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Elementary Teachers' Perspectives of Direct Instruction with More Rigorous Mathematics Standards

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Project Study Submitted in Partial Fulfillment

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Abstract

Majestic County Schools (pseudonym), a large southeastern school district, has implemented changes in instruction to align with more rigorous state and national mathematics standards. The rigor of the new standards has led to changes in instruction to help students master the standards with evidence from the state-wide standardized test. Although the district has made curricular changes, over one-third of the students in Grades 3-5 at Flint Elementary are not mastering grade-level standards. This basic qualitative study focuses on one elementary school within the district. The purpose was to understand how teachers implement direct instruction (DI) strategies in the classroom to help students master grade level standards. The study was designed to address the research question by explaining how five upper elementary teachers use DI strategies to teach mathematics at Flint Elementary. The theoretical framework for this study is based on Zig Engelmann's theory of direct instruction. The basic qualitative research design was used to collect rich descriptive details through semi-structured interviews. Purposeful sampling ensured that 5 upper elementary mathematics teachers whose instruction prepares students for standardized testing were invited. Inductive analysis was used to code the interview data and to develop themes. The results showed inconsistent use of DI and a need for professional development. The professional development project was designed to help teachers implement the DI curriculum. The implications for positive social change due to this study include opening the minds of stakeholders on ways to improve DI in mathematics and changes in the way DI is used in mathematics by ensuring that the principles of DI are included in lesson planning and school improvement.

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Section 1: The Problem

The Local Problem

The more rigorous national and state mathematics standards like common core have prompted the need for changes in mathematics instruction. Now, mathematics instruction must focus on procedural and conceptual understanding of the standards through using critical and higher order thinking skills to align with the new standards (Georgia Department of Education [GaDOE], 2015). This requirement has led to a gap between instruction and the expectations with more rigorous mathematics standards in many school districts (Bertelsen et al., 2015). The long tradition of solving problems through using rote memorization and applying a specific algorithm is not enough for students to master these standards (GaDOE, 2018). Like school districts across the country, the leaders in Majestic County (pseudonym) have explored ways for teachers to adapt to the mathematics standards and improve instruction. A new curriculum that aligned with the new standards and promoted procedural and conceptual understanding was necessary for the school district (School Improvement Plan, 2018).

The leaders of the Majestic County School District recognized that designing the mathematics curriculum and instruction to help students master grade-level standards in the early grades leads to a better probability of mastery on standardized tests (School Improvement Plan, 2018). Since students are expected to use mathematical knowledge to help them analyze, reason, represent, and explain their answers in solving problems, providing a curriculum and resources compatible with the expectations for instruction in the Majestic County School District is crucial (School Improvement Plan, 2018). The

district-level changes to support teachers in instruction included adopting and implementing Eureka Math and Go Math which are curricular resources based on direct instruction (DI) (School Improvement Plan, 2018).

Although the Majestic County School District has implemented resources to address the gaps in instruction and learning, standardized test scores show that at least one-third of the students in Grades 3-5 are not at a level of proficiency of grade-level mathematics standards while using the direct instruction curriculum. The proficiency level of achievement is used by educators to determine whether students are performing on grade-level and have mastered the grade-level standards taught during the school year. According to the state department of education, proficient learners demonstrate the knowledge and skills necessary to master grade-level standards specified in Georgia Standards of Excellence. The students are prepared for the next grade level or course and are on track for college and career readiness (GaDOE, 2018). When students are not proficient in grade-level standards, this implies that students are not equipped with all the required skills needed to be successful at the next grade level.

Proficiency in Mathematics Standards using DI

New and more rigorous state mathematics standards have resulted in instructional challenges for teachers as they strive to help students meet grade level expectations on standardized tests (School Improvement Plan, 2018). One challenge for teachers is designing DI to develop procedural and conceptual knowledge. Although using DI is not new to many mathematics teachers, the way that DI must be used is new. Teachers must provide more student-centered learning opportunities and differentiated instruction to

meet the various learning needs (School Improvement Plan, 2018). Although the Majestic County School district is working to help teachers enhance instruction, over one third of the students in Grades 3 through 5 are not mastering grade-level standards based on the state standardized assessment.

Before these standardized test results, the curricular changes included the options of the Go Math or Eureka Math curriculum for instruction. (School Improvement Plan, 2018). Both resources are based on the DI model in which the teacher provides instruction, models problem solving, guides students through sample problems, and then allows students to practice independently. Although the resources are available, how teachers use these resources for instruction in Grades 3-5 is not clear.

These DI resources must be used to prepare students for the state standardized assessments in mathematics which is designed to assess student understanding and the ability to express that understanding of the standards. The ability to reason and thoroughly explain the answers on assessments is necessary for all students to be proficient (Houseworth et al., 2016). With these new requirements, teachers must also use DI to model and guide students through constructing responses using complete sentences and details to show their understanding (School Improvement Plan, 2018).

Flint Elementary (pseudonym), the study site in the Majestic County school district, put goals in place to support teachers with DI curriculum and improve student performance (School Improvement Plan, 2018). This school is composed of one principal, one assistant principal, two counselors, 63 teachers, and over 1000 students. With a large student population, the administrators at Flint Elementary formed a

leadership team composed of the principal, the assistant principal, the counselors, and teacher leaders from Pre-K through fifth grades to address the issues surrounding student proficiency in mathematics. Developing school-wide plans to improve the implementation of DI in mathematics is a major responsibility of the leadership team.

The leadership team developed a school improvement plan specifically for Flint Elementary which revealed several problems to be addressed through instruction. The leaders acknowledged through the school's improvement plan that mathematics achievement in grades K-5 needs to improve (School Improvement Plan, 2018). An inconsistency in the use of mathematical resources across the grade levels was cited as contributing factor to the problem (School Improvement Plan, FY 2018). Furthermore, data analysis by the leadership team shows that students are not fluent in basic facts and they struggle to apply mathematics skills in problem solving (School Improvement Plan, 2018). The plan of action included using the DI curriculum resources approved by the district leaders for instruction to increase those students meeting (proficient) and exceeding (distinguished) on the mathematics portion of the state standardized test (School Improvement Plan, 2018).

In addition, mainstreaming students with special needs and gifted/talented students into regular education classrooms was implemented to increase the proficient and distinguished learners; however, designing DI to meet these varying needs may be challenging for teachers (School Improvement Plan, 2018). The goal of the leadership team was to provide students struggling with mathematics content standards a regular education teacher, a special education teacher, and peer support in the classroom using

the DI model. Teachers are expected to use DI to reach struggling students and enrich understanding for more advanced students. Regardless of the student level of achievement, teachers are expected to provide meaningful mathematics instruction and learning experiences for all students (Taton, 2015). Although this expectation is true, the DI strategies that teachers use to meet these challenges is important for district leaders to understand.

Rationale

Instruction that promotes the development of procedural and conceptual understanding for all students in K-5 education and giving students a strong foundation for future mathematics has become a priority in the Majestic County School District and Flint Elementary (School Improvement Plan, 2018). Leaders in the district understand that with the changes in the standards, curriculum and instructional changes are also necessary. The changes included implementing the DI curriculum resources to help student develop the procedural and conceptual understanding to meet or exceed the expectations on the state standardized assessments (School Improvement Plan, 2018). Although the district has made changes in the curriculum resources used for instruction, how these resources are used is at the discretion of the teacher.

The state standardized test in mathematics for Grades 3-5 changed in 2015 to align with more rigorous standards like common core. Formerly the standardized test was referred to as the Criterion Referenced Competency Test (CRCT). The CRCT was composed of multiple-choice mathematics questions and had been given in the state of Georgia since the Spring of 2000 (GaDOE, 2015). In 2015, the CRCT was eliminated,

and the new Georgia Milestones Assessment was implemented to reflect the changes in the standards. With the new assessment, students must show a deeper understanding of mathematical concepts through applying what they have learned to solve problems (GaDOE, 2015). Short answer and constructed response questions requiring step by step detail are now included on the new standardized assessment making instructional practices a concern for the school districts (GaDOE, 2015). The expectation is for all students including students with disabilities (SWD) perform on grade level by meeting or exceeding standards on the new state standardized assessment.

Through DI curriculum resources, mathematics instruction must address the procedural and conceptual knowledge students need to be successful. The prior mathematical knowledge needed to perform at these higher levels is often an issue for students which also presents an issue for teachers (Edwards & Shen, 2017). In the local school district, students take the state mathematics standardized test for the first time in third grade.

Before third grade, a strong emphasis is placed on reading instruction since students in Grades K-2 are learning to read and comprehend what is read (School Improvement Plan, 2018). Although reading and comprehension skills are also essential in mathematics, less time and focus on mathematics instruction in the lower elementary grades (K-2) makes teaching and learning key concepts in the upper elementary grades (3-5) a challenge for teachers and students (Houseworth et al., 2016; Tables 1-3).

Preparing teachers as they continue to transition to new standards for teaching and learning is an ongoing priority in the Majestic County School District (GaDOE, 2015;

School Improvement Plan, 2018). The district leaders realize that teachers are an integral part of implementing changes in instruction. Although there has been some improvement on the Georgia Milestones Assessment, the improvements are inconsistent from year to year.

Purpose

The purpose of this basic qualitative study is to explore the strategies teachers use and teachers' perspectives of DI in mathematics. In exploring DI, I intended to find how teachers use DI strategies and teachers' perspectives of DI. Through teacher interviews, the effective and ineffective aspects of DI would be revealed to stakeholders within the district. Understanding DI instruction from the teachers' perspective and using that information to make changes that promote student proficiency in mathematics is important. Furthermore, an in-depth look at daily mathematics instruction, could enlighten stakeholders by providing detailed accounts of teachers' experiences with DI.

Evidence of the Problem at the Local Level

With the implementation of a DI curriculum for teaching rigorous standards, over one third of the students in Grades 3-5 are not mastering grade-level standards based on the state standardized assessment results. The 2015 results show that over 40% of students in the upper elementary grades were developing or beginning learners who were not proficient in grade-level standards.

The results of the Spring 2015, 2016, and 2017 Georgia Milestones Assessment suggest that concerns about student performance in mathematics are substantiated. A large portion of the students tested at each grade level during each year were developing

or beginning learners which is a cause for concern within the local schools as well as the district at large.

The Georgia Milestone assessment report for the 2014-2015 school year showed that more than 40% of the students in the upper elementary grades were developing or beginning learners after a year of grade-level DI in mathematics. Although 5th grade has the largest percentage of distinguished learners, it also had the largest percentage of developing or beginning learners.

Table 1

2015 Georgia Milestones Report Summary for Flint Elementary

Grade	Distinguished Learner	Proficient Learner	Developing/Beginning Learner
Third	10.5%	44.4%	45.1%
Fourth	13.4%	46.8%	38.1%
Fifth	15.0%	29.9%	55.1%

For the 2015-2016 school year under DI, there was in increase in the number of developing or beginning learners in both the third and fourth grades. The results for fifth grade show a 12% decrease in the number of developing or beginning learners; however over 40% of the students assessed were still at this level. Furthermore, over 40% of the students tested in all grades for the 2015-2016 school were not proficient in grade level mathematics standards.

Table 2

2016 Georgia Milestones Report Summary for Flint Elementary

Grade	Distinguished Learner	Proficient Learner	Developing/Beginning Learner
Third	12.4%	39.8%	47.4%
Fourth	14.9%	41.0%	43.1%
Fifth	15.8%	41.0%	43.1%

The report for the 2016-2017 school year shows an inconsistency for the fifth grade with over 50% of the students being developing or beginning learners. There was a 12% decrease in the number of developing or beginning learners in the third grade and an 8.5 % decrease in the fourth grade. Although the third and fourth grade results were better, still over 30% of the students tested were not proficient at grade level standards using DI.

Table 3

2017 Georgia Milestones Report Summary for Flint Elementary

Grade	Distinguished Learner	Proficient Learner	Developing/Beginning Learner
Third	17.9%	46.9%	35.2%
Fourth	20.6%	44.8%	34.6%
Fifth	18.5%	28.8%	52.7%

Evidence of the Problem from the Professional Literature

Mathematics performance in elementary grades has been a consistent concern shown throughout professional literature. Furthermore, with the advances in technology and the effects of the No Child Left Behind (NCLB) Act recently renamed Every Student Succeeds Act (ESSA), mathematics has been considered a serious area of concern for K-12 education (U. S. Department of Education, 2016). These concerns are validated when comparing the increased rigor of the new standards with the previous standards which failed to promote critical and higher-level thinking (Conley, 2014).

The transition of the standards to daily mathematics instruction has presented a challenge for teachers as they design instruction to meet the rigor of the standards and the needs of the students. Considering that the new mathematics standards are completely different from the previous standards, there is great emphasis on teacher instruction in correlation to student success (Chestnut & Swars, 2016). Consequently, the connections that teachers make between the language of standards and designing instruction are crucial to the success of the students (Taton, 2015). The biggest challenge with translating the language of the standards into instruction is the tendency for teachers to take a traditional approach to mathematics (Kent, 2014). Teachers must be willing to take risks in instruction and be open to new innovative ideas for students to be successful in mastering these standards (Orange, 2014).

Definition of Terms

Conceptual knowledge: One's mental representation of the principles that govern a domain (Fyfe et al., 2016).

Developing/beginning learning: The level at which students are performing below the mastery level of standards on the Georgia Milestones Assessment. (Georgia Department of Education, 2017).

Distinguished learner: The level at which students are performing above the mastery level of standards on the Georgia Milestones Assessment. (Georgia Department of Education, 2017).

Foundation skills: Basic mathematic skills student need in the elementary grades to do more advanced mathematics (Clements & Sarama, 2016).

Procedural knowledge: The ability to execute action sequences to solve problems (Fyfe et al., 2016).

Proficient learner: The level at which students are expected to perform to master standards on the Georgia Milestones Assessment. (Georgia Department of Education, 2017).

Significance of the Study

With the changes in the standards, Flint Elementary School has made efforts to improve mathematics instruction in a way that promotes the rigor needed for instruction and learning (School Improvement Plan, 2018). Despite these efforts, a significant percentage of the students are not mastering grade-level standards. Exploring direct instructional strategies and teacher perspectives of DI could benefit teachers, students,

and the administration to improve instruction at Flint Elementary. Teachers would benefit from the findings about DI and could use those findings to improve planning and instruction for DI in mathematics. The administration would benefit from learning how teachers are using DI, the strategies, and teachers' perspectives of DI. This information is important for administration to understand how DI is used by teachers and explore how the findings could be used to develop future school improvement plans.

With good foundational instruction in mathematics, students have a stronger prediction of later success despite other factors such as family background and learning difficulties (Clements & Sarama, 2016). Based on the school improvement plan, the teachers at Flint Elementary will work to improve student mastery on standardized tests by focusing on instruction and the resources used to assist with instruction (School Improvement Plan, 2016). Instructional resources and the mathematics curriculum were designed to help create change in practices by increasing expectations for all students. According to recent research, students with low skill levels in mathematics are more likely to make improvements over time if they are exposed to the same rigor as their peers (Clements & Sarama, 2016).

The mathematics teachers at Flint Elementary personally understand the operations of the classroom; therefore, their perspectives on instruction of the mathematics curriculum could be useful to the local school district. The daily teacher interaction with the students gives them a deeper understanding of student instructional needs. Furthermore, teachers would provide rich qualitative data that can help in improving instruction and student performance in mathematics. Neglecting teacher

perspectives could result in future changes that are ineffective but including teachers' perspective could provide an informed implementation of new ideas. Through this study, teachers will express their views on DI.

Research Question

The research question is designed to gain an understanding of teacher perspectives of instruction since the implementation of the new mathematics standards. How teachers view DI and the effective or ineffective aspects of DI is important information for school and district leaders. The guiding question in this basic qualitative study was also designed to research mathematics instruction from the perspective of the third through fifth grade mathematics teachers at Flint Elementary. This qualitative study will reveal information about the mathematics instruction through interviews. Open ended interview questions will be designed to answer these research questions.

The following guiding research question for this qualitative study are designed to gain a better understanding of DI at Flint Elementary.

Research Question**:** How do elementary teachers use direct instructional strategies to teach mathematics?

Review of the Literature

Introduction

The literature review focuses on the instruction of more rigorous standards like common core with the topics of the new standards for instruction, teacher instruction, direct instruction, and professional development for instruction. The Education Research Complete database in EBSCOhost were used to specifically research peer reviewed

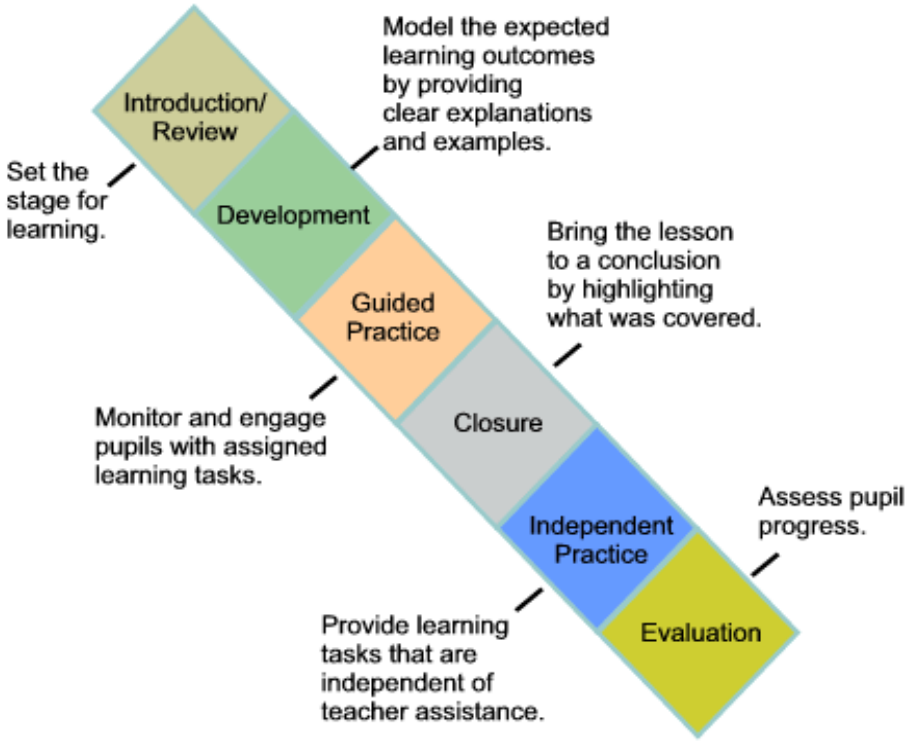
articles with information concerning *common core or similar rigorous mathematics standards, teacher influence or perspectives on mathematics*, *mathematics instruction*, *teacher instruction*, *direct instruction*, and *professional knowledge of mathematics*. A variety of search terms were used to find current peer-reviewed articles such as teacher perspectives, Common Core, mathematics, elementary mathematics, learning mathematics, professional knowledge of mathematics teachers, mathematics instruction, direct instruction, and learning theories. The themes presented from the literature include: (a) conceptual framework, (b) role of the teacher, (c) rigorous mathematics standards, (d) challenges in instruction of the new standards, (e) teacher instruction, and (f) teacher professional knowledge of instruction.

Conceptual Framework

The conceptual framework of this qualitative study is based on the DI and Siegfried Engelmann's theory of direct instruction. Engelmann believed that correctly applied DI can improve academic performance as well as certain affective behaviours (National Institute for Direct Instruction, 2015). DI is a model for teaching that emphasizes well-developed and carefully planned lessons designed around small learning increments and clearly defined and prescribed teaching tasks (See Figure 1). It is based on the theory that clear instruction eliminating misinterpretations can greatly improve and accelerate learning (National Institute for Direct Instruction, 2015). This instruction includes introduction and review, development, guided practice, closure, independent practice, and evaluation (See Figure 1).

Figure 1

Direct Instruction Model



Note: This figure describes the order and parts of a DI lesson (National Institute for Direct Instruction, 2015):

DI operates on five key philosophical principles (National Institute for Direct Instruction, 2015):

- All children can be taught.
- All children can improve academically and in terms of self-image.
- All teachers can succeed if provided with adequate training and materials.
- Low performers and disadvantaged learners must be taught at a faster rate than typically occurs if they are to catch up to their higher-performing peers.

- All details of instruction must be controlled to minimize the chance of students' misinterpreting the information being taught and to maximize the reinforcing effect of instruction

There are four main features of DI that ensure students learn faster and more efficiently than any other program or technique available:

1. Students are placed in instruction at their skill level.

   When students begin a DI program, each student is assessed to find out which skills they have already mastered and which ones they need to work on. From this, students are grouped together with other students needing to work on the same skills. These groups are organized by the level of the program that is appropriate for students, rather than the grade level the students are in (National Institute for Direct Instruction, 2015).

2. The program's structure is designed to ensure mastery of the content.

   The program is organized so that skills are introduced gradually, giving children a chance to learn those skills and apply them before being required to learn another new set of skills. Only 10% of each lesson is new material. The remaining 90% of each lesson's content is review and application of skills students have already learned but need to practice with in order to master. Skills and concepts are taught in isolation and then integrated with other skills into more sophisticated, higher-level applications. All details of instruction are controlled to minimize the chance of students' misinterpreting the information being taught and to maximize the reinforcing effect of instruction (National Institute for Direct Instruction, 2015).

3. Instruction is modified to accommodate each student's rate of learning.

   A particularly wonderful part about DI is that students are retaught or accelerated at the rate at which they learn. If they need more practice with a specific skill, teachers can provide the additional instruction within the program to ensure students master the skill. Conversely, if a student is easily acquiring the new skills and needs to advance to the next level, students can be moved to a new placement so that they may continue adding to the skills they already possess (National Institute for Direct Instruction, 2015).

4. Programs are field tested and revised before publication.

   DI programs are very unique in the way they are written and revised before publication. All DI programs are field tested with real students and revised based on those tests before they are ever published (National Institute for Direct Instruction, 2015).

The theory of direct instruction relates to my qualitative study because of the data than can potentially be gained from exploring the DI strategies, teachers use of DI strategies, and teachers' perspectives of DI in mathematics based on the principles of this theory. The principles of DI were used in designing the interview questions and the lesson plan protocol to answer the research questions. These principles will also be evident in developing categories when analyzing the data. One important construct of DI is that all students are capable of learning (National Institute for Direct Instruction, 2015). The problem of over 30% in the third through the fifth grade students performing below proficiency in mathematics is related to this principle. This principle is also supported in

recent research which suggests that DI strategies can be used to meet the unique instructional needs of individual learners. This also helps students to build confidence in their mathematic abilities which also improves their self-image. Exploring the DI strategies teachers use could reveal how teachers are controlling instruction to minimize student misinterpretations and maximize the effect of instruction for students (National Institute for Direct Instruction, 2015). Exploring DI strategies, teacher perspectives of DI, and reviewing lesson plans could enlighten stakeholders on how teachers use DI for low performing and disadvantaged students. When using DI in teaching mathematics maintaining the five key philosophical principles of DI is an important part of planning and designing instruction.

The framework relates to this qualitative study in several ways. The research question that will be addressed in this study are how teachers use DI strategies in classroom instruction. To answer this research question, the principles of DI according to the theory of direct instruction will be explored. The principles of DI were used in the development of the questions for the interview protocol. In the data analysis process, the principles of DI will also be considered when analyzing the data. As themes emerge during coding process and inductive analysis, it is important to consider how it is related to the principles of DI in the framework.

Critical Review of the Literature

Role of the Teacher

Educators are often viewed as experts by their students. Therefore, expertise in the subject matter that is taught is essential. Many students admire their teachers and trust

that they will impart research-based mathematical knowledge (Blazar et al., 2017). For this to occur, educators must stay abreast of the current standards in education and devise ways to implement strategies relevant to their instruction. The limits of the learning environment can make things challenging for students; however, educators with the appropriate tools and support are able to persuade students to change their attitudes and take an active role in their learning (Rosario & Widmeyer, 2009).

Teachers have a responsibility to ensure that students have the core knowledge to build upon and decipher complex mathematics problems. Teachers should realize that "DI is a comprehensive set of prescriptions for organizing instruction so that students acquire, retain, and generalize new learning in a humane, efficient and most effective manner as possible" (Derby et al., 2017, p. 260). It is equally important for teachers to develop strategies that foster strong mathematics skills in elementary education as it is for students to become proficient in those skills (Heyd-Metzuyanim et al., 2016).

Teaching with an understanding of how students develop critical thinking, and the problem-solving skills helps students reach proficiency on standardized tests (Afzal et al., 2014; Fyfe et al., 2016). Teachers who design instruction that encourages students to perform at this level increase student chances of being successful learners. The increased understanding of the student increases standardized test scores implying that an emphasis on core knowledge and understanding results in better performance gains on standardized tests (Hopkins et al., 2018). Therefore, teachers have a responsibility to ensure that students have the core knowledge to build upon and decipher complex mathematics problems.

Independent practice and time for students to learn through their practice is a crucial stage of DI and is significant to student learning. Creating this type of learning environment allows students to demonstrate what they have learned and receive guidance from their teachers and peers to alleviate misunderstandings (Timmerman, 2014). Knowledge construction through social interactions and life experience enables students to have a role in their learning (Mudrikah, 2016). Teacher facilitation during independent practice is a necessary component for teachers to evaluate instruction, provide feedback and guidance to students, and plan future lessons.

Despite the learning environment, DI could be effective in teaching new concepts such as geometry and time. Researchers have revealed that students perform better in geometry when teachers model a strategy with students following the same steps modeled (Zhang, 2017). DI can also be effective in telling time and elapsed time when students are given the opportunity for guided practice and real-world application. In this case, students must be given opportunities to tell-time at various times of the day using analog as well as digital clocks (Derby et al., 2017). Teachers may use these opportunities to help students build on their acquired knowledge.

DI can present challenges for teachers and students who are developing learners or students with disabilities (SWD). With a greater focus on problem solving using critical thinking skills, logical reasoning, and learning and retaining basic mathematical facts, some students need additional support (Mudrikah, 2016). Teachers must help students communicate their mathematical understanding and knowledge to others by providing clear explanations. Moreover, teachers must help developing learners and

SWD master the same grade-level standards regardless of their prior knowledge and capabilities (Mudrikah, 2016).

The role of the teacher being the model during DI comes with some criticism. One criticism is that teachers model a procedure and then have students complete a problem set using the same procedures without an in-depth understanding of how to solve the problem (Correnti et al., 2017). Based on the research, teacher modeling during instruction is not enough for students to develop procedural and conceptual understanding. Instead of modeling alone, teachers should use scaffolding in DI when teaching complex mathematical concepts (Correnti et al., 2017). This enhances student learning through chunking information to increase mathematical understanding (Correnti et al., 2017). Teacher support through scaffolding prevents frustrations when students attempt to solve problems (Bishop et al., 2018). Another issue with teachers modeling during DI is that students are given all the information relative to solving the problems without students having a complete understanding (Bishop et al., 2018). However, using scaffolding in conjunction with modeling gives students the added support that is needed when students attempt to solve complex mathematical problems.

Another role of the teacher in DI is providing feedback to students. Teacher feedback allows students to learn by understanding and then correcting their mistakes (Bishop et al., 2018). Without the feedback and support of the teacher, students become confused and have mathematical misunderstandings (Bishop et al., 2018). Teacher feedback helps to increase the performance for students performing below grade level by eliminating those misunderstandings (Gavin, et al., 2018). Teachers and students can also

use this feedback to plan and set learning goals (Gavin et.al., 2018). When students are given feedback, they are able to make necessary corrections, build their confidence in mathematics, and increase their performance.

Rigorous Mathematics Standards

More rigorous standards like the national common core standards were developed and adopted by many states in 2010 (Conley, 2014). The common core standards are research-based standards developed from student learning patterns over time with clear learning goals to lead students to college and a career readiness (Chestnut & Swars, 2016). These standards were designed to ultimately help all students gain a college education and have a successful career in any state across the nation (Jeffrey et al., 2014; Johns, 2015; Osbourne, 2015). Rigorous mathematics standards were also designed to equip students to function in a world that consistently changes and requires more critical thinking skills to be successful (Saragih & Napitupulu, 2015). Furthermore, the new standards require elementary students to interpret and demonstrate understanding of mathematics content by written explanations and using visual representations or models to solve problems (Berkowitz et al., 2016).

Considering these standards, instruction to help students construct knowledge are determining factors for student achievement (Hopkins et al., 2018). To help students focus and to increase student achievement, teachers should provide opportunities for student-centered mathematical pedagogies (Napitupulu & Saragih, 2015). With the recent mathematics reforms, students must understand the reasoning behind the procedures for solving problems. For example, students may know that 8 x 4 = 32, but students must

also know that 8 groups of apples with 4 apples in each group could be solved by multiplying 8 and 4. Furthermore, students should understand that the factors 4 and 8 have a product of 32. As a result of instruction that constructs knowledge, students will appreciate mathematics with less fear of using reasoning and applying knowledge to solve problems (Hopkins et al., 2018).

A concern with the implementation of new mathematics standards is that the language of the standards is sometimes unclear, vague, and left to teachers to interpret (Polikoff, 2015). When this happens, there is inconsistency in depth of instruction and student mastery of the standard. Another issue with understanding the language of the standards is the tendency for teachers to design instruction based on the curriculum instead of the standards (Gao & Kosko, 2017). This may cause gaps in instruction and learning resulting in less than proficient performance on standardized tests (Gao & Kosko, 2017). Teachers should use the curriculum as a resource for instruction of the standards. Therefore, teachers must have a clear understanding of the standard and what the learner is supposed to know or do in order to design affective instruction (Hand et al., 2016).

Challenges in Instruction of the New Standards

For the instruction of mathematics standards based on the curriculum, teachers are required to make significant changes in their daily instructional practices. The curriculum support to help guide teachers through the standards is critical to successful teaching and learning (Hopkins et al., 2018). Veteran as well as novice teachers have preconceived ideas about teaching and how students learn mathematics which could prevent utilizing

the curriculum or changing their instructional strategies (Hopkins et al., 2018). Therefore, teachers must change their beliefs and practices to align with the new curriculum and standards.

There are significant mathematical issues with conceptual understanding and the ability to reason according to the new standards (Browning et al., 2014). On the Program for International Student Assessment (PISA), only 18.2% of the students in the U. S. reached the minimal expected level of performance in problem solving (Duggar et al., 2014). The results imply that U.S. students were able to solve simple problems but struggled with problems that required higher order thinking skills (Duggar, et al., 2014). Higher order thinking skills require students to reason, build on prior knowledge, or perform multiple steps to solve one problem. Third grade students may be given a word problem in which they must use subtraction, but to completely solve the problem students must also use division and find the quotient. For example: *Timothy had 65 matchbox cars before he lost 9 of them. He wants to share the cars he has left equally with 8 friends. How many cars will Timothy and his eight friends get?* The third-grade students must also understand that 9 people, Timothy and 8 friends, are equally sharing the matchbox cars. Many students are able to solve a portion of problems like these, but struggle with the multiple steps involved for the final answer (Duggar et al., 2014).

The challenges with the new mathematics standards and student performance include a lack of foundational knowledge and comprehension (Satriani & Sumantri, 2016). Students who lack basic foundational mathematical knowledge such as number sense have difficulty performing on grade level and thus mastering grade-level standards

(Vasudha & Venkatesan, 2014). The lack of foundational knowledge is evident in subtraction with regrouping since students must understand the value of the individual numbers in the problem as well as the whole number. *For example, the number 643 is equivalent to 600+40+3 and 6 hundreds, 4 tens, and 3 ones.* Students may also struggle with comprehending problems which leads to difficulty with solving word problems and problems that require a written or constructed response (Avdyli et al., 2017). When students struggle with reading and comprehending problems, it is a challenge to explain how to solve the problem in detail with a written or constructed response. Not only do students need to possess knowledge for mastering grade-level of the standards, but they also need to understand how and when to apply the mathematical knowledge to be productive (Duggar, et al., 2014). For example, students may know how to multiply or divide, but they must also understand the language in the problems that implies that they need to multiply or divide. The language support teachers provide while teaching mathematics is imperative to help students who struggle to understand mathematics problems (Ambrocio et al., 2015).

Making improvements in content-specific instruction, like mathematics, is necessary given the link between teacher instruction and student performance (Blazar et al., 2017). Many problems with mathematics stem from the fact that teachers are expected to deeply understand the mathematics content and prepare students for success without proper training (Osborne, 2015). Research-based instructional approaches that promote contextual learning of both mathematics content and reasoning are crucial as states implement new standards like Common Core (Kiuhara & Witzel, 2014). Research-

based approaches to instruction of this kind have the rigor students need to be successful on grade-level standards and standardized tests. Overall student achievement can be linked to teacher knowledge in mathematics content and the ability to implement technology in instruction and learning (Killion, 2015).

Conceptual understanding beyond traditional algorithms is an area of concern for teachers and students (Roy et al., 2014). Many elementary students can use algorithms to solve problems but fail to understand or lack the ability to explain the mathematical concept (Chen & Lee, 2015). When students are able to explain mathematical concepts, there is a clear understanding of the meaning behind the procedural algorithm (Roy et al., 2014). For example, students would understand in subtracting 321-140 that 3 hundreds, 2 tens, and 0 ones is equivalent to 3 hundreds, 1 ten, and 10 ones when regrouping.

Improving mathematics achievement considering the new standards begins with conceptual understanding, coherence, and alignment in K-8 grades (Maccini et al., 2014). Mathematical concepts taught in earlier grades must be taught in a way that correlates with future concepts (Kastberg & Morton, 2014). Since many mathematical concepts serve as prerequisites for others, vertical alignment of instruction from grade to grade is important to student achievement.

To improve mathematics achievement, teachers must also help students learn basic algorithms in addition to providing instruction that develops a deep conceptual understanding of the mathematics problem (Browning et al., 2014). Unless teachers incorporate this type of instruction, students are likely to have more problems as they progress to more complex problem or multi-step problems that are imperative for mastery

of elementary mathematics standards (McLaughlin et al., 2014). Furthermore, teachers are helping students master the standards along with building confidence in mathematics which is important for students as problems become more complex (Chestnut & Swars, 2016). By helping students apply the concepts they have learned, teacher will provide students with a deeper conceptual understanding which transcends traditional mathematics (Cenk et al., 2014).

Instructing students on problem-solving strategies is also critical to student success. The National Council of Teachers of Mathematics (NCTM, 2000) recommended that students be taught a variety of strategies to work through complex mathematical concepts (Houseworth et al., 2016). One strategy is teaching students to use visual representations or models of problems which allows students to make abstract ideas relevant to their world and understanding (Houseworth et al., 2016). Students have a greater chance of success when they can comprehend, model, and select a proper operation to solve a problem (Tokac & Velasquez, 2014). Another strategy is teaching students key vocabulary words relevant to the operations used to solve problems. Teachers may teach students to underline or highlight these words. Understanding the vocabulary words that imply operations such as multiplication and division is necessary to solve problems successfully (Ambrocio et al., 2015). Teaching problem solving skills in this way goes beyond traditional mathematics of algorithms and recalling facts (Cenk et al., 2014).

Instruction and achievement of SWD is a major area of concern in mathematics (Schulte & Stevens, 2015). Although this is a concern, strategies to improve performance

and close the achievement gap for SWD are limited (Everett et al., 2014). When students fail to master important learning skills, teachers must devise ways to help struggling learners master the mathematics standards (Bell & Pape, 2014). Evidence shows that SWD tend to struggle with fact retrieval regardless of their cognitive abilities (Codding et al., 2016). Therefore, teachers must be creative in providing ways to help these students remember basic facts. Solving word problems is also a greater challenge for SWD because of barriers in reading and deciphering the language of the problem in addition to solving it (Bottge et al., 2014). When SWD have a difficult time reading and understanding a problem, then solving the problem correctly becomes less likely. SWD may have some knowledge related to solving mathematics problems, but they are more likely to make mistakes when multiple steps are involved (Bottge et al., 2014). SWD often answer only part of multiple step problems or solve the problem using the wrong operation (Zhang, 2017).

Mathematics instruction in inclusion classrooms is also a challenge for SWD. Although many states in U.S. have shifted to more rigorous standards like common core, inclusion in regular education classrooms as opposed to special education classrooms is still the dominant practice for SWD (Compton et al., 2015). This presents a challenge for teachers to ensure that SWD receive an equivalent education to their peers (Huang et al., 2014). With different learning abilities in the classroom, it is a challenge to meet the learning needs of all students (Compton et al., 2015).

Despite the challenges with instruction and meeting more rigorous standards, increased student performance in mathematics is more promising for school systems

implementing these standards and designing their curriculum around these standards (Bottge et al., 2014). Research shows that students are more successful in conceptual understanding of mathematics when these standards are implemented. Understanding problem solving based on more rigorous standards increases student performance by helping students transform formal thinking and attitudes about mathematics into more creative and flexible ones (Ahtee et al., 2014).

In implementing these standards, it is imperative that the teachers maintain the integrity of the in-depth standards by refusing to resort to conventional teacher-centered tasks which fail to support procedural and conceptual understanding (Neale et al., 2014). This is especially true for teachers when it involves promoting mathematical creativity which encourages students to find connections in different domains and devise solutions to problems (Panaoura & Panaoura, 2014). Theoretically, school systems implementing and designing the curriculum around the common core standards despite the challenges produce students with the skills and knowledge needed to be successful in college (Conley, 2014).

Teacher Instruction

Since teachers and their instructional strategies are a primary influence on student learning, educators should carefully consider the strategies they use (Gest et al., 2014). This requires teachers to understand how students think and learn to design meaningful instruction that benefits students (Edgington et al., 2015). Depending on the task, teachers should use DI strategies to support the creative abilities of students and encourage them to use their creative abilities in constructing written responses to complex mathematical

questions (Edwards & Shen, 2017). Teachers must also override the natural desire to impose their own teaching strategies and the way they were taught when it contradicts research and the language and goals of the standards (Edgington, et al., 2015).

With the implementation of the new standards and standardized tests, accountability for teacher instruction is more crucial than ever. Due to the recent gaps in standardized test results, teachers are expected to be accountable for understanding mathematics that is evident in classroom observations and teacher instruction (Blazar et al., 2017). Teachers who demonstrate accountability for instruction in a caring, but challenging environment produce more positive results based on student assessments (Blazar et al., 2017). Furthermore, teachers taking accountability for mathematical knowledge should not be minimized; teachers should have in-depth comprehensive knowledge of mathematics to teach students (Chestnut & Swars, 2016). Moreover, the implementation of the standards and success of instruction in the classroom is dependent upon in-depth knowledge (Quan, 2016). To use effective instructional strategies, teachers must be accountable for understanding the content of the standards, the prior knowledge that students must have, and the teaching strategies that help students master these standards (Edgington, et al., 2015).

Collaborating can provide teachers with opportunities to share and increase mathematical understanding and knowledge for themselves, colleagues, and stakeholders (Quan, 2016). In fact, school districts should encourage excellent teacher leaders to share mathematical knowledge gained from research or professional development with their colleagues and stakeholders (Green & Kent, 2016). Conversations with parents about

standards and expectations in mathematics can be beneficial. Involving parents in the learning process is a way for teachers to express learning goals and expectations which could potentially impact their perspective of the new mathematics standards and instruction (Fish et al., 2014; Quan, 2016).

Teacher instruction with the use of technology is an important part of DI in the modern age. Technology allows teachers to personalize assignments and consistently collect formative assessment data which could inform instruction (Cayton-Hodges et al., 2015). With technology, teachers are able to make assignments to specific students based on their learning needs. This provides flexibility and choices for students that cater to individual learning styles while making learning interesting and exciting (Taylor, 2014). Computer-based mathematics can also help students to relate mathematical concepts to real-life experiences by giving them virtual learning experiences that are otherwise impossible in a classroom environment without technology (Martin, 2017). Examples of using technology in DI include using an interactive board and various interactive manipulatives and features to display a digital textbook for instruction.

Teacher Professional Knowledge of Mathematics Instruction

Mathematics is not typically an area of strength for most elementary teachers so opportunities for teachers to increase their knowledge and understanding are important to instruction (Chestnut & Swars, 2016). Inadequate training makes some teachers timid about teaching and promoting the importance of mathematics to their students (Edwards & Shen, 2017). Teachers at the Flint Elementary and many teachers nationally tend to lack the skills and training necessary for teaching mathematics in the way that promotes

higher level thinking; therefore, it is necessary to emphasize improvement on teaching skills (Ball et al., 2016). Since the expectations for teachers and students have increased with the implementation of new standards, there is a need for schools and districts to provide specialized content training for teachers to be successful in the classroom (Orange, 2014; Superfine, 2014).

Educators should also take responsibility for their own learning to enhance instruction and increase student achievement (Desimone et al., 2016). The humanistic approach of professional accountability declares that everyone is able to and should strive for better (Desimone et al., 2016). To become better, teachers at Flint Elementary would benefit from increased professional knowledge in mathematics. A greater professional knowledge could break traditional mathematical ideologies which lack the intensity needed to teach more rigorous standards (Desimone et al., 2016). Professional knowledge for mathematics teachers should reflect the needs of the school community with the ultimate results in mind (Desimone et al., 2016).

Teachers need more in-depth, research-based training to teach mathematics instead of relying on an undergraduate degree alone (Francis-Poscente & Friesen, 2014). Through consistent professional development, teachers can alter their views of instructional reform and reflect on how a student learns (Albano et al., 2017; Jarry-Shore & Mcneil, 2014). When teachers in the district have a clear understanding of how students learn, they are better equipped to help students become proficient in the more rigorous mathematics standards (School Improvement Plan, 2018).

Educators with instructional training to lead students towards higher level mathematical thinking are the most effective teachers. Learning ways to support and encourage students while teaching higher level thinking strategies makes students comfortable and gives them a sense of community. This inspires students to work hard despite the learning challenges (Chestnut & Swars, 2016). When teachers can focus on higher level thinking skills, students develop a conceptual understanding of mathematics which increases student confidence in their mathematical abilities (Eccles & Upadyaya, 2014). It is also imperative that teachers learn and understand problems students have with learning higher level thinking skills. Learning about these problems would help teachers develop plans to address the needs of these students. Training for mathematics teachers would help them teach higher order thinking skills and provide an environment that is conducive for learning (Corredor et al., 2015).

Assuming that teachers have the knowledge and resources needed to foster the learning styles of every student is unrealistic thinking (Fadiana, 2015). Teachers may or may not be trained to meet the learning styles of all students. This could lead to teacher frustrations due to a lack of professional knowledge and teacher support (Kutaka et al., 2017). School leadership can be instrumental in providing support for teachers through professional development initiatives that help teachers address student learning needs (Jarry-Shore & McNeil, 2014).

Implications

A potential project for this study may be professional development. With the changes in the mathematics standards, continued education for teachers may be necessary

to learn more about DI. Professional development could help teachers who struggle with direct instructional strategies. The positive impact professional development could have teacher instruction and student performance are worthy of focusing on professional knowledge to equip teachers (Berkowitz, et al., 2016)

The anticipated findings from interview data include identification of patterns, trends, and factors that are related to direct instructional strategies and teachers' perspectives of DI. Another implication could possibly include contradictory perspectives of DI. Possible project directions based on anticipated findings include Professional Development training on DI and direct instructional strategies.

Summary

More rigorous standards and greater expectations in mathematics have caused concerns related to instruction and learning in the Majestic County School District. Substantial changes for standardized assessments have resulted in a substantial number of students failing to meet requirements for grade level standards; therefore, the district has adopted and implemented a DI curriculum and resources to improve mathematics instruction. Flint Elementary implemented these changes to address the need for students to develop procedural and conceptual understanding of the mathematics standards.

Research reveals that developing mathematical skills in the elementary grades is necessary for students to be successful. The direct instructional strategies teachers use and teachers' perspectives of DI would provide valuable insight for the instructional and learning needs at Flint Elementary and the district. Through this research, school and district leaders may gain vital information for future improvements in DI. The research

may also open more opportunities for teachers to share in making decisions for DI and learning in the Majestic County school district.

Section 2: The Methodology

Research Design and Approach

Introduction

The purpose of this study was to explore the DI strategies teachers use and teachers' perspectives of DI in mathematics. With the qualitive research method, I interviewed five teacher participants. Purposeful sampling was used to solicit participation in this study. These teachers provided rich qualitative data that would help in understanding how DI is used with the recent curricular changes. Protecting the rights and the identities of the potential participants was a priority. Once the data were collected, it was coded and analyzed with the assistance of a computer program. The interview data collection was validated through member checking after they were analyzed.

Research Design

For this research study, a basic qualitative study was the most appropriate research design for the study of elementary teachers' perspectives of direct instruction with the implementation of more rigorous standards. In this study, teachers' perspectives of direct instruction were explored through interviews. Data from interviews were explored to develop a deeper understanding of how teachers use direct instructional strategies in the classroom. A basic qualitative study was the most effective choice to answer the research question of how teachers' use DI instructional strategies. Answering this question involved gathering data about the personal experiences of teachers while

implementing DI. The study design was important because it would allow the researcher as well as stakeholders to learn about DI through interview data.

Based on my research study, other research designs were not appropriate. After careful consideration, I chose the basic qualitative study design. With a basic qualitative research design, the researcher is interested in "how people interpret their experiences and what meaning they attribute to their experience" but researcher's "overall purpose is to understand how people make sense of their lives and experiences" (Merriam & Tisdell, 2016, p. 936). Basic qualitative research is commonly found in the education field with interviews, observations, or document analysis as options for data collection (Merriam & Tisdell, 2016).

Other qualitative research designs have an "additional dimension" that is not necessary in answering the research question (Merriam & Tisdell, 2016, p. 943). Using the phenomenology research design was not suitable for this research study since phenomenology focuses on lived human experiences and how these experiences are transformed into consciousness (Creswell & Poth, 2016; Merriam, 2009). An ethnography was also alleviated because the concentration on "human society and culture" which "essentially refers to the beliefs, values, and attitudes that structure the behavior pattern of a specific group of people" (Creswell & Poth 2016; Merriam, 2009, p. 27).

Grounded theory, another qualitative research design, was not the best option because theory which is grounded emerges after data is collected. In a narrative, the researcher tells the stories with first person details of experiences of the participants

(Creswell & Poth 2016; Merriam, 2009). The narrative research design is based on researching the details of someone's life (Creswell & Poth, 2016). An intrinsic case study is an "in-depth description and analysis of a case" (Creswell & Poth, 2016, p. 103) Therefore, I concluded that basic qualitive research would be the best design to understand elementary teachers' perspectives of direct instruction in mathematics.

Research Method

The research method for this study was the qualitative research method. Qualitative research method involves collecting rich descriptive data to understand a situation and to address the research questions (Creswell & Poth, 2016). Although my qualitative research method could lead to more research using the quantitative method, it was not the best choice for the initial research project study. A mixed method study was not warranted in this case since numerical data was not used to capture the DI strategies teachers use or teachers' perspective of DI (Merriam, 2009). Therefore, the qualitative research method was the best option for my research project.

Participants

Sampling Procedures

A purposeful sampling strategy was used to identify and then select five upper elementary mathematics teachers at the research site. Since I am employed at the research site, I knew who the potential participants were. The purposeful sampling strategy was appropriate in this study because exploring DI in mathematics would require specific teachers to share their direct instructional strategies and their perspectives of DI. These

specific participants were upper elementary mathematics teachers with students required to take the Georgia Milestone state assessment.

The sample size in this study was five of the possible eight upper elementary mathematics teachers at Flint Elementary. The sample size for this basic qualitative study was conducive to developing themes and conducting inductive analysis. Furthermore, the sample could provide data to address the research question through providing insight for DI.

Criteria for Participants

Criteria for participants and timeframes included the following requirements necessary for participation in the study: (a) The participant must teach mathematics (the subject area being studied); (b) The participant must teach in grades 3-5 (grades for standardized testing); and (c) Participants must be available for an hour interview.

Before my research begins, I requested permission to conduct my study from Walden's Institutional Review Board (IRB). Then, I requested permission from the principal of Flint Elementary and the Majestic County Board of Education. Once permission for research was approved, the process to solicit participation in the study began. The potential participants were invited to participate in the basic qualitative study by a formal invitation explaining the purpose of the study and the expectations for the interview process. Due to Covid-19 restrictions and school being closed, I emailed the invitation instead of using a sealed envelope and placing it in the teacher mailboxes of the potential participants. In addition to the formal invitation, the potential participants were asked to respond to the email if they consented instead of signing and returning the

consent form to my teacher mailbox. There was no need for the potential participants to receive another plain envelope to seal and return their response. The potential participants responded with “I consent” to participate in the study. I requested that the potential participants respond to my email within 2 weeks.

Protection of Human Rights

The IRB ensured that all ethical issues were considered to protect the rights of all participants in this qualitative study (Creswell, 2012). Protecting the rights of the participants in this study was crucial. If the potential participants agreed to become a part of the study, “I consent” was emailed back to me instead of the form being placed in a provided envelope, sealed, and placed in my teacher mailbox. I retained a copy of the emailed consent that I received from each participant. Copies of the emailed consent that I receive from each participant were printed and stored in a locked file cabinet in my home office. These emails were stored at the end of the day that I received them. I ensured that the potential participants for the basic qualitative study felt confident that the information shared during the interview will only be used for the purpose of the study and not shared with anyone else to protect their privacy. Recordings of the interviews and transcriptions were kept in a locked file cabinet in my home office immediately after they were completed daily. All digital files were stored on an external hard drive with password protection. To ensure continued confidentiality, all of these documents will be destroyed by shredding or complete deletion of external hard drives within 5 years of my doctorate completion and conferral.

With the potential participants being teacher colleagues, it was important that there was no pressure or feelings of obligation to participate in the study. I did not discuss a potential participants' decision with colleagues or potential participants. I always demonstrated professionalism by treating potential participants as I did before I extended the invitation to participate in the study. Only potential participants who agreed to participate in the study were contacted to schedule interview times.

The rights of participants or stakeholders involved in the study are more important than proving or disproving a research theory (Creswell, 2012). Therefore, confidentiality and privacy of each participant were observed by removing all identifiers linked to the participant, the school, and the district. This included not identifying the participant by the specific grade level taught or any specific roles of the teacher other than being a mathematics teacher. In addition, I utilized pseudonyms for the participants to further protect their identity. The pseudonyms for participants were used throughout the interview data collection process and when reporting the findings.

In the formal invitation, I informed the potential participants of the one-hour interview. Each participant was also be informed of the five-dollar gift card as a thank you gift for their time. For those teachers who agreed to participate in the study, the interviews took place outside of contract hours by Zoom or email at a time that was comfortable for the participant. Since this was different for each participant, I allowed the participant to choose the interview format that worked best for them. Any doors in the interview space were closed during the time of the Zoom interviews to avoid interruptions or comprising privacy. During the interview or at any time, participants

were given the right to decline to answer any questions or to participate in the study (See Appendix B).

Data Collection Method

To capture the perspectives of the teachers concerning direct instructional strategies and their perspectives of DI in mathematics, one-on-one interviews were conducted. Interviews were the method by which rich data on DI in mathematics were gathered to address the research question. The data collection instrument was a researcher created interview protocol. The protocol was aligned with the DI research question and based on related literature and the DI framework. This ensured that the appropriate questions were addressed during the interviews to answer the research question (Creswell, 2012) (See Appendix B). The data from the interviews were a direct account of the participants perspective of DI strategies and DI in mathematics. I kept an electronic reflexive journal to document my learning from the data collection tool as each interview was completed.

The data collection process included interviewing the participants using Zoom and email. Zoom and email were appropriate means to interview participants due social distancing during the COVID-19 pandemic. The researcher created interview protocol was used for the Zoom interviews which were recorded with password protection. The interview time frame was limited to a period of one month. First, I reminded the participant of the purpose of the interview and that the participant may stop or decline to answer any questions at any time. Secondly, each participant was informed of the recording device used for the interview and asked for permission to be recorded. After

the participant responded to the questions from the interview protocol, I asked the participants if there are additional comments about DI of mathematics. Then, I informed the participants of member checking in which participants check the findings for accuracy of their data. The participants concluded that the findings were accurate, and no changes were made. Once each interview was completed, I thanked the participant and securely closed the recording device or notes from the interview in a file cabinet in my home office. Then, I converted the audio recordings to text and transcribed the data collected in the interviews. The data were transcribed within 72 hours of the interviews. MAXQDA, a computer program, was used as a tool to organize and store the data.

Data Analysis

After the data collection process was complete, inductive data analysis began. In this basic qualitative research study, inductive data analysis was used for analyzing the data (Creswell & Poth, 2016). I determined that inductive analysis was the best method to analyze the data. In inductive analysis, the researcher uses intuitive understandings derived from experience in a particular field. The data collected from observations, interviews, or documents are used to take personal accounts and generalize them. According to Merriam (2009):

> All investigations are informed by discipline-specific theoretical framework that enables us to focus our inquiry and interpret the data. However, this framework is not tested deductively as it might be in an experiment; rather, the framework is informed by what we inductively learn in the field (pp. 15-16).

Inductive analysis was chosen rather than narrative analysis where the researcher focuses on a topic and analyzes the data collected from case studies, surveys, observations or other similar methods. Inductive analysis was also chosen rather than thematic analysis where the researcher analyzes the patterns of themes in the data. The process began with reading the data multiple times to become familiar with them (Creswell & Poth, 2016). Open coding was used to start coding the data. During the open coding process, I created codes based on the interview data. The codes were used to create categories, then the categories were used to create themes to answer the research questions (Creswell & Poth, 2016; Merriam, 2009).

The next phase of my data analysis consisted of descriptions, classifications, and interpretation of the data (Creswell & Poth, 2016). I reviewed the interview notes and assigned open codes to the raw data. The open codes were applied to the data and were used to group similar words, phrases, and/or concepts, giving each group a label that give the group meaning. Once open codes were completed, I categorized similar codes and developed themes. The themes emerged as I categorized similar open codes and determined what they meant (Merriam, 2009). Computer files were created to organize the interview data into the appropriate categories This process included renaming categories as the analysis continued or deleting categories that were not substantiated by the data (Merriam, 2009).

The MAXQDA computer program was used to assist in organizing the interview data. MAXQDA is a qualitative data analysis software developed in 1989 (MAXQDA,

2018). The interview data was entered in the computer program. Then, the computer program was used to organize the codes and themes.

The researcher must confront issues with validity, reliability, and ethics in qualitative research while collecting, organizing, and analyzing data (Merriam, 2009). To address reliability and validity member checking was used. The participants were asked to check the findings for accuracy of their data. The participants did not find inaccuracies in their data, so I did not edit the findings. In the case of discrepant data or data that does not fit the theme, I did not find this to report.

Clarifying researcher biases was also a part of the data analysis process. During the data collection process, open ended questions were asked during the interview. The participants expressed their perspectives without any imposed viewpoints. I ensured that respondents' points of view were presented rather than mine. By collecting the data and objectively interpreting the data and literature, personal biases can be eliminated, and true perspectives will be the result of the research (Bogdan & Biklen, 2007).

Role of the Researcher

Within the research site, it is important that my role as an educator and a researcher were separated. I have been a third grade teacher of all subjects at the research site since 2007. The participants in this study are colleagues at the research site and did not affect data collection. Since I have a good professional relationship and a rapport with the participants, I ensured to the best of my ability that the participants were comfortable in expressing their experiences and perspectives without reservations. My relationship with the participants was professional without any interactions outside of the profession.

To address bias, I used reflexivity by disclosing my role as a researcher, my interest in the research, how my findings were reported, and anything gained from my research (Creswell & Poth, 2016). I am a third grade mathematics and science teacher at the research site. My interest in the research came because of my noticing a decline in student performance on the standardized state-wide mathematics assessment after the implementation of more rigorous standards. Along with the implementation of more rigorous standards, the Majestic County school district also implemented a new DI mathematics curriculum. I was interested in how 3rd through 5th grade mathematics teachers used DI strategies to teach mathematics. As the researcher, I ensured that my biases had no influence on the interpretation of the research. I have used DI curriculums in all subjects throughout my teaching career. The only known bias I have had with DI is whether using it in isolation is effective. By keeping a reflexive journal, I acknowledged this bias and ensured that it did not influence the research process. The findings will be reported to participants, administrators, and the school district by email.

Limitations Due to Sample Size

The sample size for this basic qualitative study was five upper elementary teachers. During the invitation process, all schools within our district were shut down. Covid-19 restrictions were in place and some teachers who were invited may not have checked their email. Due to the sample size, the results of this study may not be transferred to include all upper elementary mathematics teachers.

Conclusion

Research on DI in the Majestic County School District was necessary to explore direct instructional strategies used in mathematics. Siegfried Engelmann's theory of direct instruction was the conceptual framework for this research. The basic qualitative study design was selected over other designs to explore and answer the research question. The qualitative research method was selected to learn about DI through interviews of five upper elementary mathematics teachers. Throughout the data collection process and thereafter, all participants in the study were protected through confidentiality measures. Open and axial coding of the data, the member checking process, and clarifying researcher biases were used to ensure validity. Reporting the data to participants and stakeholders was also a critical part of my qualitative research to promote social change.

Data Analysis Results

The purpose of this basic qualitative research study was to understand how teachers implement DI strategies in the classroom to help students reach proficiency and master the new mathematics standards. The basic qualitative research design and purposeful sampling were used to collect descriptive details from interviews. Five upper elementary mathematics teachers agreed to participate in one-on-one interviews used for data collection.

I explained the purpose of my research and reminded participants of confidentiality before beginning each interview including those who participated by emailing their responses. There were three Zoom participants and two participants responding by email. I asked each Zoom participant for permission to record the

interview. The process of data collection lasted 4 weeks during the Spring of 2020. Each Zoom interview lasted 40 to 50 minutes. The two email participants sent their responses to the interview questions to my school email address.

Zig Engelmann's theory of DI and the research questions were used to guide the study. They were the basis of the interviews on teacher perspectives of DI and how DI strategies are implemented in the classroom. Engelmann stated that DI can improve academic performance as well as certain affective behaviours (National Institute for Direct Instruction, 2015).

RQ: How do elementary teachers use direct instructional strategies to teach mathematics?

As the researcher, I determined that inductive analysis was the best method to analyze the data. In inductive analysis, the researcher uses intuitive understandings derived from experience in a particular field. Inductive analysis was chosen rather than narrative analysis where the researcher focuses on a topic and analyzes the data collected from case studies, surveys, observations, or other similar methods. Inductive analysis was also chosen rather than thematic analysis where the researcher analyzes the patterns of themes in the data (Merriam, 2009).

Once the data were collected, I began analysis. Open coding began with highlighting key phrases in the data and determining what it meant. I assigned codes to those key phrases and used a specific color for each code. Those codes were further analyzed to form categories. The initial categories were instruction, formative assessments, modeling, communication, mastering standards, and small group

instruction. As I further analyzed the data, modeling became a part of clear communication, and the use of formative assessments became a part of instructional knowledge. After the data were analyzed, four major themes emerged from the categories: instructional knowledge, clear communication, mastery of grade level standards, and small group/one-on-one instruction. Examples and excerpts from the transcripts are used in the following paragraphs to report the data. The results are presented by research question and also by theme. The themes were also considered in the development of the professional development project. The participants in the study are identified by letters A-E. Through following the interview protocol, each participant was asked a series of questions related to their perceptions and use of DI. These themes were used to describe the findings from the interview data.

Theme 1: Instructional Knowledge

Direct Instruction is intended to keep students focused on the increased learning. The interview findings show a variety of instructional strategies used to teach students. The participants used a progressive format that teaches foundational concepts first, then builds upon them. The participants described their instructional strategies and gave examples of how they are used in daily instruction. The participants expressed time management was also found to be an issue in completing instructional goals and for students who struggle to reach their learning targets. The participants use guided practice, independent practice, and formative assessments as instructional strategies.

Participant B stated,

> I start out with whole group instruction which is where I do the direct instruction and the guided practice. The students usually sit on the floor in front of the interactive board. Then, I do a guided practice with them which is 2 to 4 questions. The students go back to their seats and do 2 to 4 problems on their own. I use that to gauge where they are in their understanding. Those who complete the problems and appear to understand the concept soundly are sent to their seats to complete independent practice. Those that are struggling get small group instruction. Even after small group instruction, there are some students who need one-on-one instruction.

Participant C said,

> I will usually introduce the concept to the class as a whole. I will also provide some examples and model for about 10-15 mins more. Then I will divide the class in half, and I will take a group and the SPED teacher in my room will take the other half. We will use manipulatives, dry erase boards, etc. or whatever it takes to work in small groups. I also use peer tutoring/helping in certain situations.

Participant D stated,

> I provide many examples during whole group instruction, and I closely monitor their independent practice. I pull small groups based on the formative assessments. When they are working on their independent practice, small group, or one-on-one I try to address student needs in small groups.

Participant E stated,

During whole group instruction, I am constantly asking the students questions to make sure they are on track. My co-teacher will do the same. Then students work on independent practice based on the lesson taught. If the students seem to be struggling, we may break off right then into small groups.

Theme 2: Clear Communication

All participants expressed that clear communication during mathematics instruction is critical to ensuring that students are successful. Correcting a mistake later is considerably more difficult than clear instruction and guided practice with teacher feedback. Instruction with clear communication that will not be contradicted helps students grasp mathematical concepts better. For example, if a teacher simply shows a picture of a square when teaching about quadrilaterals, students may incorrectly assume that only squares are quadrilaterals. Pictures of various quadrilaterals, such as a trapezoid, a rectangle, or a rhombus, as well as non-quadrilaterals, such as a triangle, an octagon, or a pentagon, would help students learn better through displaying examples of what is and is not a quadrilateral.

Clear Communication Through Modeling

All participants stated that they used the district-wide curriculum, Into Math, for whole group instruction and modeling. Each participant also expressed the need to model abstract concepts using mathematics manipulatives. Although Participant A used the district-wide mathematics curriculum, the use of several other resources in addition to the curriculum was acknowledged. Teacher and student created Flipgrids and Khan Academy videos were also used in addition to the curriculum.

The participants stated that effective DI is dependent upon effective modeling. The participants were asked: How do you model or provide examples for students during direct Mathematics instruction? Modeling was viewed as an essential part of DI. Participant A stated

> I provide models and examples for my students by implementing the instructional strategy of "I do, we do, you do." I start by showing an exemplar to my students, so they know what the expectations are. Then, I gradually release the task at hand for them to try it with added support. At this stage, they will have a good deal of support through feedback. Once they have had an opportunity to practice the skill with support, they will move into the independent stage of this instructional model.

The participants expressed that modeling helps students move from dependence to a stage of independence. When modeling is effective, the students are prepared and willing to work on their own.

Participant B uses the interactive lessons provided by *Into Math* and models using the strategies provided within the curriculum.

Participant C replied,

> Based on the unit or lesson being taught, *Into Math* is used. The lesson is projected on the TV(Interactive) panel mounted on the board. The students follow along in their individual books. *Into Math* introduces the concept at the beginning of the chapter and then provides methods of solving problems. It shows examples

in the book that are used for modeling the concepts. Sometimes manipulatives are used to model concepts for the students.

Participant D acknowledged that modeling is crucial to student success. Students cannot learn effectively without the use of modeling to lead them. Participant D stated,

> In my opinion, modeling is the name of the game! It is one thing to explain in words how to do something but showing how to do something is what brings on that "a-ha" moment! For instance, at the beginning of the year when we are reviewing over Place Value and number sense base ten blocks are very helpful. Base 10 blocks are also helpful for addition/subtracting with regrouping. This way the students can see that you are actually borrowing ten from the next number. When we talk about angles in Geometry, I will walk around the room to point out right angles such as the corner of the board, corners of cinder blocks, posters, piece of paper, etc. Then we will do the same for less than right and greater than right angles. I like for students to model as well on the board.

Participant E pointed out that modeling increases instructional time because the students are aware of what the exemplar looks like. This takes the "guess work" out of the task. They know exactly what is expected of them.

Teacher understandings and misconceptions. The interview data also revealed teacher understanding and some misconceptions about DI. DI does follow routine and is structured but there are misconceptions concerning limited creativity and small group or one on one instruction. Clear communication about DI principles and strategies could bring clarity as teachers are implementing the district-wide DI curriculum.

Participant A stated,

> With direct mathematics instruction, teachers are able to establish the purpose of the lesson and follow a routine. Students and teachers thrive on routine and the students know what is expected of them each and every lesson. Students can't learn at their own pace though. During direct instruction, the pacing is determined by the majority of the students and their mastery. Each student progresses at a different rate so all students may not be ready to move forward during a direct instruction lesson. Creativity is also limited in direct instruction. Direct instruction is very rigid, and you do the same thing each and every day. Direct instruction is more teacher led than student led.

Participant B replied,

> Direct instruction is like giving the students a destination with a highlighted path to reach that destination. When learners don't have the prerequisite skills to learn the lesson that you are teaching, it presents a problem. Pre-assessments of the prerequisite skills to identify and address those areas of need is necessary for students to be successful.

Participant C stated,

> It is easier to use direct instruction because it is laid out for you in the teacher's manual, but sometimes it's not the best approach for all students. It is easy for them to lose attention, daydream, fidget, or just block the teacher out. There have been times in the middle of direct instruction where students need to stand up and stretch or run in-place for 30 seconds. Direct instruction has to be limited in time

> to keep students engaged. Students seem to be focused for 10 or 15 minutes then it dwindles from there. To improve instruction, we must change it up. Some days we will not use the textbook, some days we will sit on the floor, some days we will stand by our desks. The mystery keeps students guessing and engaged.

Participant D stated,

> Direct instruction is necessary and very important in the mathematics classroom; however, it is not a one size fits all approach. Some students will need small group reteaching and others may need one-on-one remediation.

Participant E stated,

> With the direct instruction model, teachers are able to present and cover large amounts of content in a shorter amount of time. It is very structured and a great way to make sure you have covered all standards throughout the year which is important for standardized testing.

Theme 3: Mastery of Grade-Level Standards

The participants expressed that to master new standards, DI lessons should begin with what students already know and then expand on it with logical sequences. To master a concept, students must be given the opportunity for repetition and correction to ensure learning is sequential and concepts are reviewed until familiar and internalized. The DI model (Figure 1) incorporates teaching to mastery in this manner, and students gain confidence in their abilities as they grow.

Formative Assessments. The participants used formative assessments as another method of helping students master grade level standards. Formative assessments were

used in a variety of ways by the participants. Participant A uses a thumbs up or thumbs down approach to assess understanding throughout a DI lesson and a ticket out the door as a daily lesson assessment which was used to form small groups for upcoming instruction. Participant B, D, and E also use tickets out the door for formative assessments after adequate modeling and guided practice.

Participant C took great pride in the formative assessments and stated,

> I am a formative assessment queen! My favorite is Stick It! I learned this from the Math in the Fast Lane workshop. Each student receives a sticky note. They write their name on the sticky side. After I put a problem on the board, they write their answer on the sticky note and stick it in the location they are told to. This is a quick way to form groups for the next day, use for remediation, etc. We take a formative assessment at the beginning of each chapter, so we know where we stand at the beginning. This helps also with grouping.

Student Confidence. Student confidence was viewed as important to mastery of grade level standards. Since upper elementary students are administered a state standardized test, teachers must address student confidence as it relates to direct mathematics instruction. When the participants were asked, how do you help students improve academically and improve their self-image as well?

To promote the desired learning outcomes, the participants thought it was necessary to emphasize the positive and do so precisely. A teacher uses Direct Instruction to provide numerous possibilities for praise because of its inherent rapid pace and repetition, which allow for many correct replies. Additionally, teachers must project

genuine motivation and encouragement to convey the value of education and their faith in their students' capacity to master the topic. This fosters not just an internal need for knowledge in students, but also a sense of self-worth, both of which benefit students in the future. These beneficial effects on students are rewards for both students and teachers, who see real-time results and tangible student improvement in their classrooms. Participant A stated

> I help students improve academically as well in their self-image by giving them a taste of success. I provide lots of positive feedback during the "we do" process. When students get a taste of success, their self-image improves therefore, their drive to succeed academically improves (See Sample Transcript, Appendix D).

Participant B had a similar perspective to Participant A. Taking concepts one little chunk at a time and making the goal smaller helps students feel confident. It is also necessary to celebrate the small successes. This helps them improve academically and helps their self-image.

Participant C focused on relationships to build student confidence. Relationships are very important. If you build a relationship with each of your students, they will want to learn from you. The teacher-student relationship goes together with student confidence. Bringing enthusiasm and positive thinking into the classroom makes students will want to succeed. It also makes students happy to be at school.

Participant D stated that students will rise to the expectations that you have for them. These students are told that they are mathematicians and are made to feel

important. Praise and affirmation are important to use so students don't give up when problems are more challenging.

Participant E acknowledged that students fear mathematics because they are not confident in their abilities. Setting goals that students can achieve helps them to succeed and want to keep trying. Teachers must have patience and use creative ways to keep students enthusiastic.

Theme 4: Small Group/One-on-One Instruction.

The participants used small group or one on one instruction for remediation and to help struggling learners. All student learning must be addressed through DI. To make sure all students are learning, all participants utilized the WIN (What I Need) block of time to offer differentiated instruction to students. During this time, the needs of all students are addressed whether the need be remediation, independent practice, or acceleration. Participant B stated that the problems that students complete on their own after whole group instruction are used the gage student understanding. If there are students struggling on their own, those students are pulled into small group instruction while the remaining students complete the independent practice. Participants C, D, and E used small group instruction, but also stated that one-on-one instruction is needed as interventions for some students.

Evidence of Quality

I followed the process and procedures to ensure the reliability and quality of research. First, I followed the interview protocol for each interview and ensured that all confidentiality concerns were addressed. Participants' names were substituted with an

alphanumeric code and used throughout the findings. Then, I conducted member checking to ensure that my interpretations of the data were correct. Participants were sent a summary of the findings and searched the findings for accuracy of their data. There were no changes to the findings based on the member checks. Finally, I acknowledged my personal bias concerning DI and did not allow it to influence the findings nor my interpretations of the findings.

Summary

Inductive analysis was used to analyze the interview data. The data were coded based on the open codes, which were further examined for categories and resulted in four major themes. Those themes were instructional knowledge, clear communication, mastery of grade level standards, and small group/one-on-one instruction. Based on these themes and current DI literature, I developed a professional development project. The professional development project was designed to provide clarity for DI and promote social change in planning and using DI.

Section 3: The Project

Introduction

The purpose of this basic qualitative study was to understand how teachers implement DI strategies in the classroom to help students reach proficiency and master the new mathematics standards. The research was designed to address the research question of how teachers use direct instructional strategies to teach mathematics. For this study, I collected and analyzed data from one-on-one semistructured interviews from five upper elementary mathematics teachers. The results of the study show that mathematics teachers could benefit from PD in DI to enhance instruction and potentially improve student mastery of mathematics standards. These findings were used to develop the PD plan for teachers to maximize the use of the DI curriculum for instruction and to increase mastery of mathematics standards on state-wide standardized tests. The focus of the 3-day PD initiative was based on principles of DI and how they can be used effectively along with the Georgia Standards of Excellence and the district-wide mathematics curriculum. This PD initiative supports upper elementary mathematics teachers at the research site and elementary teachers district wide.

In this section, I addressed the rationale for PD project for upper elementary mathematics teachers, a literature review related to professional development, academic achievement, teacher success, reaching low performing and disadvantaged learners, and professional learning communities (PLC) as well as the social change resulting from the project. This section also includes a description that entails the potential resources, potential barriers, the proposal timelines, and implementation of the PD project along

with the project components. The final portion of this section contains the responsibilities and roles of the facilitator and the participants. Information for the project evaluation plan and how the project has the potential to bring positive social change for stakeholders at Flint Elementary and the Majestic County School District at large are addressed. The daily agenda and the PowerPoint presentations are included in the appendices to give the readers a clear understanding of the project design and the purpose.

Rationale

As a result of this qualitative study, I determined that PD on DI would be beneficial for understanding of DI and consistent use of the DI curriculum among mathematics teachers to increase student mastery of standards. Upper elementary teachers use the district-wide DI curriculum in a variety of ways along with supplemental materials. Although there are various resources provided within the DI curriculum, the mathematics teachers use other materials that are more familiar to them. With specific training and a better understanding of DI, teacher confidence and consistent use of the DI curriculum may increase.

Professional development is instrumental in helping teachers to continue learning about research-based practice for mathematics. Professional development also helps teachers evaluate their current practices relative to current research. With consistent research-based knowledge, teachers are more likely to be open to implementing changes for ineffective practices. The one-on-one and email interviews revealed inconsistencies in the use of the district-wide mathematics curriculum and misunderstanding of DI.

The trainings on the district-wide mathematics curriculum did not include training on and the principles of DI. Without a clear understanding of DI and the principles on which DI was founded, the mathematics curriculum could not be used with fidelity. Understanding these principles could help teachers develop lessons and deliver instruction that increases academic achievement for all students. The principles of DI and multiple examples of each principle are integral parts of the 3-day professional development training.

With the 3-Day PD on DI, teachers will gain knowledge to improve instructional pedagogy, resulting in an increase student achievement. Each principle of DI highlights a specific component that is key to student achievement. The collaborative components of the professional development training are designed to give the participants an opportunity to practice implementing these principles in their lessons. These collaborations are also designed to make planning DI lessons meaningful and relevant for the participants. With this type of professional development, the participants are more likely to implement what they have learned into their daily classroom instructional practices.

Review of the Literature

The data collected from this basic qualitative research shows the need for training in using mathematics direct instruction for upper elementary teachers to improve student achievement on standardized assessments. There is also a need for fidelity in using the district-wide DI mathematics curriculum. The literature review will give the research-based evidence to support the research project of a 3-day professional development on DI. The data collected from interviews shows that teachers need a deeper understanding

of the direct instruction (DI) and instructional strategies to use the district-wide curriculum effectively and with fidelity across the elementary grade levels. The data shows inconsistencies in the way teachers in Grades 3-5 use the DI curriculum and DI instructional strategies. In this literature review, I focused on the impact professional development has on teacher instructional strategies and student achievement. In addition, I pointed out changes in teacher attitudes about mathematics instruction with implementation of professional development. I searched using EBSCO Host, Google Scholar and ProQuest for relevant literature. The literature was used to define key terms such as, *professional development, student achievement,* and *teacher pedagogy*.

Professional Development

Professional development is widely used as a means for teachers to learn instructional strategies to improve student achievement. With more rigorous mathematics standards, continuous professional development is needed to help teachers instruct in ways that they may not have learned or been taught (Garner et al., 2017). When school systems make teacher professional development a priority, teachers and students benefit with better instruction and student performance outcomes (Polly, 2017). Local, state, and national departments of education find it necessary to continue to invest time and money in professional development because evidence shows positive results in teacher instruction and improvements in student performance (Polly, 2015).

Teacher professional development is the professional growth a teacher achieves as a result of gaining increased experience and examining his or her teaching systematically: (a) Teachers should be treated as active learners; (b) it is perceived as a long-term process

as it acknowledges the fact that teachers learn over time; (c) it is perceived as a process that takes place within a particular context; (d) many identify this process as one that is intimately linked to school reform, as professional development is a process of culture building and not of mere training which is affected by the coherence of the school program; (e) a teacher is conceived of as a reflective practitioner; (f) professional development is conceived of as a collaborative process; and (g) professional development may look and be very different in diverse settings, and even within a single setting (Kang & Liu, 2016).

Professional Development and Teacher Pedagogy

Professional development for elementary mathematics teachers is especially important since most elementary teachers have not had specialized training in mathematics (Sheridan & Wen, 2021). Education experts believe that successful teachers have a deep pedagogical knowledge of the subject matter along with positive attitudes about teaching and learning mathematics (Kutaka et al., 2018). Educators should understand that what teachers learned from doing mathematics throughout their educational career is different from teaching mathematics; therefore, time must be invested in helping teachers understand evidence-based strategies for teaching students while addressing the content standards (Kutaka et al., 2017).

The proper use of mathematics curricular resources requires professional development (Remillard & Kim, 2017). Mathematics curricular resources are used world-wide by teachers daily (Remillard & Kim, 2017). Understanding the intended use of a curriculum requires that teachers interpret the curriculum and use content knowledge to

deliver instruction in the classroom (Remillard & Kim, 2017). The knowledge teachers need to successfully teach a curriculum the way in which it was designed places a strain on teachers (Remillard & Kim, 2017). This may result in teachers using the curriculum based on personal knowledge instead of a research-based design for success in student learning (Remillard & Kim, 2017; Sheridan & Wen, 2021).

Professional development helps change long-lasting practices and ideas about teaching mathematics (Kutaka et al., 2017). Teacher's prior knowledge in mathematics may be an obstacle in professional learning since it may require teachers to reconstruct that knowledge (Barlow et al., 2018). Teacher attitudes and beliefs concerning mathematics instruction are connected to their practices and instructional strategies in the classroom (Kang & Liu, 2016). The attitudes teachers have towards the content area has consequences resulting in either a positive or negative effect on student learning (Kutaka et al., 2017). However, effective professional development can change those beliefs when teachers also experience improvements in student achievement (Lindvall, 2017).

Professional development gives teachers support that makes them more comfortable and effective in mathematics instruction (Sheridan & Wen, 2021). Teachers should be aware of and evaluate their instructional pedagogies through professional development (Akkus & Karakaya, 2020). The pre-existing ideas, a lack of confidence, and personal ability levels are reasons elementary teachers tend to avoid intentional mathematics instruction (Sheridan & Wen, 2021). These limitations in mathematics should be realized and then addressed through well-designed and consistent learning opportunities for teachers (Akkus & Karakaya, 2020; Sheridan & Wen, 2021). Some

elementary schools and teachers have under-emphasized mathematics which resulted in inconsistent instruction and low student achievement (Sheridan & Wen, 2021). Professional development in which teachers collaborate and take ownership in their learning results in a solution-oriented culture among teachers and positive student outcomes (De Simone, 2020). However, professional development is viewed as ineffective when it is designed without collaborative learning in mind (Gore et al, 2021).

The goals of the professional development leaders and those of the teachers should align to gain the best outcomes (Jacob et al., 2017). Empowering teachers with self- improvement, encouraging reflective practice, and offering professional learning opportunities over time are all important for teacher success and student achievement (Biccard, 2019; Smith, et al., 2020). First, teachers must be considered as adult learners with specific needs that need to be met and should also be active learners in the PD learning community (Jacob et al., 2017). Without this component, teachers may not attempt new instructional strategies even if they are evidence-based. Secondly, teacher collaboration should be considered to allow teachers to work with their colleagues to plan how their knowledge can be used in the classroom setting (Jacob et al., 2017). Next, teachers need models of effective practices to implement those practices in instruction (Jacob et al., 2017). Effective teacher practices should also include evaluating student thinking (Melhuish et al., 2020). Finally, teachers should have opportunities to reflect on what they have learned and provide feedback (Jacob et al., 2017). When the goals of the PD leaders and the teachers are in alignment, the potential for an overall supportive learning environment is greater.

A significant aim of early mathematics PD should be to increase teachers' trust and knowledge about early mathematics while also lowering their anxiety level (Sheridan et al., 2020). Research results show that elementary mathematics teachers are required to take the least mathematics college courses but have the highest level of mathematics anxiety (Stoehr, 2017). Therefore, teacher buy-in is crucial in mathematics professional development. Teacher buy-in is most likely to occur when PD learning is relevant to the real teaching and learning experiences (Heck et al., 2019; Shirrell et al., 2019). Effective PD should be ongoing, include at least thirty cumulative hours of training, and incorporate follow-up activities to review or enhance what was learned (Heck et al., 2019). PD in which teachers participate in practice-based learning experiences by analyzing and actively using teaching artifacts such as mathematic, assignments student work, and videos to improve their comprehension of subject matter, pedagogy, and students as learners, all of which are important components of a teacher’s knowledge base for teaching (Heck et al., 2019). The higher the degree of confidence a teacher has in their mathematics abilities, the greater their belief in teaching mathematics in the early childhood education setting (Sheridan et al., 2020). This self-assurance makes it more likely to use developmentally acceptable methodology when teaching mathematics to children (Sheridan et al., 2020).

Effective mathematics PD generally requires the presence of an expert facilitator who possesses a thorough understanding of the mathematics content, an understanding of the pedagogy used to teach the content, and knowledge of how to lead a professional learning community (Heck et al., 2019; Henderson et al., 2018). Under these

circumstances, it may then be deduced that PD could be fundamental to change the practices of classroom teachers and to influence teacher beliefs (Heck et al., 2019). Thus, it is critical to consider the nature of teachers' beliefs about mathematics teaching and learning to better understand changes in their practice (Heck et al., 2019).

Given the highly technical nature of DI, training in proper program usage is cited as a critical factor in promoting high fidelity (Stockard, 2020). The need for administrative support has also been specifically pointed out (Stockard, 2020). Another critical component of effective PD is the participation of teachers from the same school, grade level, or subject content (Heck et al., 2019). The main reason for this is to ensure that teachers collaborate and administer programs according to their designs (Stockard, 2020).

The collaborative working relationship is built on teachers' shared needs, goals, and experiences, which enables them to relate to one another and build on one another's ideas during PD experiences (Heck et al., 2019). Professional development can be impactful when teachers are leaders in the collaborative effort of learning and sharing (Lipscombe et al., 2020; Wan, 2020). The assignment of teachers to grade levels and instructional groups for which they have been properly trained is one of the most critical decisions school principals can make (Stockard, 2020). Prior to the start of the school year, teaching staff should receive extensive preservice training in the specific levels of the programs that correspond to their students' mastery levels (Stockard, 2020).

The development of positive attitudes and beliefs about mathematics should be acknowledged in PD sessions for early childhood educators (Gupta & Lee, 2020;

Sheridan et al., 2020). Recommending continuous PD over the course of several weeks enables teachers to return to the material for later sessions as a benchmark (Sheridan et al., 2020). Sustained duration is a frequent criterion for defining effective PD (Sheridan et al., 2020). As a result, they are averse to the idea of teaching concepts they do not understand (Sheridan et al., 2020).

Professional Development and Student Achievement. PD designed to help teachers meet the diverse needs of their students is effective in increasing student performance (Kutaka et al., 2017). The range in student learning abilities require a variety of strategies that teachers should be comfortable implementing (Gupta & Lee, 2020). Through modeling and practicing, teachers can learn and become comfortable in implementing new ideas (Gupta & Lee, 2020).

PD has become widely used as an indicator of quality teacher instruction and academic success for students (Gupta & Lee, 2020). The key to success in PD initiatives means investing time and effort to consistent learning opportunities that meet the specific needs of the teachers and students (Akkus & Karakaya, 2020; Gupta & Lee, 2020). Studies show that when PD is based on those specific needs, teachers respond more positively to making changes in instructional strategies which leads to increases in student performance (Gupta & Lee, 2020). Furthermore, as teachers experience increases in student achievement their motivation to make changes in instruction also increases (Gupta & Lee, 2020).

Increases in teacher mathematical knowledge because of PD has been linked to increases in student performance (Jacob et al., 2017). Teacher mathematics knowledge

for teaching (MKT) aids teachers in making decisions about how students learn and instructional strategies to meet the needs of diverse learners (Heck et al., 2019). MKT refers to the skills that are needed and the pedagogical knowledge for teaching specific subject content standards (Heck et al., 2019). Furthermore, MKT encompasses a teachers' "ability to focus on the underlying mathematics concepts, to pose and approach rigorous mathematical questions, and to help students make important mathematical connections among key ideas—and is related to student achievement" (Heck et al., 2019). There is a direct connection between MKT and the belief teachers have about learning and instruction (Heck et al., 2019).

Continuous efforts to improve mathematics instruction depends on PD learning opportunities for teachers (Jacob et al., 2017). Federal and state mandates to improve classroom instruction and student mathematical performance on standardized assessments have caused this increased interest in PD with a focus on teacher instructional strategies as well as mathematical reasoning (Jacob et al., 2017). The important educational actions of teachers include following the program guidelines, monitoring student mastery of standards, and ensuring consistent and visible student improvements (Stockard, 2020). The breadth of factors that can affect student performance include everything under the control of a school or district, such as the daily schedule, personnel assignment, PD of staff, classroom arrangement, and public announcement system (Stockard, 2020).

Specific PD programs may have a variety of effects on teachers' instruction and students' learning (Stockard, 2020). The different facets of teachers' knowledge have varying predictive abilities for student learning (Stockard, 2020). Pedagogical content

knowledge (awareness of students' mathematical thinking and instructional strategies for mathematics) appears to be a more powerful predictor of student learning than other factors (Stockard, 2020). Some scholars argue that certain strategies, such as providing teachers with opportunities to apply what they've learned and reflect on their experiences, can help teachers improve their pedagogical content knowledge (Copur-Gencturk, 2019).

Children's academic achievement has been the subject of mathematics research and the basis for PD for teachers (Sheridan et al., 2020). Mathematics presents a unique challenge in early childhood education because many early childhood educators have preconceived notions of mathematics based on their own learning experiences as students, and many early childhood education teachers view math as something they are personally incompetent at (Sheridan et al., 2020). Early mathematics skills are a better predictor of later academic performance in mathematics as well as other academic subject content areas. The links to mastering early mathematics skills increases in importance as students advance through education (Sheridan et al., 2020).

Project Description

Potential Resources and Existing Support

Those responsible for implementing this planned professional development on DI will include me as the facilitator, and Flint Elementary mathematics instructional coach. I will meet with the mathematics instructional coach to determine the dates, times, and a suitable location for the professional development training. During the meeting, I will suggest for the training to be done during the summer over 3 consecutive days. I will also request the materials that I would need for the training; however, I will provide any

materials that Flint Elementary does not provide. The teachers participating in the training will need to bring their Chromebooks and mathematics curriculum instructional tools.

Potential Barriers and Solutions

There are a few potential barriers that could prevent the professional development training from occurring. Currently, there are no restrictions due to the COVID-19 pandemic in the Majestic County school district. Since some participants may not be fully vaccinated against COVID-19, I will intentionally design the meeting space to encourage social distancing. In the event of another pandemic shutdown, the initial plans could change. Technology will be used throughout the training and there is a possibility of the internet being down. In this case, the daily schedule will be adjusted to include only the portions of the training that do not require internet access.

Teacher participation could be another possible barrier. Participation is often a barrier when professional development trainings are held during the summer. A possible solution providing compensation or a stipend for the participants. I will contact Flint Elementary and the Majestic County school district leadership and request permission to both allow the PD and compensation/stipend for the training. Another aspect of teacher participation is the learning environment. As the facilitator, I will consistently survey the room to ensure a safe and engaging learning environment where we are all learning together.

Proposal for implementation and Timetable. The professional development training will be a 3-day training offered during the summer. This training could be used

towards professional hours for teacher certification. Several ideas will be incorporated during the training to keep the participants engaged. An icebreaker, small group and whole group instruction, videos, group discussions, and collaborative planning activities will be used to keep participants engaged. The participants will use their mathematics curriculum resources to plan a DI lesson.

At the beginning of day 1, I will introduce myself as the facilitator and discuss my basic qualitative study including the data that prompted the 3-day professional development training. Each day, I will distribute copies of the PowerPoint presentation in note format. The PowerPoint will include research-based DI instructional strategies including the principles and phases of DI, the norms and expectations, and the goals. The daily agenda will be distributed each morning with a detailed schedule of the day. In addition, the principles of DI diagram and the phases of DI instructional strategies will also be circulated.

Project Evaluation Plan

The professional development training will include a daily formative evaluation form for the participants to complete at the end of each day. The data gathered from the daily evaluation form would allow me to gauge the effectiveness of the day's session. As the facilitator, I will use the daily feedback to make any possible adjustments to the next day's sessions that will enrich learning. This could include making changes to the scheduled daily activities, changing the design, or adjusting the pacing to meet the needs of the participants.

Including an evaluation form at the end of each day's session is also necessary for future sessions. The results from the 3 days of evaluations could be valuable to me in planning and implementing future professional development that I may facilitate. District leaders may also use the results to plan continuous professional development during the instructional year. The findings will be shared with professional development leaders at Flint Elementary and the Majestic County school district.

Project Implications

The 3-day professional development was designed using research-based instructional strategies that upper elementary mathematics teachers can implement to improve student achievement. The teacher participants will benefit from the professional development by engaging in discussions, collaborating with their colleagues to plan research-based DI activities and lessons, and reflecting on their learning each day. The professional development may help teachers improve their knowledge of DI, instructional strategies, and student academic achievement. Although the focus for the professional development is for upper elementary mathematics teachers, Flint Elementary could also potentially elect to expand the training to help K-2nd grade mathematics teachers. The Majestic County school district could also potentially elect to use the training for all elementary mathematics teachers within the district. Therefore, the professional development could potentially positively impact all elementary mathematics teachers in the school district if district leadership viewed the professional development as beneficial to use. Research-based instructional strategies have a positive influence on teacher instructional strategies and student achievement.

As a result, it is anticipated that upper elementary mathematics scores on the state-wide standardized assessment could improve. If there is an increase in upper elementary student achievement in mathematics on the state-wide assessment, the school and district stakeholders may decide to implement the DI 3-day professional development for other elementary teachers in the district.

Section 4: Reflections and Conclusions

Project Strengths and Limitations

One strength of this DI professional development project is that the project sessions were designed because of the data gathered from one-on-one teacher interviews from this basic qualitive study. The sessions were developed to enhance teacher understanding of DI and use of district-wide DI curriculum to improve student academic achievement in mathematics. The data showed that five upper elementary many variations in their implementation of DI and the use of the district-wide curriculum. Although teachers have a need individuality and creativity, the basic principle of DI must be understood and implemented. The DI professional development project is designed to allow the participants an opportunity to learn the research-based information for DI, the principles of DI, and insight on planning effective DI lessons using the district-wide curriculum. Attending the 3-day professional development will give teachers a greater knowledge of DI that can be used to plan future lessons. The participants will also leave understanding the research that supports effectively utilizing DI and the potential effect on student achievement. Through collaborating with their peers, the participants will also build a community of support in planning DI lessons.

The 3-day professional development project has three possible limitations. One limitation of this project will be planning time for teachers continue collaborating to implement what they have learn in their daily lessons. Administrative support to help teachers with time for planning sessions and encouragement to continue collaborating would be beneficial. Although there is grade level collaborative planning day each week,

this time would not be enough for developing lessons based on the new information. Effective planning is an important element in implementing DI lessons and promoting student achievement. The teachers would need more time to effectively plan DI lessons using the resources from the PD sessions. The district and school calendar would be another possible limitation. The 3-day PD project must fit in the calendar during the staff development days. Third through fifth grade mathematics teachers must also be willing to participate in the PD sessions. Another potential limitation could be the current COVID-19 pandemic. The state of the pandemic could alter the presentation of this 3-day PD project. Finally. limited participants could be a potential limitation as there were only five upper elementary participants; therefore, the findings may not apply to the entire upper elementary teacher population at Flint Elementary and district wide.

Recommendations for Alternative Approaches

One alternative approach would be for district and school leaders to allow planning time during the designated teacher planning days throughout the school year. This would help mathematics teachers to continue to implement what they have learned to see results in student achievement. Another alternative approach would be to use district or school level professional development funds to pay teachers a stipend to collaborate and plan for 3 hours after school each month. The final alternative approach would be to survey teachers to get their ideas on the best options for collaborating and planning. In addition, the district could also set up a group email or Google classroom for teachers to share their strategies, ideas, resources, and to ask questions.

Scholarship, Project Development and Evaluation, and Leadership and Change

Several factors have contributed to my growth as a doctoral student, educator, and a leader. One factor is my journey in pursuing my doctorate degree. During my journey, I have developed in my overall knowledge of elementary mathematics instruction for all students. I have attended several mathematics workshops, served as a mentor teacher for new mathematics teachers, and served as a district representative in mathematics for my grade level.

While serving as a district representative, I collaborated with other grade level teachers across the district to develop district-wide benchmark assessments. These assessments were designed as formative assessments to determine if students were mastering the mathematics standards taught. During this time, I also helped in determining a scope and sequence for teaching the mathematics standards which also led to helping develop our grade level district-wide curriculum map. In addition, I consistently research and share ideas with my colleagues that will enhance our mathematics instruction and student achievement.

As I decided on my research topic, problem, and project, I investigated district student achievement data and discovered an issue with the more rigorous mathematics standards and student achievement in mathematics. In my personal experience, I realized that many students experienced mathematics anxiety. Although students had a basic understanding of algorithms, they did not have the deeper conceptual understanding needed to solve complex or multi-step problems. Students also experienced difficulties in explaining the basic algorithms or how they solved a problem.

Evaluating the mathematics data from the state standardized assessment inspired me to focus on the challenges upper elementary teachers and students experienced. My research on teaching elementary mathematics, teacher pedagogy, and student achievement led to research on professional development. During this research, I gained an understanding of the critical professional development need for elementary mathematics teachers. As I observed my professional setting, I found that mathematics teachers who attended mathematics workshops, seminars, and professional development sessions were more confident and successful in teaching mathematics.

My doctoral journey has also taught me endurance and perseverance. The original timeline to complete my doctorate was extended due to two major life events. Although the journey has been long and difficult, quitting was not an option for me because I wanted to set an example for my daughter, family, and colleagues. There were times that I allowed myself a moment to breathe because of the pressures of life, but I knew that I had to continue working. Managing my full-time job, my family, and my education became overwhelming at times. Knowing my limitations has kept me balanced personally and professionally so I could continue my doctoral journey.

In retrospect, I believe that reaching out to my advisor and my committee members more could have benefited me. At times I did not understand the process and I could have saved myself time and needless stress by reaching out to my chair. There were some things that I assumed that I should know which caused me to spend time researching or trying to figure it out. This process is a collaborative effort and I have learned that my committee is designed to help me move forward and succeed.

My research and writing process has given me a great respect scholarly writing. In the beginning, I struggled in this area which resulted in numerous revisions. I also used the writing center resources to help me develop as a scholarly writer. My learning experiences have become a part of my life and will continue to help me in my professional career.

Leadership and Change

As a life-long adult learner, I have a greater appreciation for the research, time, and development educational leaders contribute to professional development. As I am learning, I am consistently seeking new ways to share that learning with my colleagues. This is especially important when thinking about technology and the various ways that it can be used for professional learning and instructional purposes. Presenting information to adult learners requires you to think about all aspects of the learning on a higher level. The content must be presented in a way that adult learners can grasp it and then utilize it in their own way.

Being able to support instruction with research-based knowledge allows me to present information that is researched based. Practicing this has helped me to grow as a classroom educator and an educational leader. My growth in these areas has allowed me to assist my colleagues and gain their respect as a well. This research has given me a deeper understanding of mathematics and reaching students on all academic levels. As a result, I can provide valuable input concerning mathematics instructional needs for all students during professional learning sessions.

Continuing to grow as a life-long educator and an educational leader is my aspiration. One key to continue this growth, is learning to listen and value the perspective of others. Professional development is an opportunity for adult learners to grow together and learn from one another. This is important for me personally to be a positive influence and support to my colleagues.

My professional development project has great potential to promote social change. Through this project, upper elementary mathematics teachers will have new support and resources for DI to promote student academic achievement. The support and resources are founded on research-based knowledge and instructional strategies appropriate for elementary students. The teacher participants will use the knowledge gained to collaborate with their grade level teachers and develop DI lessons support all student learners. When teachers feel supported, teachers become more confident and teacher efficacy improves. As teachers implement these strategies, student academic achievement in mathematics is expected to increase on the state standardized assessment. The increase in student achievement will raise the interest of district-wide stakeholders and open the possibility for the professional development project to be implemented district-wide. The increase in student achievement could also encourage conversations and collaboration with other grade levels to review current DI mathematics instructional practices and possibly inform change in elementary mathematics.

Reflection on Importance of the Work

As I reflect on my research study, I recognize that much of what I thought about this journey was not true. I thought that I should know how to navigate the process because I was successful in undergraduate writing. This caused me to feel a bit insecure in the beginning as I was trying to find my way and understand this new world I had entered. As time progressed, I realized that people who earned their doctorate could be described as great learners which brings about true intelligence. Learning how to navigate the online class format, the Walden library resources, and MyDR have all taken time and came with a willingness to continue learning. I also had to learn to communicate with my chair and committee member. I feel I could have relied on their expertise a little more during the entire process instead of mostly for feedback on a draft or other work that I submitted. Learning to persevere and encourage myself through this process has been crucial to my continuation on this doctoral journey. The current pandemic has not been an easy time to complete my dissertation due to family loss and health challenges in my family. There have been times that I considered giving up, but I thoughts of others who supported me through this journey kept me going. I also knew that I wanted to accomplish this goal for myself because I have invested a tremendous amount of energy, time, and money into this effort. With a family, church priorities, and a full-time job, I had to learn to prioritize my research study. Sometimes that meant saying no to things that I would normally do, but I knew that my research study was of greater importance.

The most rewarding part of this journey is the knowledge I have gained from my research. I have acquired valuable knowledge on mathematics instruction and

instructional strategies to increase student achievement. Since this knowledge is grounded in years of research, it can be applied to any future time and still be effective. I acknowledge the importance of this research and I realize that my love for teaching and learning inspires me to help others through promoting life-long learning. My doctoral journey and the knowledge I have gained has inspired others to further their education.

Implications, Applications, and Directions for Future Research

In my educational career, I have often heard that the only constant in education is change. Educational leaders are often seeking ways to provide professional learning opportunities to help teachers meet the variety of student learning needs. As I reflect from the beginning of my teaching career to the current time, it looks quite different. With the changes in education, effective instructional strategies are an important foundation for student learning. Effective instructional strategies result in a winning situation for teachers and students. Teachers feel more confident in their teaching abilities and in turn student are more confident in their learning abilities. As teachers apply research-based instructional strategies, the possibilities for student achievement are great. It is crucial to continue to provide professional development grounded in research as education continues to change.

This basic qualitative research was conducted with five upper elementary teachers but, it has the possibility for further research. A clear understanding of DI using the principles upon it which it was founded is important learning for all teachers. Although this professional learning project was specifically designed for upper elementary grades, it has the capacity to be used for all elementary mathematics teachers. This study

explored the instructional strategies of DI for five upper elementary teachers since the implementation of more rigorous mathematics standards at Flint Elementary. Future research could explore the perspectives of other elementary teachers since the implementation of more rigorous mathematics standards at Flint Elementary. This research included five elementary teachers but, future research could also include district-wide elementary mathematics teacher or even across the state of Georgia.

Conclusion

Supporting teachers and students as mathematics standards have become more rigorous has been a goal for many school districts. In support of teachers and students, the Majestic County school district sought a DI mathematics curriculum to meet those needs. DI is founded on 5 main principles and each phase involves a variety of research-based instructional strategies. Understanding the principles and phases of DI is crucial information for effective planning and implementing the district-wide curriculum. My learning as a doctoral student has brought about changes in some long-standing views. I have learned throughout my dissertation research that consistent and meaningful professional development promotes change in instructional strategies. This seemed to be the only means by which teachers changed their way of thinking about instruction. As a result, I designed a professional development project on DI for upper elementary mathematics teachers. The project includes research-based strategies on DI to improve student achievement on standardized assessments.

Through one-on-one interviews in this qualitative study, I found that teachers used district-wide curriculum in a variety of ways, but there was no consistent use of DI.

In exploring teacher perspectives of DI, I concluded that understanding the foundational principles and phases would be worthwhile for planning and implementing research-based instructional strategies to meet the needs of students. Furthermore, meeting the needs of students results in an increase in student achievement on standardized assessments. The professional development project includes three days of professional development rooted in research-based knowledge on DI. The project also includes large group discussions, collaborative group activities, and collaborative lesson planning to promote academic achievement for all students. This project was design to be a support to teachers and educational leaders as they continue meet the diverse needs of students. As a result of this project, I hope that the evidence-based strategies will be used by other educators seeking to meet the diverse needs of their students.

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Hi Sharon,

Notice: The Walden IRB approval for the study # 04-08-20-0131969, will expire on April 7, 2021. If you wish to request an additional year of IRB approval, please make sure the IRB receives this form requesting continuing review prior to 5 p.m. central time on March 24, 2021. Failure to return this form will result in expiration of your Walden IRB approval for your study.

Please note, you **ONLY** need to submit the attached form if you are still collecting data or if there is a chance you will be collecting more data in the future or if you are analyzing data that continues to have identifiers. If you are done with the data collection and are conducting an analysis on deidentified data, or the study is complete, it is fine to let the approval expire.

Sincerely,

Elyse V. Abernathy, MSL, MSM
Research Ethics Support Specialist
Office of Research Ethics and Compliance

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Information about the Walden University Institutional Review Board, including instructions for application, may be found at this link:
http://academicguides.waldenu.edu/researchcenter/orec

Appendix A: The Project

Implementation the Three-Day Professional Development Training for Elementary Upper Elementary Mathematics Teachers

The 3-Day Professional Development Training designed for Upper Elementary Mathematics Teachers is titled, "Using Direct Instruction in Mathematics to Increase Student Achievement."

The intention of this project is to educate upper elementary mathematics teachers on DI and how the DI design can be used increases academic achievement. Each day of professional development training will begin at 8:30 a.m. and end at 3:30 p.m. During 3 in-service days of the summer break, teachers will gain knowledge that would be used to enhance daily mathematics instruction using the district-wide curriculum resources. The meeting PowerPoint would be presented to teachers not able to attend through email.

Purpose

The purpose of the 3-day PD training is to provide upper elementary mathematics teachers with a deeper understanding of DI using current research, the principles of DI, and how DI is used to promote academic achievement for students. This would include developing lessons and activities that can increase students' confidence and mathematic performance. Participants will learn how develop lessons based on DI to use during the academic school year.

PD Target Audience

The target audience for this PD training is upper elementary mathematics teachers in the Majestic County School District. Participants includes upper elementary regular education, special education, and gifted mathematics teachers.

The Goals for Professional Development Training

1. The participants will increase their understanding of Direct Instruction.
2. The participants will increase their understanding of the principles of DI and how they relate to mathematics instruction.
3. The participants will enhance their effectiveness in mathematics direct instruction using the principles of DI.

PD Learning Outcomes

The learning outcomes for this PD training enables participants to understand DI and the principles related to DI and use it in mathematics instruction to improve academic achievement for all students. Teachers will have the opportunity to develop a deeper understanding DI and the principles and then use that information to enhance instruction and the use of the district-wide mathematics curriculum. These outcomes would allow teachers to use DI consistently and effectively in teaching mathematics with confidence and equity. The DI content, resources, and collaborative sessions provided during the PD will enable teachers the opportunity to plan DI in mathematics for consistent use across upper elementary grade levels with a focus on improving student achievement.

PD Timeline

The planned timeline for the PD is three consecutive days during the summer in-service days. The training will take place from 8:30 a.m. to 3:30 p.m. each day. The agenda will include lunch and breaks for each day throughout the training. The sessions will include whole group and small collaborative learning groups for teachers.

On day 1 of the PD training, titled "What Is Direct Instruction?" the upper elementary mathematics teachers will learn about the focus of researcher's study, DI, and the principles of DI. This day of training will include short videos, a breakdown of each principle of DI, activities that highlight each principle, and discussions. The facilitator will show the PowerPoint on defining DI which includes the principles. The day 1 session will conclude with discussions and a written evaluation from teachers.

On Day 2 of the PD training, titled "What Are the Parts of a Direct Instruction Lesson" upper elementary teachers will participate in a morning session of learning about the parts of a DI lesson and then using that information in the afternoon session to construct a complete DI lesson using a grade level standard and resources from the district-wide DI curriculum. The facilitator will present a PowerPoint describing the parts of a DI lesson. During the afternoon session, teachers would break out into groups by grade level to create a DI lesson based on a grade level standard using the DI curriculum and manipulatives. Teachers will also use their assigned Chromebooks to access the mathematics curriculum and resources online. After discussions, teachers will give a written evaluation at the conclusion of this PD session.

On Day 3 of the PD training, titled "Creating a Direct Instruction Lesson Plan," teachers will actively participate in the last session. During this last day of PD, teachers

will continue to create the lesson plans they began on Day 2. After lunch, the participants will present the DI lesson plans. The facilitator will lead a discussion of each lesson to highlight some positive aspects of the lesson. Teachers will give a written evaluation at the conclusion of the Day 3 PD session.

3-Day Direct Instruction Professional Development

Professional Development Training Day 1: What Is Professional Development?

8:30 am- 3:30 pm

8:30-9:00

- Participants will sign in, receive agenda, and nametag

  Ice Breaker: PowerPoint
- Participants will draw a number as they enter the Day 1 Session
- Each participant will be paired with another participant based on the number drawn. (Participants with the same numbers will be paired together)
- Each pair will have 10 minutes to learn as much about their partner as a teacher as possible in order to introduce them (examples: why they became a teacher, favorite subject, greatest challenges, great rewards, funny teacher story)
- After 10 minutes, participants will introduce their partner as a teacher

Set Norms and Expectations for the Day -Power Point

- Each day will begin and end on time
- Be respectful of others
- Put cell phones on mute (If you need to have a phone conversation, please step out)
- Be an active participant in group sessions
- Enjoy the learning experience

Facilitator introduces the research study, the findings and the need for PD Training on Direct Instruction.

Topics for the Day 1

➢ What is Direct Instruction?

➢ What are the principles of Direct Instruction?

9:00-9:10

What is Direct Instruction? Introduction to Direct Instruction Video

https://www.youtube.com/watch?v=TkjxO3PSzwk

9:10-10:15

Principles of Direct Instruction- Facilitator will discuss each principle of Direct Instruction providing research-based support for each principle. PowerPoint- Facilitator will allow time for questions related to each principle.

- Principle 1- All children can be taught.
- Principle 2- All children can improve academically and in terms of self-image.
- Principle 3- All teachers can succeed if provided with adequate training and materials.
- Principle 4- Low performers and disadvantaged learners must be taught at a faster rate than typically occurs if they are to catch up to their higher-performing peers.
- Principle 5- All details of instruction must be controlled to minimize the chance of students' misinterpreting the information being taught and to maximize the reinforcing effect of instruction.

10:15- 10:30

15 Minute Break- PowerPoint

10:30- 10:45

Teach Like This Video & Brief Discussion of video led by facilitator-

https://www.youtube.com/watch?v=OJJkkUPC_yM

10:45- 11:30

Principles of Direct Instruction Whole Group Discussion- Facilitator will lead discussion. Participants will share how they could apply these principles in planning and teaching Direct Instruction.

11:30- 1:00

Lunch on Your Own- (District approved lunch times on professional development days due to the proximity of schools to restaurants.)

1:00- 3:00

Principles of Direct Instruction Scenarios- Participants will break into grade level groups. Each grade level will receive a task scenario in which they would apply the principles of Direct Instruction to develop a plan for instruction by answering some essential questions. Participants will use information from the morning session to develop the plan for instruction by answering the essential questions.

Essential Questions to Address:

-*How will the task be presented to all students?*

-*What strategies can you use to motivate all students and help them accomplish the task?*

-What materials or further training do teachers need to effectively help students complete the task?

-What prerequisite skills do teachers need to review with low performing or disadvantaged students to help them complete the task?

- How can teachers control instruction to prevent student misconceptions? What common mistakes can teachers address to alleviate misconceptions?

- 3rd Grade Task Scenario: (Standard: MGSE3.MD.8 Area & Perimeter) Twelve toothpicks can outline shapes with areas of 5 square units and 9 square units. What other areas can you outline with 12 toothpicks?
- 4th Grade Task Scenario- (Standard: MGSE4.NBT.4 Addition in Standard Algorithm) A recent expedition to the North Pole found a message from an explorer of long ago. In the message the explorer talked about an addition problem she was working on, but only the answer to the problem was readable. The explorer said the 2 numbers she added used each digit 1-8 only once. The answer that the explorer could read was 7785. What was the problem?
- 5th Grade Task Scenario- (Standard: MGSE5.NF.7 Multiplying & Dividing Fractions) Billy made 60 cards to give away on Valentine's Day. Help Billy figure out how many cards he will give to his family, his teachers, and his friends. Show your work. If Billy gives 1/3 of his cards to his family, how many cards does Billy give his family? If Billy gives 1/4 of his cards to his teachers, how many cards does Billy give his teachers? (mathlearningcenter.org)

2:00- 2:15

15 Minute Break- PowerPoint

3:00- 3:30

Facilitator debriefs on grade level scenarios in whole group. Participants share what they learned.

Individuals fill out Day 1 evaluation form.

3-Day Direct Instruction Professional Development

Professional Development Training Day 2: What Are the Parts of a Direct Instruction Lesson?

8:30 am- 3:30 pm

8:30-9:00

Participants will sign in, receive agenda, and nametag

Set Norms and Expectations for the Day -Power Point

- Each day will begin and end on time
- Be respectful of others
- Put cell phones on mute (If you need to have a phone conversation, please step out)
- Be an active participant in group sessions
- Enjoy the learning experience

Facilitator introduces the topics for the day.

Topics for the Day

➢ What are the parts of a Direct Instruction lesson?

➢ What are the phases of Direct Instruction?

9:00-10:15

Parts of a Direct Instruction Lesson

- Introduction/Review

- Development
- Guided Practice
- Closure
- Independent Practice
- Evaluation

10:15- 10:30

15 Minute Break- PowerPoint

10:30- 11:30

Phases of a Direct Instruction Lesson

- Before
- I Do
- We Do
- Corrective Feedback/Verification
- You Do

11:30- 1:00

Lunch on Your Own- (District approved lunch times on professional development days due to the proximity of schools to restaurants.)

1:00- 1:30

Video and Discussion- https://www.youtube.com/watch?v=GIrldg89g54

1:30- 1:45

15 Minute Break- PowerPoint

1:45- 3:00

Creating a Direct Instruction Lesson Plan

Within your grade level groups, create a Direct Instruction mathematics lesson using the knowledge you gained from this PLC, your curriculum, and mathematics manipulatives.

3:00- 3:30

Facilitator debriefs on today's sessions in whole group. Participants share what they learned.

Individuals fill out Day 2 evaluation form.

3-Day Direct Instruction Professional Development

Professional Development Training Day 3: Creating a Direct Instruction Lesson Plan

8:30 am- 3:30 pm

8:30-9:00

Participants will sign in, receive agenda, and nametag

Set Norms and Expectations for the Day -Power Point

- Each day will begin and end on time
- Be respectful of others
- Put cell phones on mute (If you need to have a phone conversation, please step out)
- Be an active participant in group sessions
- Enjoy the learning experience

Facilitator introduces the topics for the day.

Topics for the Day

➢ Planning a Direct Instruction Lesson

9:00-10:15

Continue Creating a Direct Instruction Lesson Plan

Within your grade level groups, create a Direct Instruction mathematics lesson using the knowledge you gained from this PLC, your curriculum, and mathematics manipulatives.

10:15- 10:30

15 Minute Break- PowerPoint

10:30- 11:30

Continue Creating a Direct Instruction Lesson Plan

Within your grade level groups, create a Direct Instruction mathematics lesson using the knowledge you gained from this PLC, your curriculum, and mathematics manipulatives

11:30- 1:00

Lunch on Your Own- (District approved lunch times on professional development days due to the proximity of schools to restaurants.)

1:00- 3:00

Direct Instruction Lesson Plan Presentations

- 3rd grade presentation
- 4th grade presentation
- 5th grade presentation

3:00- 3:30

Facilitator debriefs on grade level presentations in whole group. Participants share what they learned.

Individuals fill out Day 3 evaluation form.

Mathematics
Direct Instruction PLC
Day 1
What Is Direct Instruction?

Facilitator: Sharon Taylor

ICE-BREAKER/INTRODUCTIONS

30 Minutes

- Participants will draw a number as they enter the Day 1 Session
- Each participant will be paired with another participant based on the number drawn. (Participants with the same numbers will be paired together)
- Each pair will have 10 minutes to learn as much about their partner as a teacher as possible in order to introduce them (examples: why they became a teacher, favorite subject, greatest challenges, great rewards, funny teacher story)
- After 10 minutes, participants will introduce their partner as a teacher

What Is Direct instruction?

Direct Instruction (DI) is a teaching model that emphasizes well-developed and carefully sequenced lessons designed around small learning increments and clearly defined and prescribed teaching tasks. DI is based on the theory that clear instruction eliminating misinterpretations greatly accelerates learning for all students.

(National Institute for Direct Instruction, 2015)

What Is Direct instruction?

Its creator, Siegfried Engelmann, and his colleagues have demonstrated that DI greatly improves both academic performance and affective behaviors. Over 40 years of research has proven that DI dramatically increases academic performance of students of all backgrounds.

(National Institute for Direct Instruction, 2015)

What Is Direct instruction?

Video

https://www.youtube.com/watch?v=TkjxO3PSzwk

(National Institute for Direct Instruction, 2015)

What Is Direct Instruction?

Principle 1
All children can be taught

(National Institute for Direct Instruction, 2015)

Principle 1: All Students Can Be Taught

A positive learning environment is essential in motivating students to learn and in teaching them. Teachers can create a positive learning environment by:

- Supporting student interests
- Increasing student responsibility
- Allowing students to take an active role in their own learning
- Helping students create their own reasonable goals and objectives

(Johnson, 2017)

Principle 1: All Students Can Be Taught

Since students may not be motivated to learn on their own, teachers play an important role in student motivation

Teachers can support student learning by:

- Being competent- teacher's skill and knowledge of concepts taught
- Making lessons relevant- connect lessons to students' personal world
- Relating to students- understanding students' needs

(Johnson, 2017)

Principle 1: All Students Can Be Taught

Teachers can support student learning by providing positive feedback. Positive feedback can encourage students to:

- Have confidence in their own abilities
- See the positive aspects of their own work
- Believe that teacher supports them

(Johnson, 2017)

Principle 1: All Students Can Be Taught

Teachers can support student learning by providing positive feedback.

Positive Feedback Example:

Principle 1: All Students Can Be Taught

Teachers can support student learning by providing positive feedback.

Positive Feedback Example:

Principle 1: All Students Can Be Taught

Teachers can support student learning by providing positive feedback.

Positive Feedback Example:

What Is Direct Instruction?

Principle 2

All children can improve academically and in terms of self-image

(National Institute for Direct Instruction, 2015)

Principle 2

All children can improve academically and in terms of self-image

The teacher-student relationship is at the heart of student learning (Brinkworth et al., 2018).

- Positive student-teacher relationships decreases behavior problems which improves self image and academic achievement
- National & International studies acknowledge the great impact of the teacher-student relationship on student academic achievement

(Oz and Dolapçioglu, 2019).

Principle 2

All children can improve academically and in terms of self-image

The teacher-student relationship is at the heart of student learning (Brinkworth et al., 2018).

- Conflict in teacher-student relationships results in low motivation and academic achievement
- Conflict in teacher-student relationships is more difficult for at-risk students leading to a poor self-image and low academic achievement
- Positive teacher-student relationships can help at-risk students improve academically and in their self-image.

(Samson and Wehby, 2019)

Principle 2

All children can improve academically and in terms of self-image

The teacher-student relationship is at the heart of student learning (Brinkworth et al., 2018).

Positive teacher–student relationships causes:

- Students to work harder leading to greater academic achievement
- Fewer discipline problems due to mutual respect
- Greater student motivation to meet academic goals

(Brinkworth et al., 2018)

Principle 2
All children can improve academically and in terms of self-image

DEVELOPING A GROWTH MINDSET

INSTEAD OF.....	TRY THINKING....
I'm not good at this	What am I missing?
I give up	I'll use a different strategy
It's good enough	Is this really my best work?
I can't make this any better	I can always improve
This is too hard	This may take some time
I made a mistake	Mistakes help me to learn
I just can't do this	I am going to train my brain
I'll never be that smart	I will learn how to do this
Plan A didn't work	There's always Plan B
My friend can do it	I will learn from them

What Is Direct Instruction?

Principle 3

All teachers can succeed if provided with adequate training and materials

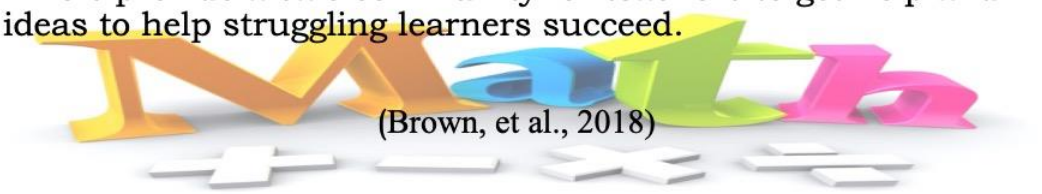
(National Institute for Direct Instruction, 2015)

Principle 3

All teachers can succeed if provided with adequate training and materials

Teacher instructional training known as Professional Learning Communities (PLC) is "a group of committed educators working collaboratively in an ongoing process resulting in better student achievement"(Brown, et al., 2018).

- Teachers must meet regularly to set goals
- To succeed, teachers need time to review goals and student achievement based on formative assessment data
- PLC's provide a safe community for teachers to get help and ideas to help struggling learners succeed.



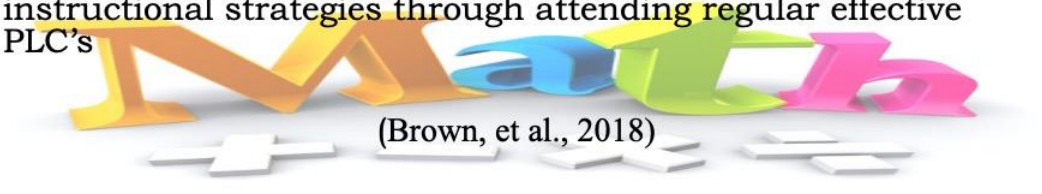
(Brown, et al., 2018)

Principle 3

All teachers can succeed if provided with adequate training and materials

Teacher instructional training known as Professional Learning Communities (PLC) is "a group of committed educators working collaboratively in an ongoing process resulting in better student achievement"(Brown, et al., 2018).

- Student learning and teacher success is a collaborative effort in which all teachers take responsibility for student learning
- Through training and collaboration, teachers learn more about how to use curricular resources and materials to help students
- Teachers are more likely change their perspective on ineffective instructional strategies through attending regular effective PLC's



(Brown, et al., 2018)

Principle 3
All teachers can succeed if provided with adequate training and materials

Principle 3
All teachers can succeed if provided with adequate training and materials

What Is Direct Instruction?

BREAK

What Is Direct Instruction?

Principle 4

Low performers and disadvantaged learners must be taught at a faster rate than typically occurs if they are to catch up to their higher-performing peers

(National Institute for Direct Instruction, 2015)

Principle 4
Low performers and disadvantaged learners must be taught at a faster rate than typically occurs if they are to catch up to their higher-performing peers

Low performing/disadvantaged students with a growth mindset are able to make significant gains with teacher support (Gupta and Guang-Lea, 2020).

- Students can make significant gains with assistance in setting attainable goals
- Students can stay on track with immediate and consistent feedback
- A timer or a reminder of time left may be used to help students who have difficulties completing assignments in the given time frame

(Grunke et al., 2019)

Principle 4
Low performers and disadvantaged learners must be taught at a faster rate than typically occurs if they are to catch up to their higher-performing peers

Low performing/disadvantaged students with a growth mindset are able to make significant gains with teacher support (Gupta and Guang-Lea, 2020).

- Students can complete more difficult mathematics problems when they learn the basic facts quickly and fluently
- When students learn the basic foundational mathematics facts quickly, they are able to catch up to their peers academically by the end of elementary school regardless of the previous gaps

(Grunke et al., 2019)

Principle 4
Low performers and disadvantaged learners must be taught at a faster rate than typically occurs if they are to catch up to their higher-performing peers

What Is Direct Instruction?

Principle 5

All details of instruction must be controlled to minimize the chance of students' misinterpreting the information being taught and to maximize the reinforcing effect of instruction

(National Institute for Direct Instruction, 2015)

Principle 5

All details of instruction must be controlled to minimize the chance of students' misinterpreting the information being taught and to maximize the reinforcing effect of instruction

- Provide clear instruction and time for students to ask questions to clear misconceptions
- Allow time for students to collaborate during guided practice to learn from each other
- Address common mistakes students make during instruction to clear any misconceptions

Principle 5

All details of instruction must be controlled to minimize the chance of students' misinterpreting the information being taught and to maximize the reinforcing effect of instruction

- Help students learn from misconceptions
- Use misconceptions to guide further instruction

(National Institute for Direct Instruction, 2015)

What is Direct Instruction? Teach Like This

Video

https://www.youtube.com/watch?v=OJJkkUPC_yM

What Is Direct Instruction?
Principle of Direct Instruction 30 Minute Discussion

What do your think?

How could you use these principles in your lessons?

- ❑All children can be taught
- ❑All children can improve academically and in terms of self-image
- ❑All teachers can succeed if provided with adequate training and materials
- ❑Low performers and disadvantaged learners must be taught at a faster rate than typically occurs if they are to catch up to their higher-performing peers
- ❑All details of instruction must be controlled to minimize the chance of students' misinterpreting the information being taught and to maximize the reinforcing effect of instruction

Lunch Break On Your Own 11:30- 1:00

What Is Direct Ins
Principle of Direct Instruction
What do your think?
How could you use these principles in your lessons?

The purpose of the principles of Direct Instruction scenarios is to help participants think about the principles of Direct Instruction as they are planning their lessons.

What Is Direct Instruction?
Principle of Direct Instruction

Principles of Direct Instruction Scenarios

Each grade level will receive a task scenario in which they would apply the principles of Direct Instruction to develop a plan for instruction by answering some essential questions. You may use information from the morning session to develop the plan for instruction by answering the essential questions.

What Is Direct Instruction?
Principle of Direct Instruction

Principles of Direct Instruction Scenarios-

Essential Questions to Address:

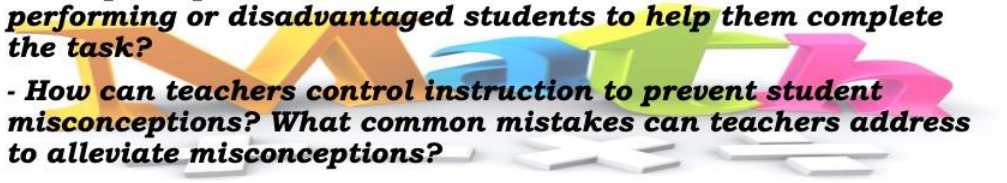
-How will task be presented to all students?

-What strategies can you use to motivate all students and help them accomplish the task?

-What materials or further training do teachers need to effectively help students complete the task?

-What prerequisite skills do teachers need to review with low performing or disadvantaged students to help them complete the task?

- How can teachers control instruction to prevent student misconceptions? What common mistakes can teachers address to alleviate misconceptions?



What Is Direct Instruction?

BREAK

What Is Direct Instruction?
Principle of Direct Instruction

Principles of Direct Instruction Scenarios-

3rd Grade Task Scenario:

(Standard: MGSE3.MD.8 Area & Perimeter)

Twelve toothpicks can outline shapes with areas of 5 square units and 9 square units. What other areas can you outline with 12 toothpicks? (gadoe.org)

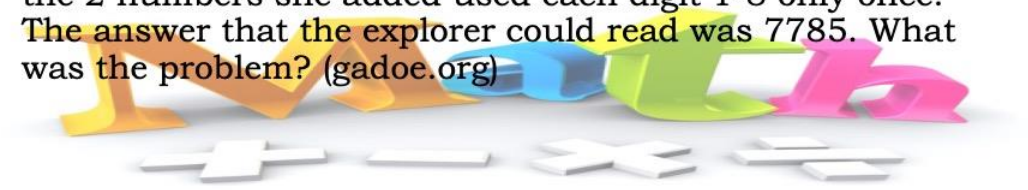
What Is Direct Instruction?
Principle of Direct Instruction

Principles of Direct Instruction Scenarios-

4th Grade Task Scenario

(Standard: MGSE4.NBT.4 Addition in Standard Algorithm)

A recent expedition to the North Pole found a message from an explorer of long ago. In the message the explorer talked about an addition problem she was working on, but only the answer to the problem was readable. The explorer said the 2 numbers she added used each digit 1-8 only once. The answer that the explorer could read was 7785. What was the problem? (gadoe.org)



What Is Direct Instruction?
Principle of Direct Instruction

Principles of Direct Instruction Scenarios-

5th Grade Task Scenario

(Standard: MGSE5.NF.7 Multiplying & Dividing Fractions)

Billy made 60 cards to give away on Valentine's Day. Help Billy figure out how many cards he will give to his family, his teachers, and his friends. Show your work. If Billy gives 1/3 of his cards to his family, how many cards does Billy give his family? If Billy gives 1/4 of his cards to his teachers, how many cards does Billy give his teachers? (mathlearningcenter.org)

Mathematics
Direct Instruction PLC
Day 1 Debriefing & Evaluation Form

Facilitator: Sharon Taylor

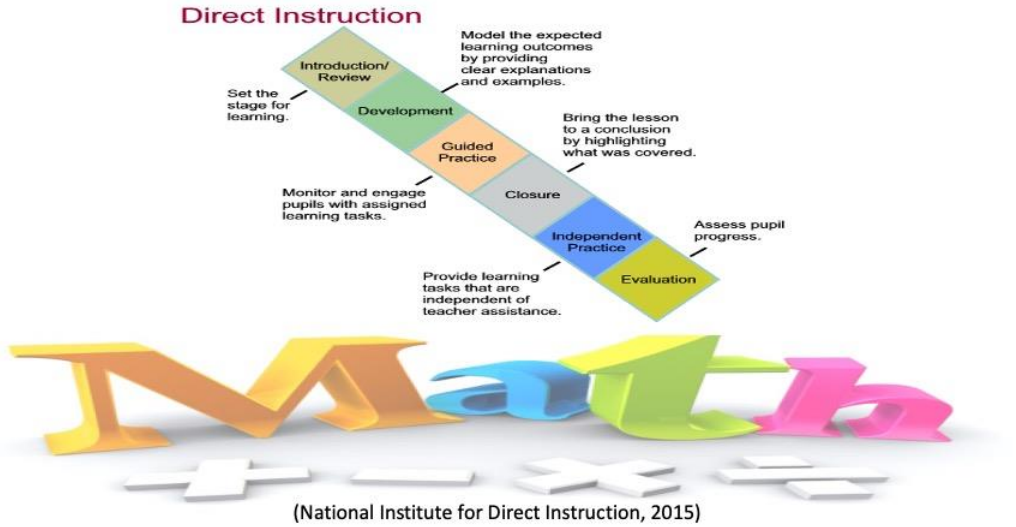
Mathematics
Direct Instruction PLC
Day 2
What Are the Parts of a Direct Instruction Lesson?

Facilitator: Sharon Taylor

Norms and Expectations

- Each day will begin and end on time
- Be respectful of others
- Put cell phones on mute (If you need to have a phone conversation, please step out)
- Be an active participant in group sessions
- Enjoy the learning experience

What Are the Parts of a Direct Instruction Lesson?
Direct Instruction Model



(National Institute for Direct Instruction, 2015)

What Are the Parts of a Direct Instruction Lesson?
Direct Instruction: Introduction

The introduction consists of setting the stage for learning and gaging the prior knowledge students have about a concept.

(National Institute for Direct Instruction, 2015)

What Are the Parts of a Direct Instruction Lesson?
Direct Instruction:
Introduction

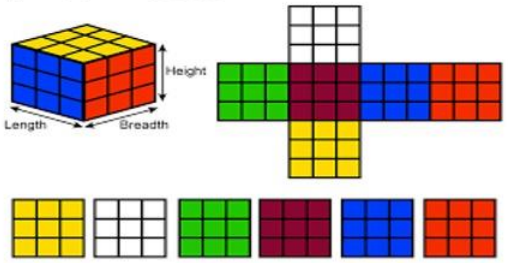
Setting the stage for learning is a crucial part of the DI Lesson.

- This is the opening of the lesson
- It's intended to engage students, get their attention, and activate their prior knowledge
- This may be called a lesson opener or a hook.

What Are the Parts of a Direct Instruction Lesson?
Direct Instruction:
Introduction/Hook Ideas

Games

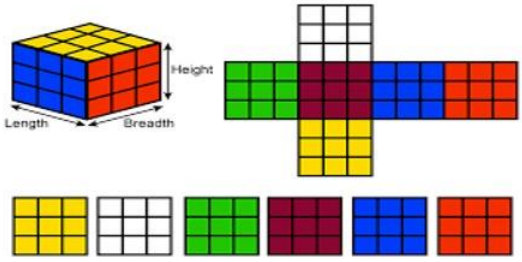
Playing a game is one way to hook students. When the game is relevant, it makes it even more interesting for students.



What Are the Parts of a Direct Instruction Lesson?
Direct Instruction:
Introduction/Hook Ideas

Games

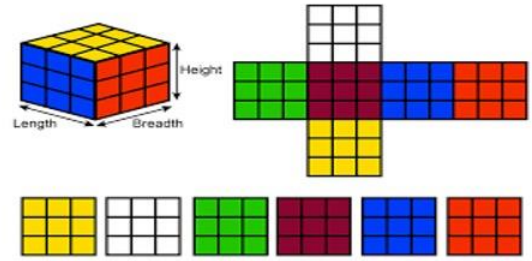
Asking students to bring in their Rubix Cubes for an upcoming mathematics lesson would immediately get their attention.



What Are the Parts of a Direct Instruction Lesson?
Direct Instruction:
Introduction/Hook Ideas

Games

The Rubix Cube could be used to introduce students to area and also to review multiplication which students would need to use to find the area.



What Are the Parts of a Direct Instruction Lesson?
Direct Instruction:
Introduction/Review

Build upon a previous lesson or get an understanding of their background knowledge of the subject you are about to teach them.

(National Institute for Direct Instruction, 2015)

What Are the Parts of a Direct Instruction Lesson?
Direct Instruction:
Introduction/Review

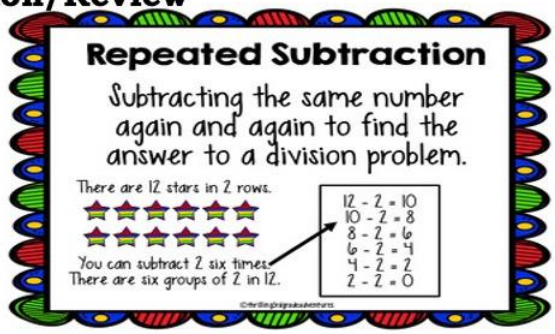
Introducing a Multiplication Lesson:

Review addition and build upon that concept. Students already understand addition and teaching repeated addition will help students understand multiplication as adding equal groups.

What Are the Parts of a Direct Instruction Lesson?
Direct Instruction:
Introduction/Review

Introducing a Division Lesson:

Review subtraction and build upon that concept. Student already understand subtraction and teaching repeated subtraction will help students understand division as subtraction of equal groups.



What Are the Parts of a Direct Instruction Lesson?
Direct Instruction: Development
Modeling

Model the expected learning outcomes by providing clear explanations and examples.

(National Institute for Direct Instruction, 2015)

What Are the Parts of a Direct Instruction Lesson?
Direct Instruction: Development
Modeling

Few teachers model with the level of explicitness needed to *immerse* students in the instruction. They tend to gloss over critical details, rely on too much talk and hand gestures, and make assumptions about what students should already know and understand.

https://www.smartclassroommanagement.com/2013/10/26/the-3-most-common-modeling-mistakes-teachers-make/

What Are the Parts of a Direct Instruction Lesson?
Direct Instruction: Development
Modeling

Few teachers model with the level of explicitness needed to *immerse* students in the instruction. They tend to gloss over critical details, rely on too much talk and hand gestures, and make assumptions about what students should already know and understand.

https://www.smartclassroommanagement.com/2013/10/26/the-3-most-common-modeling-mistakes-teachers-make/

What Are the Parts of a Direct Instruction Lesson?
Direct Instruction: Development
Modeling

Good modelers assume nothing. They play-act every step from start to finish. They even add amusing, inconsequential steps to help students create richer mental pictures and memory maps.

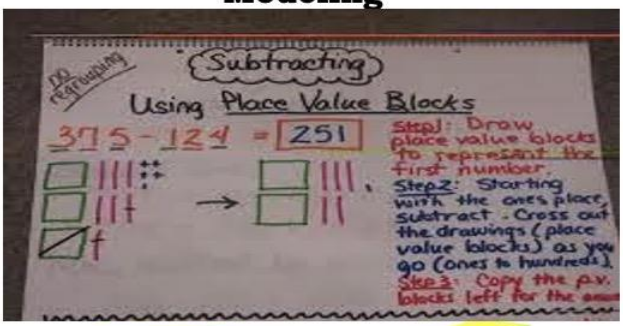
https://www.smartclassroommanagement.com/2013/10/26/the-3-most-common-modeling-mistakes-teachers-make/

What Are the Parts of a Direct Instruction Lesson?
Direct Instruction: Development
Modeling

Good modelers also have the ability to put themselves in their students' shoes, vicariously viewing their instruction from a student's perspective. They model from student desks, model using student materials, and model as if they were an actual member of the class. They capitalize on the universal desire for students to *see with their own eyes* what is expected of them—so there are no mysteries or uncertainties, and nothing left uncovered.

https://www.smartclassroommanagement.com/2013/10/26/the-3-most-common-modeling-mistakes-teachers-make/

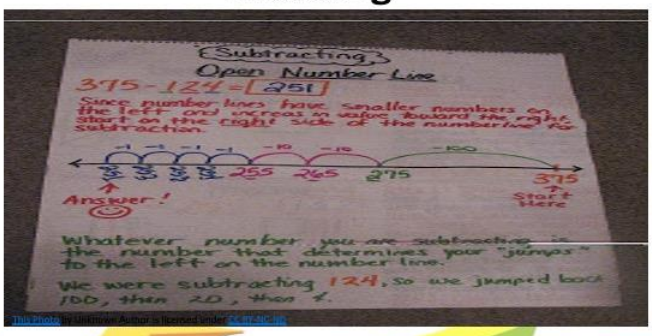
What Are the Parts of a Direct Instruction Lesson?
Direct Instruction: Development
Modeling



What Are the Parts of a Direct Instruction Lesson?

Direct Instruction: Development

Modeling

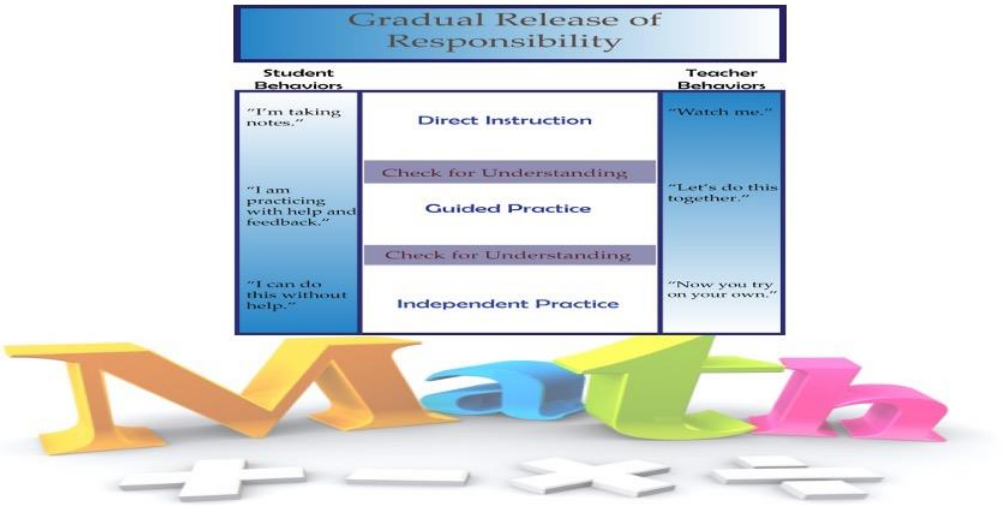


What Are the Parts of a Direct Instruction Lesson?
Direct Instruction:
Guided Practice

Monitor and engage students with the assigned learning task. Consistently monitoring students and offering positive feedback helps student stay engaged while learning.

(National Institute for Direct Instruction, 2015)

What Are the Parts of a Direct Instruction Lesson?
Direct Instruction:
Guided Practice



What Are the Parts of a Direct Instruction Lesson?

Direct Instruction:
Closure

This is an opportunity for teachers to highlight what was taught and bring the lesson to a closure.

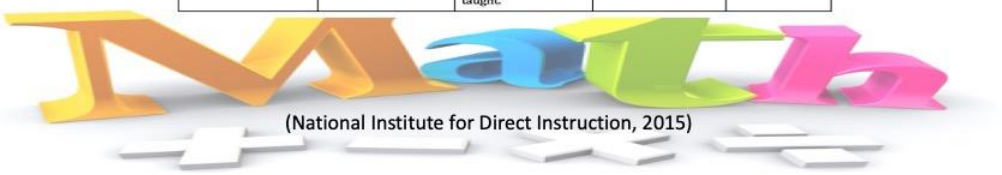
What Are the Parts of a Direct Instruction Lesson?

Direct Instruction:

Evaluation

Assess student progress.

4 Meets standards at a high level	3 Meets standards	2 Approaching standards	1 Minimal understanding	0 No attempt
The student provides correct solutions and strategies.	The student provides mostly correct solutions and strategies with minor errors.	The student demonstrates some correct thinking about solutions and strategies.	The st - lent demonstrates some evidence of mathematical thinking, but shows little understanding.	No evidence of attempting the task.
The student explains and justifies his/her thinking thoroughly and clearly.	The student explains and justifies his/her thinking.	Student explains their thinking but it may be hard to follow.	The student offers little explanation of his/her thinking or what is offered does not make sense.	
The student connects and applies the standards in complex ways.	The student demonstrates mastery of the standards that were explicitly taught.	The student demonstrates partial understanding of the of standards that were explicitly taught.	The student demonstrates minimal or no understanding of the standard.	



(National Institute for Direct Instruction, 2015)

What Are the Parts of a Direct Instruction Lesson?

BREAK

What Are the Parts of a Direct Instruction Lesson?

Phases of Direct Instruction PDF- Handout

Participants explore sample activities to enhance lessons.

https://education.ky.gov/school/stratclsgap/instruction/Documents/Direct%20Explicit%20Instruction%20Model.pdf

Direct/Explicit Instruction: Five Essential Phases for an Instructional Process

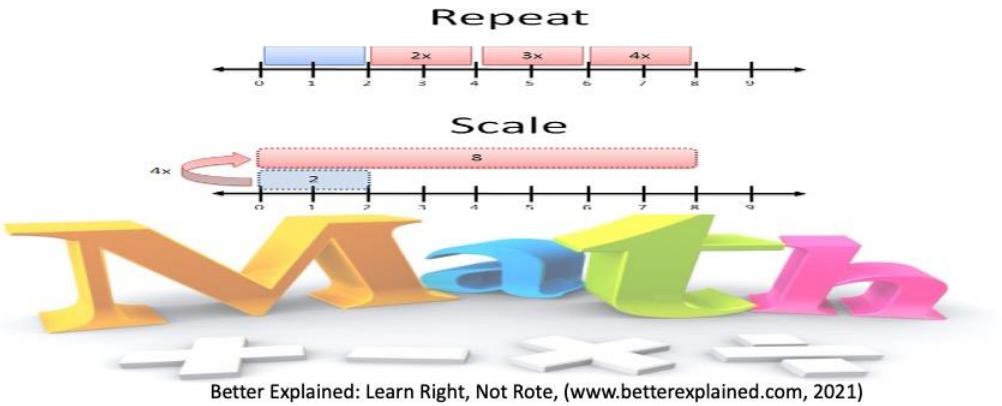
One: Direct Explanation-Before Learning **Two: Modeling (I Do It)** **Three: Guided Practice (We Do It)** **Four: Corrective Feedback/Verification** **Five: Application/Problem Solve/Practice and Self monitor (You Do It)**	Research indicates that Direct Instruction yields high results, more than other approaches. This model ensures: adequate practice, correct levels of rigor, congruent instruction and appropriate learning strategies. The teacher must ensure integration of differentiation, provide appropriate challenge and rigor, and ensure mastery before progressing in curriculum.
Sample Activities: **Providing Cues* **Video clips* **Essential Questions* **KWL/BDA Chart* **Guided Imagery* **Anticipation Guides* **Probable Passage*	**(BEFORE)** **Phase One: Direct Explanation** consists of bridging the gap between students' prior knowledge and new learning **Strategies:** Includes providing a "hook" for instruction and setting the stage for learning by clarifying the learning target and measures of success. Teachers can use a metacognitive strategy such as frontloading, activating prior knowledge, making connections and generating questions, creating mental images **Prerequisites:** Teachers know and understand the underpinning knowledge, pre-assessments/previous exit slips results **Level of Support:** Teacher provides a high level of support and control
Sample Activities: **Think Alouds* **Providing Cues* **KWL/BDA Chart* **Think, Pair, Share* **3 Minute Pause* **Say Something* **Guided Imagery* **Anticipation Guides* **Double Entry Diaries*	**(During Learning-) "I DO IT"** **Phase Two: Demonstration and Modeling** includes the overt actions of the teacher as well as implementing metacognitive thinking (think alouds are a good example). The teacher engages students through questioning, models, strategies and cues. More importantly, the students are encouraged to monitoring their own thinking as the teacher monitors and assesses student learning (understanding and comprehension). Monitoring allows for immediate adjustments and clarification of misunderstandings to maximize student learning. **Sample Instructional Strategies**: Concept Definitions, Note Making (e.g., Cornell Notes), Graphic Organizers, Connect to Self/Text/World, Kagan Strategies that embeds cognitive engagement **Level of Support:** Teacher provides **high level of support to students which can include**: verbal direction, chunking the work, varied prompts, cues, organizers, peer assistance, small group learning
Sample Activities: **FALS* **Interactive Reading Guides* **Questioning the Author* **Story Mapping* **Double Entry Journals/Diaries* **Logographic Cues* **Use of Bookmarks* **Syntax Surgery* **Anticipation Guides* **Author Says, I Say* **Connect Two* **Character Quotes* **Mind Mapping* **KWL Plus* **Labs* **Magnet Summaries* **Sketch to Stretch* **GIST*	**(During Learning-) "WE DO IT"** **Phase Three: Guided Practice** provides students with opportunities to work more independently on new learning, concept or skill (individual, groups, project based, cooperative grouping). Initially, in this stage, the teacher maintains a high level of support. Slowly and gradually, as indicated by student data and performance, the amount of support is withdrawn. Teacher monitors for conceptual clarity as strong procedural, engaging, instructional practices are carried out in the classroom setting. LEARNING, formative student data, teacher formative evaluation is all taking place simultaneously, teaching is adjusted to maximize the learning. Entering the proximal zone of development. • Students are highly cognitively engaged in this phase • Teacher uses student work samples and responses to monitor performance **Phase Four: Corrective Feedback/Verification**- Teachers are providing descriptive feedback (intervention/remediation and success) and metacognitive strategies. **Sample Instructional Strategies:** Copy-Cover-Compare, Chunking, Similarities and Differences (Discovering Patterns/Connections), Cornell Note Making, Graphic Organizers, Cooperative or Collaborative Learning, Kagan or other engagement Strategies, Non Linguistic Representations **Level of Support:** Teacher provides **scaffolds for some learners, but is gradually releasing support where appropriate**
Sample Activities: **Anticipation Guides* **Scales (Likert)* **Plus/Delta* **Somebody Wanted But So* **Text Reformulation* **It Says-I Say-So* **Most Important Word* **Reflections* **Cornell Notes* **Summaries* **Conjectures*	**(After Learning-) "YOU DO IT"** **Phase Five: Independent Practice** and problem solving- This phase is when students are able to demonstrate proficiency in the standard. Students are problem solving and cognitively engaged without scaffolds. Students are making sense of the problems, leading discussions, questioning thinking, engaged in the learning and problem solving, using rubrics and exemplars to improve their work. Teachers evaluate formatively for Tier I Interventions and **debrief** strategies and student success on the target for the day. Teacher brings closure to the target and students conclude if they need support or practice. **Sample Instructional Strategies:** Differentiate and vary the independent practice formats (e.g., independent practice, peer tutoring, self-correcting materials, software/web-based, cooperative learning, group work, centers, projects, etc.) to demonstrate a performance of understanding or culminating assessment of the target. **Level of Support:** No teacher supports, but excellent time to **provide needed Tier I Interventions** for students in small groups based on formative data. Teacher continues to monitor student work and gather data results for Tier I

What Are the Parts of a Direct Instruction Lesson?
Phases of DI Activities (Before)
Guided Imagery for Multiplication

Multiplication

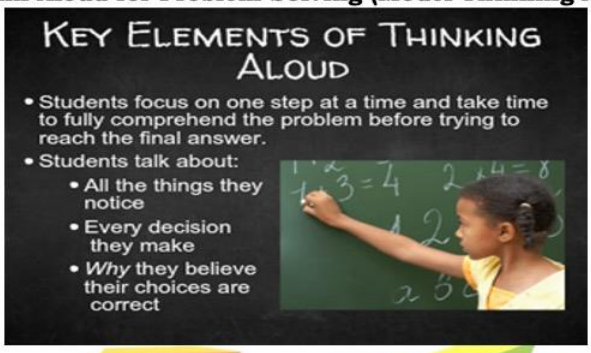
Multiplication can also be interpreted in several ways:

- **Repetition**: Performing multiple additions.
- **Scaling**: Making a number grow or shrink all at once.



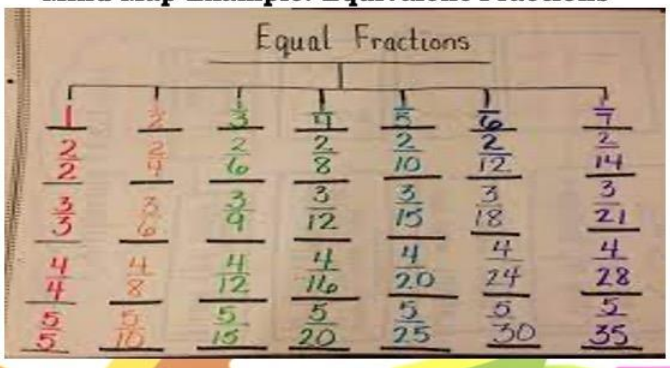
Better Explained: Learn Right, Not Rote, (www.betterexplained.com, 2021)

What Are the Parts of a Direct Instruction Lesson?
Phases of DI Activities (I Do)
Think Aloud for Problem Solving (Model Thinking Aloud)



Learning Disabilities Online, (www.ldonline.org, 2021)

What Are the Parts of a Direct Instruction Lesson?
Phases of DI Activities (We Do)
Mind Map Example: Equivalent Fractions

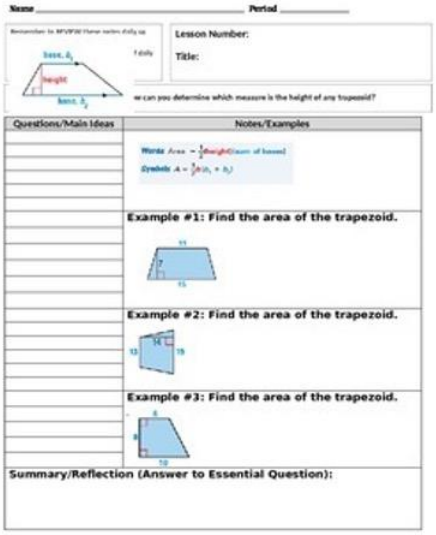


What Are the Parts of a Direct Instruction Lesson?
Phases of Direct Instruction Activities
(Corrective Feedback/Verification)

Teacher provides descriptive student feedback and clears up misconceptions.

What Are the Parts of a Direct Instruction Lesson?
Phases of DI Activities
(You Do)

Cornell Notes are a different way for students to take notes during Direct Instruction. These notes can be used during the guided and independent practice phase of the lesson.



Name _____ Period _____

Lesson Number:

Title:

How can you determine which measure is the height of any trapezoid?

Questions/Main Ideas	Notes/Examples
	Words: Area = ½(height)(sum of bases)
	Symbols: $A = \frac{1}{2}h(b_1 + b_2)$
	Example #1: Find the area of the trapezoid.
	Example #2: Find the area of the trapezoid.
	Example #3: Find the area of the trapezoid.
Summary/Reflection (Answer to Essential Question):	

Lunch Break On Your Own 11:30- 1:00

What Are the Parts of a Direct Instruction Lesson?
Thales Academy

Video

https://www.youtube.com/watch?v=GIrldg89g54

What Are the Parts of a Direct Instruction Lesson?

BREAK

What Are the Parts of a Direct Instruction Lesson?

Direct Instruction Lesson Plan 1:45-3:00

Within your grade level groups, create a Direct Instruction mathematics lesson using the knowledge you gained from this PLC, your curriculum, and mathematics manipulatives.

Mathematics
Direct Instruction PLC
Day 2 Debriefing & Evaluation Form

Facilitator: Sharon Taylor

Mathematics
Direct Instruction PLC
Day 3
Creating a Direct Instruction Lesson Plan

Facilitator: Sharon Taylor

Norms and Expectations

- Be respectful of others
- Put cell phones on mute (If you need to have a phone conversation, please step out)
- Be an active participant in group sessions
- Enjoy the learning experience

Creating a Direct Instruction Lesson Plan

Direct Instruction Lesson Plan 9:00-11:30

Within your grade level groups, create a Direct Instruction mathematics lesson using the knowledge you gained from this PLC, your curriculum, and mathematics manipulatives.

Creating a Direct Instruction Lesson Plan 10:00-10:15

BREAK

Lunch Break On Your Own 11:30- 1:00

Presentation of Direct Instruction Lesson Plans

Direct Instruction Lesson Plan Presentations

Grade level groups will present their lesson plans

3rd Grade Lesson Plan Presentation

4th Grade Lesson Plan Presentation

5th Grade Lesson Plan Presentation

Mathematics
Direct Instruction PLC
Day 3 Debriefing & Evaluation Form

Facilitator: Sharon Taylor

References

Better Explained: Learn Right, Not Rote, (www.betterexplained.com, 2021)

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Math Learning Center (mathlearningcenter.org)

National Institute of Direct Instruction

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Smart Classroom Management: (http://www.smartclassroommanagement.com, 2013)

Teach Like This Video: https://www.youtube.com/watch?v=OJJkkUPC_yM

Thales Academy Video: https://www.youtube.com/watch?v=Glrldg89g54

Appendix B: Interview Protocol

Interview Protocol Form

Project: Mathematics Teachers' Perspective of Direct Instruction

Date _____

Time _____

Location _____

Interviewer _____

Interviewee _____

Release form signed? ____

Notes to interviewee:

Thank you for your participation. I believe your input will be valuable to this research and in helping our teaching profession.

Confidentiality of responses is guaranteed

Approximate length of interview: 60 minutes, 11 major questions

Purpose of research:

For teachers, direct instruction to address procedural and conceptual is an integral part of students mastering rigorous standards.

i. *How do teachers use direct instructional strategies to teach mathematics?*

ii. *What are mathematics teachers' perspectives of direct mathematics instruction?*

Methods of disseminating results: Administration and participants will receive the results through email.

1. What mathematics direct instruction training have you received? How has that training helped you succeed as a teacher? (Principle 3)

2. How do you model or provide examples for students during direct Mathematics instruction?

3. How does modeling improve instruction or student performance? What are some specific examples of modeling in your instruction?

4. Describe the strategies you use to teach all students. (Principle 1)

5. How do you help low performing or disadvantaged students catch up with their peers who are performing at or above grade level? (Principle 4)

6. How do you help students improve academically and improve their self-image as well? (Principle 2)

7. How do you use formative assessments to provide constructive feedback to your students?

8. How do you conclude a direct instruction mathematics lesson? How do you determine if the lesson was successful or not?

9. What are the strengths and limitations of direct mathematics instruction? How could the limitations of direct instruction be addressed to improve instruction?

10. How do you control instruction to minimize your students misinterpreting the information that is taught? (Principle 5)

11. Is there anything else you would like to add about using direct instruction strategies or your perspective direct instruction in mathematics?

- Closure
    - Thank you to interviewee
    - Reassure confidentiality
    - Ask permission to follow-up for member checking

Appendix C

DIRECT INSTRUCTION PROFESSIONAL DEVELOPMENT EVALUATION FORM

Date: _____	**Strongly Agree**	**Agree**	**Neither Agree Nor Disagree**	**Disagree**	**Strongly Disagree**
Content					
1. The objectives for today's session were clearly stated.	☐	☐	☐	☐	☐
2. Today's session was aligned to its stated objectives.	☐	☐	☐	☐	☐
3. Today's session was useful and practical.	☐	☐	☐	☐	☐
4. Today's session advanced the development of my leadership capacity.	☐	☐	☐	☐	☐
Process					
5. Today's activities (presentations, scenarios, group exercises, etc.) increased my capacity to use Direct Instruction to improve my practice.	☐	☐	☐	☐	☐
6. The facilitators of today's session effectively modeled appropriate instructional strategies.	☐	☐	☐	☐	☐
7. The facilitators incorporated our experiences into today's activities (presentations, scenarios, group exercises, etc.)	☐	☐	☐	☐	☐
8. Time was allocated effectively today to deepen my understanding of the presented material.	☐	☐	☐	☐	☐
Context					
9. There were opportunities during today's session to collaborate on shared activities.	☐	☐	☐	☐	☐
10. Today's activities (presentations, scenarios, group exercises, etc.) were relevant for my job-related needs.	☐	☐	☐	☐	☐

11. Today's sessions advanced my understanding of Direct Instruction.	☐	☐	☐	☐	☐
12. The organization of the learning environment (facilities, tools, materials, participant groupings, etc.) met my learning needs.	☐	☐	☐	☐	☐

Comments

Appendix D

Sample Transcript

1. **What mathematics direct instruction training have you received? How has that training helped you succeed as a teacher?**

    - Several Into Math trainings. In person and Online
    - Suzy Pepper: Math in the Fast Lane training
    - Collaborative training at the RESA level with several surrounding counties
    - Tim Macnemera training from Engage New York
    - Teach your Heart Out teaching conference
    - PLC sessions at the school level as well as collaborative grade level meetings

    Through all these trainings, I think they have helped be become a better math teacher and succeed in the classroom by opening my eyes to many more resources to use in the classroom with my students. These trainings have allowed me to establish my initial purpose for the lessons and direct instruction and allow me to maximize student engagement in the classroom.

2. **How do you model or provide examples for students during direct Mathematics instruction?**

    I provide models and examples for my students by implementing the instructional strategy of "I do, we do, you do". I start by showing an exemplar to my students so they know what the expectations are. Then, I gradually release the task at hand for them to try it with added support. At this stage, they will a good deal of support through feedback. Once they have had an opportunity to practice the skill with support, they will move into the independent stage of this instructional model.

3. **How does modeling improve instruction or student performance? What are some specific examples of modeling in your instruction?**

    Modeling increases instructional time because the students are aware of what the exemplar looks like. This takes the "guess work" out of the task. They know exactly what is expected of them.

    - Example: Task: Multiplying two digit by two digit numbers

- Exemplar model “I do”: Teacher models different strategies to show how to solve multiplication problems. Standard Algorithm and “Box Method or Area Model”.
- Student with Support “we do”: Students will be given problems to try with either strategy. Teacher gives support and aid where needed. They can work in groups or partners as well.
- Student Independent “you do”: Students will roll dice to come up with the numbers they need to multiply together and they successfully solve the multiplication problems with little to no aid with either strategy they choose.

4. Describe the strategies you use to teach all students.

- “I do, we do, you do”
- Interactive Notebooks
- Anchor Charts
- Instructional Technology
    - Moby Max Fact Fluency
    - Flipgrid
    - Khan Academy
    - Into Math online
- Collaborative groups (WIN)
    - differentiated learning groups
- “Each one, Teach one” Peer Teaching/ Learning or Turn and Talk

5. How do you help low performing or disadvantaged students catch up with their peers who are performing at or above grade level?

To help low performing or disadvantaged students catch up to their peers, I implement a lot of differentiated instruction/ learning groups. At our school, we are able to carve out an instructional block called the WIN (What I Need) block. This is a great time to implement differentiated learning groups. This enables me to have a more one on one and small group instruction. I am able to constantly spiral instruction during this time to aid in bringing these lower performing students to grade level.

6. How do you help students improve academically and improve their self-image as well?

I help students improve academically as well as their self-image by giving them a taste of success. I provide lots of positive feedback during the “we do” process. When students get a taste of success, their self-image improves therefore, their drive to succeed academically improves.

7. **How do you use formative assessments to provide constructive feedback to your students?**

   I use a wide variety of formative assessments throughout the lesson to check for mastery. Some examples that I use range from a simple thumbs up, thumbs down, answering questions aloud, Kahoot or Quizizz, and ticket out the doors. These formative assessments allow me to quickly determine where the area of need is and what we need to continue practicing or what has been mastered by most or all of the students. These allow me to provide immediate and positive feedback to students as well as provide support where needed.

8. **How do you conclude a direct instruction mathematics lesson? How do you determine if the lesson was successful or not?**

   I like to conclude my direct mathematics instruction with some sort of formative assessment. I typically use a ticket out the door model or allow the students to play a Kahoot or Quizizz. If the student responses are written, I am able to collect data through their written responses. If it is verbal, I collect the data through teacher observation. I am able to determine if the lesson was successful based on the mastery of student responses.

9. **What are the strengths and limitations of direct mathematics instruction? How could the limitations of direct instruction be addressed to improve instruction?**

   The strengths of direct mathematics instruction are that we are able to establish our purpose of the lesson and follow a routine. Students and teachers thrive on routine and the students know what is expected of them each and every lesson. The limitations are that students can't learn at their own pace. During direct instruction, the pacing is determined by the majority of the students and their mastery. Students progress at different rates so all students may not be ready to move forward during a direct instruction lesson. Another limitation is that it limits creativity. Direct Instruction is very rigid and you do the same thing each and every day. It is more teacher led than student led.

10. **How do you control instruction to minimize your students misinterpreting the information that is taught?**

    Conferencing with students and using one on one feedback is a great way to control instruction and make sure that the information is not being misinterpreted. You need to do check-ins throughout instruction with students to see if anyone has any questions or needs something repeated to ensure all learners are understanding.

11. Is there anything else you would like to add about using direct instruction strategies or your perspective direct instruction in mathematics?

The reason that most schools use the direct instruction model is because it allows teachers to present and cover large amounts of content in a shorter amount of time. It is very structured and a great way to make sure you have covered all standards throughout the year.