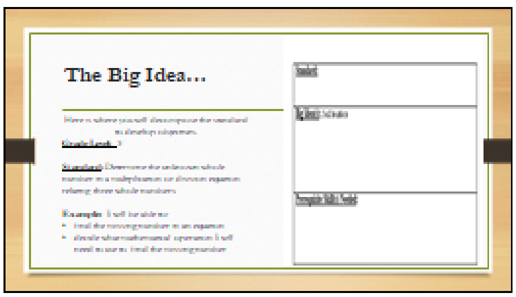

Student Mathematical Practices


Overview of Alabama Mathematics
Common Core Standards

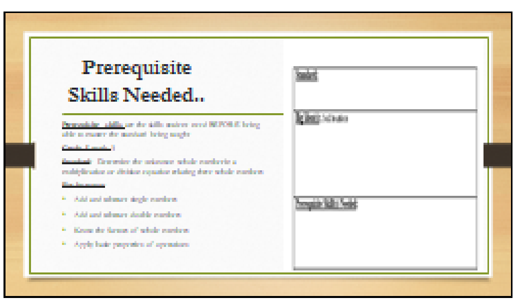

Let's Break Down
Mathematics Standards.

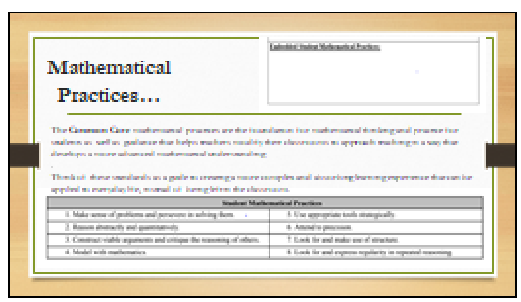

The Standard…


Academic Vocabulary…


The Big Idea…


Formative Assessments…


Prerequisite Skills Needed..


Mathematical Practices…


Let's Get To Work!


Wrapping Up Day One!
That's a Wrap


Today's Exit Ticket

Professional Development Training
Session Schedule Day 2

Time	Activity	Method
8:30 – 9:00	Sign-in	**Conference Room A.** Sign-in at the front table before entering the room. After sign in teachers will pick up pick-up PD materials and table assignment.
9:00 – 9:30	Continental Breakfast	Rear of Conference Room A.
9:30 – 10:30	Review of Day 1 and Icebreaker Activity	Lead by PD facilitator
10:30 – 11:45	Presentation: Research Based Mathematics Instructional Approaches	PowerPoint Presentation- Lead by PD facilitator
11:45 – 12:00	Break	
11:15 – 12:30	Collaborative Group Activity	Lead by PD facilitator and group discussion; handouts
12:30– 1:30	Lunch	On your own
1:30 – 2:30	Continue Collaborative Group Activity	
2:30– 3:00	Closing Session	Lead by PD facilitator and group discussion; handouts Reflection: Exit Ticket

Professional Development Facilitator Notes

Day 2

The Facilitator will address the following tasks at the beginning of the day 2 session:

- Welcome participants back for day 2 and ensure all participants have signed in
- Review day 2 schedule
- Review
  - Ground rules
  - Purpose of training
  - Learning objectives
  - Review

Icebreaker Activity

- Set timer for 10 minutes
- While teachers are working pass out individual tickets. Once time is up teachers will post their groups creation on the back wall of the conference room. Tape a large Ziploc bag under each poster. During the break allow teachers view everyone's activity. Teachers should place their ticket in the bag underneath the activity they feel is best!
- The winning group will be announced before the end of the day and should receive a 'goody bag' with classroom materials.

Begin PowerPoint

Interdisciplinary Instruction

- Interdisciplinary teaching is a method, or set of methods, used to teach across different curricular disciplines to increase student understanding and fosters 21st century skills. Interdisciplinary instruction requires knowing how standards across the curriculum work together. It can be as simple as a vertical planning session with teachers or providing teachers with small group assignments that are content related and deepen understanding. Remember the purpose of interdisciplinary instruction is to provide student an opportunity to deepen their content knowledge and improve understanding.

Differentiating Instruction

- Tailoring instruction to meet individual needs. Whether teachers differentiate content, process, products, or the learning environment, the use of ongoing assessment and flexible grouping makes this a successful approach to instruction.

STEM

- Provides students with opportunities to experience academic success amongst peers through communication. Fosters an environment that capitalize students interest. Stimulates the use of academic discourse among students and teachers. STEM activities requires planning and planning ensures that your goals are SMART. SMART goals assists with teacher planning and student knowledge.

Icebreaker 2.0

- Each table will be assigned a random number 1-7.
- Pick a group leader from each table to retrieve their groups activity from the back wall.
- Give each group 3 minutes to strategize how they will make the previously created activity a STEM activity. Once time has elapsed for planning. Deem the work area a ‘quiet zone’
- After the seven-minute mark the teams must choose a representative to explain how they enhanced the activity. Once all groups have presented the PD facilitator will determine the group that worked best together.
- The team who wins this game will receive a door prize!

SMART Goals

Specific

- What do I want students to gain?
- Where will the activity be conducted do?
- When will students begin and end?
- What students will be involved?
- Which resources are needed and what limits are there??
- Will this deepen student knowledge? (How?)

Measurable

- How will you know when students ae mastering skills?
- How will you differentiate learning if students don’t understand?
- How will you know when students have reached the goal?

- What formative and summative assessments will be used?

Achievable

- How can student accomplish the activity?
- How realistic is this goal based on potential constraints?
- Will students experience success?
- How will you redirect?
- How will you level student groups or differentiate instruction?

Realistic

- Is it the right time to try this activity?
    - School schedule
    - Student maturity
    - Student knowledge
- Does this align with the content standards?
- Does it align with school content improvement goals?
- Is there a real world connection?

Timely

- When does it need to be accomplished by?
- Does it align with the pacing guide?
- What perquisite skill do student need for the activity?
- What back ground knowledge is needed?
- What can I do today?
- Effective planning

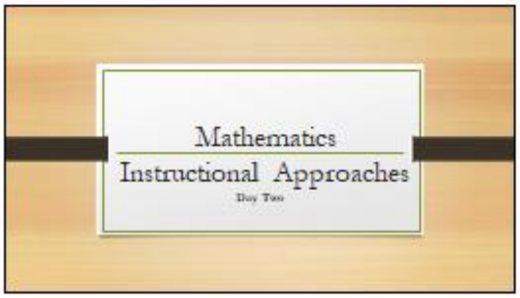
Group Activity

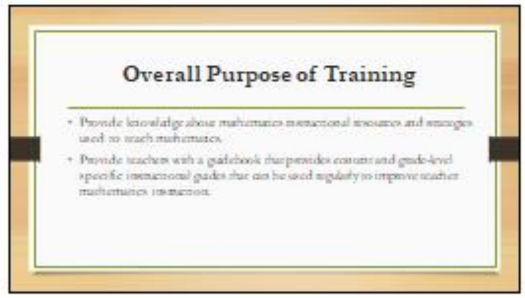
- Effective teaching requires effective planning and effective planning include goal setting. In your group for this activity you all will be working together to create smart goals and activities for your grade level standards. On day one you all were given an opportunity to breakdown standards. Today we will be working to create SMART objectives for those standards and add activities that include STEM and interdisciplinary approaches to learning! Complete copies of the course of study standards that include all content areas. Distribute SMART objective graphic organizer. Each person should receive a minimum of 5 copies. On each table place a copy of “Good Questions’ by Marian Small. This book will provide teacher with various differentiated instructional strategies that are specially related to mathematics.

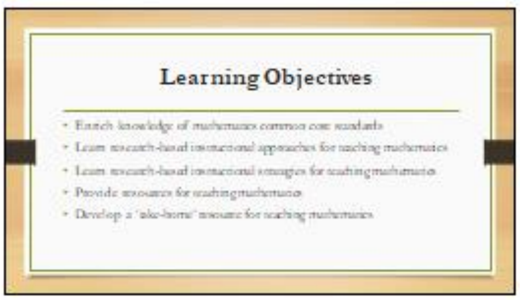
Exit Ticket

- Using a camera Paper Slide: On paper, small groups sketch or write what they learned. Once all groups have completed their sketches and or writing, one team representative is chosen to line up at the front of the room with the teacher. Using a camera students slide their work under the video camera while quickly summarizing what was learned. The camera doesn’t stop recording until each representative has completed his or her summary or cellular devices.

The PowerPoint Slides for day two begin on the next page.

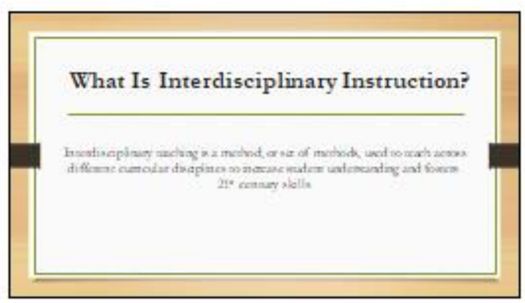

Mathematics
Instructional Approaches
Day Two

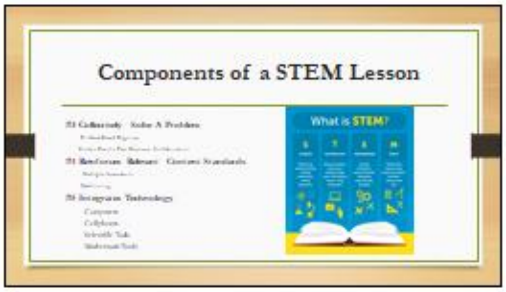

Overall Purpose of Training
Provide knowledge about mathematics instructional resources and strategies used to teach mathematics.
Provide teachers with a guidebook that provides content and grade-level specific instructional guides that can be used regularly to improve teacher mathematics instruction.

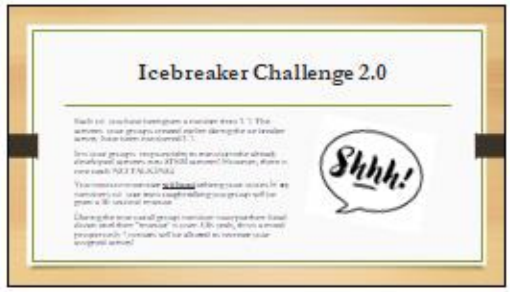

Learning Objectives
Enrich knowledge of mathematics common core standards
Learn research-based instructional approaches for teaching mathematics
Learn research-based instructional strategies for teaching mathematics
Provide resources for teaching mathematics
Develop a 'take-home' resource for teaching mathematics


It's Fun to Review!
REVIEW
Review Ground Rules
What is the goal of common core?
What are some examples formative assessment?
What are some of the mathematical practices you learned yesterday?
What is the difference between a content area and a cluster?

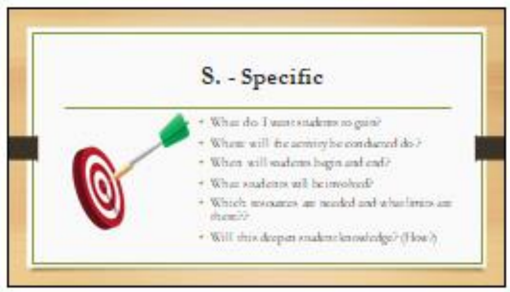

Icebreaker Activity
BE CREATIVE!

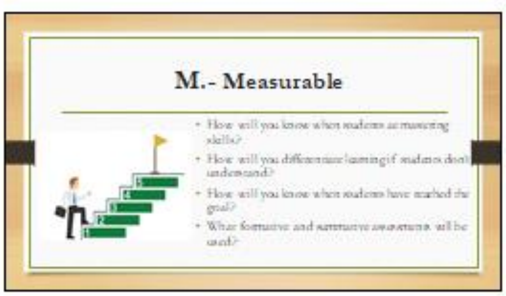

What Is Interdisciplinary Instruction?
Interdisciplinary teaching is a method, or set of methods, used to teach across different curricular disciplines to increase student understanding and fosters 21st century skills.

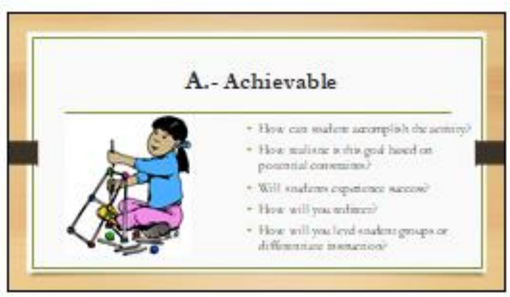

Components of a STEM Lesson
What is STEM?


Icebreaker Challenge 2.0
Shhh!

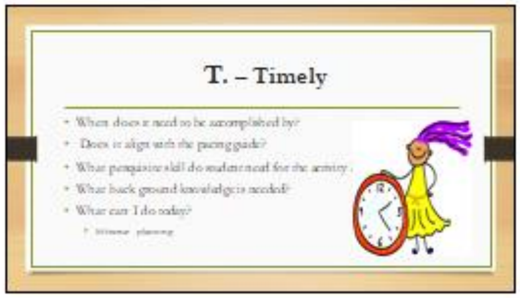

Lesson Objectives
Specific
Achievable
Measurable
Relevant

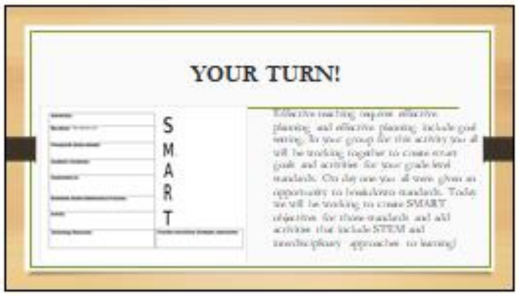

S. - Specific

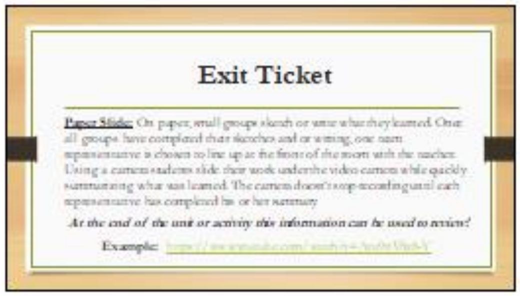

M.- Measurable


A.- Achievable


R. – Realistic
Is it the right time to try this activity?
Does this align with the content standards?
Does it align with school content improvement goals?
Is there a real world connection?


T. – Timely
When does it need to be accomplished by?
Does it align with the pacing guide?
What prerequisite skill do students need for the activity
What back ground knowledge is needed?
What can I do today?


YOUR TURN!
S
M
A
R
T


Exit Ticket
Paper Slide: On paper, small groups sketch or write what they learned. Once all groups have completed their sketches and or writing, one team representative is chosen to line up at the front of the room with the teacher. Using a camera students slide their work under the video camera while quickly summarizing what was learned. The camera doesn't stop recording until each representative has completed his or her summary
At the end of the unit or activity this information can be used to review!
Example:


Here is your topic!
You are going to create a video to describe how to create a S.M.A.R.T. and successful mathematics lesson. You must use the graphic organizer and include all the components listed. Make sure you are explicit and have planned an activ check for understanding.

PD Session Schedule - Day 3

Time	Activity	Method
8:30 – 9:00	Sign-in	**Conference Room A.** Sign-in at the front table before entering the room. After sign in teachers will pick up pick-up PD materials and table assignment.
9:00 – 9:30	Continental Breakfast	Rear of Conference Room A.
9:30 – 10:30	Review of Day 1 and 2 Icebreaker Activity	Lead by PD facilitator
10:30 – 11:45	Presentation: Research Based Mathematics Educational Technology Tools	PowerPoint Presentation- Lead by PD facilitator
11:45 – 12:00	Break	
11:15 – 12:30	Collaborative Group Activity	Lead by PD facilitator and group discussion; handouts
12:30– 1:30	Lunch	On your own
1:30 – 2:30	Continue Collaborative Group Activity	
2:30– 3:00	Closing Session	Lead by PD facilitator and group discussion; handouts Reflection: Professional Development Evaluation

Professional Development Facilitator Notes- Day 3

Provide teachers at least 20 minutes to finalize their videos. Use the ‘fist-to five’ strategy to determine if more time is needed. Encourage participants to be creative and to be as explicit as possible.

- Choose random tables to present allow teachers to describe the experience and ask “How could the activity be used in a mathematics classroom?”
- Provide each group with a wall sized post-it note. This is where final lists will be written.

“High Five” PowerPoint Presentation

- After groups have completed their presentation posters all participants will do a gallery walk to discuss the lists created. Prompt teachers to discuss why or who not they believe the identified areas are important to student growth. After the gallery walk have teachers share how the activity can be used to plan and develop lesson and pacing guides. After this activity allow a break

Wakelet

- For this activity everyone will need access to a device that is capable of accessing the internet. Each person will need to create his/her own Wakelet account at the conclusion
- Make sure you provide the Wi-Fi code.
- Allow teachers to discuss how the Wakelet platform could be used to collaborate and plan for teachers. Inform teachers that all graphic organizers used can be found in the Wakelet classroom.

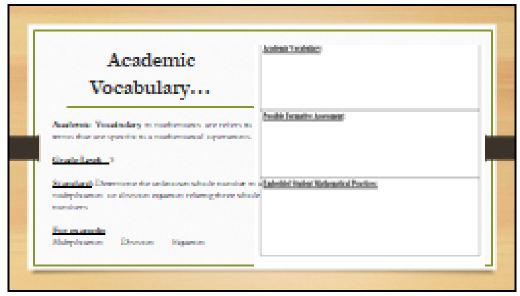
- Teachers will now add and plan together and add resource's they use in order to effectively teach mathematics in the classroom. Teachers should be instructed to decompose as many standards as possible using the graphic organizer pictured.

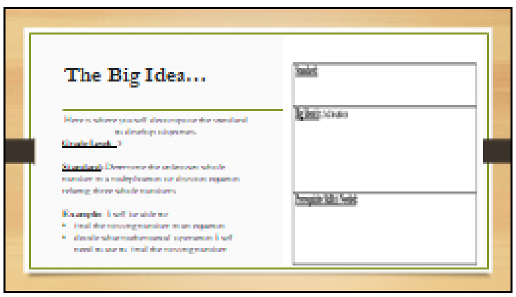
Evaluation/Exit ticket

- Participants will complete an evaluation of the 3-day project study. This document must be turned in from all participants before dismissal

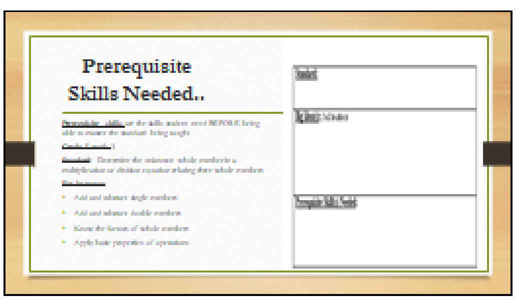
PowerPoint Presentation begins on the next page.

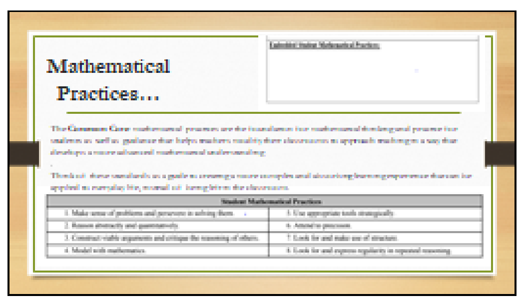

The Standard…

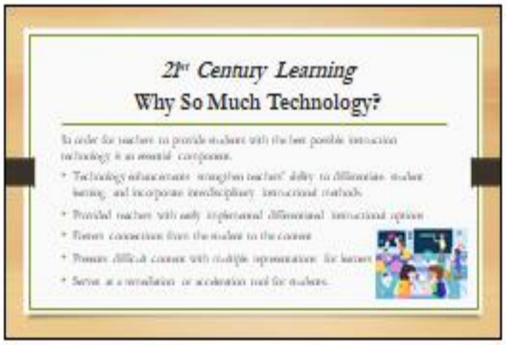

Academic Vocabulary…


The Big Idea…


Formative Assessments…
FORMATIVE ASSESSMENT

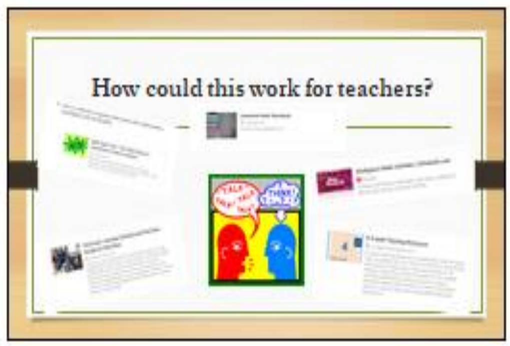

Prerequisite Skills Needed..


Mathematical Practices…

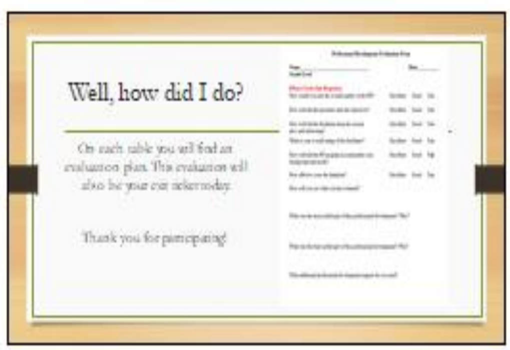

21st Century Learning
Why So Much Technology?


Wakelet
wakelet
How to create a Collection


Wakelet
Math


How could this work for teachers?


Time to Plan!
S
M
A
R
T
TIME TO PLAN


Well, how did I do?
On each table you will find an evaluation plan. This evaluation will also be your exit ticket today.
Thank you for participating!

Summative Evaluation

Name______________________________________ **Date**___________

Grade Level

(Please Circle One Response)

How would you rate the overall quality of the PD?	Excellent	Good	Fair
How well did the presenter state the objectives?	Excellent	Good	Fair
How well did the facilitator keep the session alive and interesting?	Excellent	Good	Fair
What is your overall rating of the facilitator?	Excellent	Good	Fair
How well did the PD program accommodate your background and needs?	Excellent	Good	Fair
How useful were the handouts?	Excellent	Good	Fair

How will you use what you have learned?

What was the most useful part of this professional development? Why?

What was the least useful part of this professional development? Why?

What additional professional development/support do you need?

Appendix B: Interview Protocol

Teacher: _______________ Position: _________
Date: _________________ Time: _________

Interviewer: Doctoral Student

Topic of Study: *Rural Educator Perspectives of Teacher Instructional Resources*

Student Performance on Constructed Response Questions

The purpose of this interview will allow me to gather information related to my doctoral study topic of *Rural Educator Perspectives of Teacher Instructional Resources*. Participation in this study is strictly voluntary. The data collected and the participant will be held in the highest confidentiality. I appreciate your participation in this study and your willingness to be interviewed. This interview will last 30 – 45 minutes and, with the permission of the participant, will be recorded. Recording the interview is to ensure a nonbiased approach by the researcher and to accurately depict the responses of the participant. Do you have any questions for me before we get started?

The following questions are derived from research question #1:
What are rural elementary administrator and teacher perceptions about instructional resources and strategies used to teach mathematics?

1. What primary instructional resources and supports do you currently use when teaching mathematics?

2. When teaching students mathematics, what type of instructional resources such as technology or manipulatives do students prefer most? Why?

3. What type of explicit instructional procedures do you use when teaching mathematics?

    a. What types of explicit instructional strategies have you found to be most beneficial to students?
    b. What types of explicit instructional strategies have you found to be least beneficial to students?

4. What instructional resources would you like to have that would assist you when teaching mathematics?

5. Describe an ideal mathematics lesson and the classroom setting to support it.

The following questions are derived from research question #2:

What are rural elementary school administrator and teacher perceptions about professional development to improve mathematics instructional delivery?

6. Describe the professional development program to support mathematics instruction.

    a. What kind of mathematics professional development have you participated in over the last three years?
    b. Are you provided with enough professional development each year? Why?

7. What types of professional development would be most beneficial to mathematics teachers in grade 3-6?

8. What was the most beneficial professional development activity that you participated in over the last year?

    a. What made it different from other professional development activities?

9. Describe your experiences with peer observations?

    a. How important are peer observations to your professional growth?

10. Describe your experiences with peer observations and department meeting exchanges?

    a. Explain how instructional strategies are shared and discussed.

    b. Explain your experiences with collaborative planning.

Thank you for your time.

Do you have any questions for me before we leave?