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Improving Seventh Grade Mathematics Achievement Using Differentiated Instructional Strategies

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IMPROVING SEVENTH-GRADE MATH ACHIEVEMENT USING DIFFERENTIATED INSTRUCTIONAL STRATEGIES

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ABSTRACT

The Improvement Science Dissertation in Practice conducted a comprehensive assessment of differentiated instruction implemented within a school district in East Texas, focusing on its impact on student achievement in mathematics. The initial evaluation was followed by a subsequent improvement iteration that concentrated on the specific differentiated instructional strategies of formative assessment and small group instruction, supported by job-embedded professional learning, and their effects on student performance. Both iterations employed a mixed-methods case study design utilizing an embedded experimental model with a one-phase approach. The study's methodology allowed for a robust analysis of both quantitative and qualitative data, providing a comprehensive understanding of the instructional interventions. The findings from the initial iteration indicated a positive impact on student achievement, demonstrating the potential efficacy of differentiated instruction. However, the second iteration revealed a decline in student achievement, underscoring the complexities of sustaining instructional improvements over time. Moreover, the data underscored the critical need for targeted professional development focused on instructional strategies. While the initial application of differentiated instructional strategies showed promise, the subsequent decline in achievement points to the importance of continuous professional development and support for educators. This study underscores the dynamic nature of instructional improvement and the need for ongoing efforts to refine and enhance teaching practices.

Keywords: student achievement, differentiated instruction, small-group instruction, formative assessment, students

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

CHAPTER 1: THE PROBLEM OF PRACTICE

President George W. Bush began the practice of strict accountability for school districts in Texas with the No Child Left Behind (NCLB) Act of 2001. The NCLB law increased the federal role in holding schools accountable for student outcomes (Klein, 2015). A particular focus was to ensure states and schools boost the performance of certain groups of students, such as English language learners, students in special education, and poor and minority children, whose average achievement trails their peers (Klein, 2020). One of the unintended results of NCLB was that high-achieving students were not prioritized, and this habit became woven into the fabric of educational practices (Hess, 2002). Unfortunately, teachers still inadvertently fall into this practice today. The focus traditionally lies only on the students close to passing the state assessment when it should be a divided concentration among all students. Updates in state accountability have attempted to shift educators' priorities, but it is still something that administrators need to be aware of when determining areas of school improvement.

In the Texas accountability system, in addition to academic achievement, districts are responsible for students' annual academic growth in their overall accountability scores. Annual academic growth is a student's improvement or growth from year to year (Texas Education Agency, 2023). For STAAR assessments (with or without accommodations), annual growth is measured by a transition table. Individual student growth is calculated as the change between Low Did Not Meet Grade Level, High Did Not Meet Grade Level, Low Approaches Grade Level, High Approaches Grade Level, Meets Grade Level, and Masters Grade Level performance from the prior year to the current year (Texas Education Agency, 2023). An example of the annual academic growth transition table is listed below.

Figure 1.1

Annual Academic Transition Table

		Current-Year Performance on STAAR			
Prior-Year Performance on STAAR		**Did Not Meet Grade Level**	**Approaches Grade Level**	**Meets Grade Level**	**Masters Grade Level**
	Did Not Meet Grade Level	Met or Exceeded Growth Expectation=1 point, Else=0 points	Met or Exceeded Growth Expectation=1 point, Else=0.5 point	1 point	1 point
	Approaches Grade Level	Met or Exceeded Growth Expectation=1 point, Else=0 points	Met or Exceeded Growth Expectation=1 point, Else=0.5 point	1 point	1 point
	Meets Grade Level	0 points	0 points	Met or Exceeded Growth Expectation=1	1 point

				point, Else=0.5 point	
	Masters Grade Level	0 points	0 points	0 points	0 points

The focus helps to alleviate the concerns about concentrating on one group of students. Each year, districts and schools must show their students' growth based on their performance on the end-of-year assessments. The growth component of the accountability rating is heavily included in grades three through eight. Growth in mathematics and reading is expected to occur each year. The growth score is determined based on each student's previous year's score. This iteration in the accountability system allows the focus to shift from just getting students to pass to ensuring all students' needs are being met.

The state of Texas accountability system is designed to determine a school's performance. Based on their performance, districts and campuses are given an A-F letter rating for performance on state standardized tests, CCMR (College, Career, and Military Readiness), and graduation rates (Texas Education Agency, 2023). The accountability system rates student performance based on three domains.

> Student Achievement evaluates student performance across all subjects on general and alternate assessments; College, Career, and Military Readiness (CCMR) indicators; and graduation rates.
>
> School Progress measures district and campus outcomes in two areas: the number of students that grew at least one year academically (or are on track) as measured by State

> of Texas Assessments of Academic Readiness (STAAR) results and the achievement of all students relative to districts or campuses with similar economically disadvantaged percentages.
>
> Closing the Gaps uses disaggregated data to demonstrate differentials among racial/ethnic groups, socioeconomic background, and other factors. The indicators included in this domain, as well as the domain's construction, align the state accountability system with the Elementary and Secondary Education Act (ESEA), as amended by the Every Student Succeeds Act (ESSA) (Texas Education Agency, 2023)

The state of Texas groups academic achievement into four categories: Masters, Meets, Approaches, and Not Met.

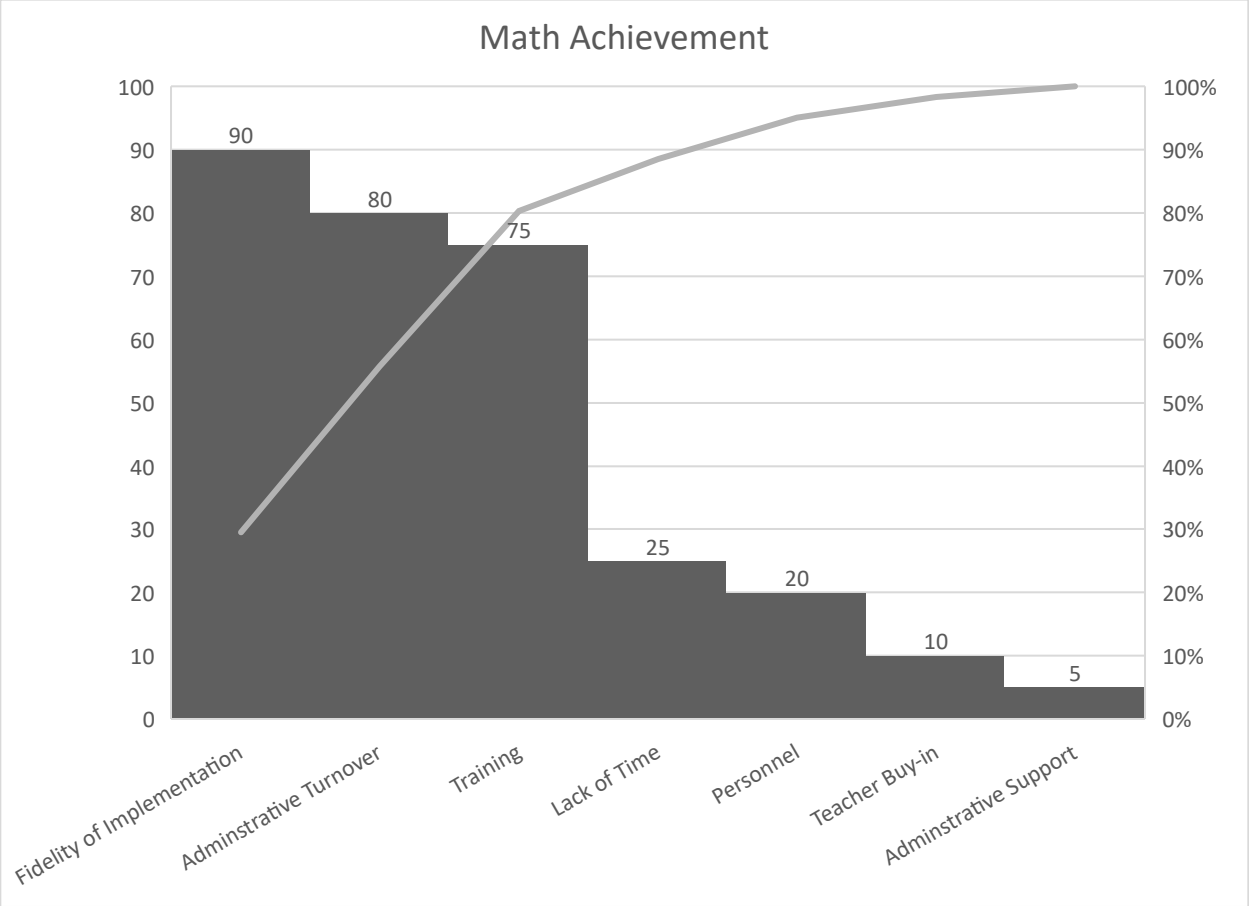
> MASTERS GRADE LEVEL* Performance in this category indicates that students are expected to succeed in the next grade or course with little or no academic intervention. Students in this category demonstrate the ability to think critically and apply the assessed knowledge and skills in familiar and unfamiliar contexts. * For Algebra II and English III, this level of performance also indicates that students are well prepared for postsecondary success.
>
> MEETS GRADE LEVEL** Performance in this category indicates that students will likely succeed in the next grade or course but may still need short-term, targeted academic intervention. Students in this category generally demonstrate the ability to think critically and apply the assessed knowledge and skills in familiar contexts. ** For Algebra II and English III, this level of performance also indicates that students are sufficiently prepared for postsecondary success.

> APPROACHES GRADE LEVEL Performance in this category indicates that students will likely succeed with targeted academic intervention in the next grade or course. Students in this category generally demonstrate the ability to apply the assessed knowledge and skills in familiar contexts.
>
> DID NOT MEET GRADE LEVEL Performance in this category indicates that students are unlikely to succeed in the next grade or course without significant, ongoing academic intervention. Students in this category do not demonstrate a sufficient understanding of the assessed knowledge and skills (Performance labels and policy definitions) (Texas Education Agency, 2023)

Based on the abovementioned definitions, Hogwarts's STAAR results revealed that only 41% of the students scored in approaches on the math STAAR test. Only 15% met standards, and 4% mastered grade-level standards. Emphasizing differentiated instruction could improve the percentage of students who achieve meets and masters on the math STAAR test.

Figure 1.2

Math Achievement Pareto Chart



Problem of Practice

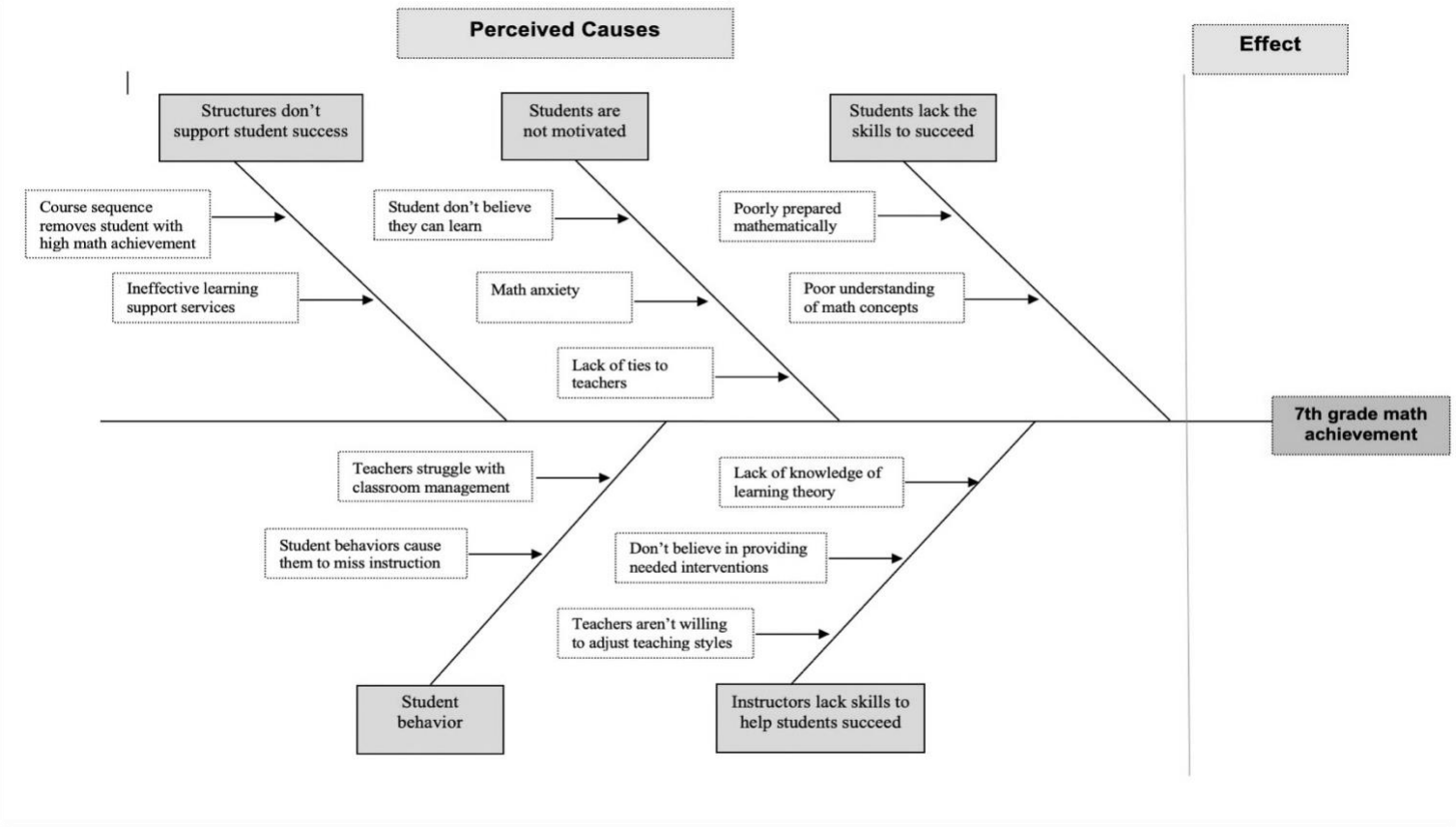
Hogwarts Middle School is a campus in the middle of a leadership transition. Since the 2013-14 school year, the campus has had three different principals and a revolving door of assistant principals. In the 2022-23 school year, there will be a new principal and three new assistant principals. One aspect of the transition that favors the campus is that the principal and two assistant principals will return administratively. The constant changes have contributed to the campus's low achievement and behavior issues. The accountability rating for the 2021-22 school

year is projected to be low, "C." After analyzing the data, there is a significant gap in the 7th grade math achievement compared to the 6th and 8th grade scores.

To improve seventh-grade math scores, challenges will need to be addressed. A fishbone diagram was created to assist in working through the problem analysis and serve as a visual representation (Bryk et al., 2017). One challenge that stands out is the teacher's inability to meet all students' academic needs. The lack of teacher capacity is a significant factor in math achievement. Figure 1.1 details some perceived causes of the achievement gap in 7th-grade math scores.

Figure 1.3

Fishbone Diagram 7th Grade Math Achievement



Purpose of Present Study

This two-phase mixed-method study aims to evaluate factors impacting seventh-grade math achievement and then propose improvements that will also be evaluated. Using the mixed-method evaluation methodology allowed the researcher to use quantitative and qualitative data sets to better understand the extent to which differentiated instructional practices were effective in helping struggling students meet grade-level expectations (Creswell et al., 2006). The current approach for improving mathematics achievement at the school is the implementation of differentiated instructional strategies.

The researcher will evaluate the teacher's capacity to implement differentiated instruction as part of the evaluation. There is no single definition of differentiated instruction; it is considered an approach to proactively adapt instruction to suit students' mathematical thinking while concurrently developing a cohesive classroom environment (Hackenberg et al., 2020, as cited in Marks et al., 2021). Differentiated instruction can take on many formats depending on what teachers are differentiating.

Small group instruction and formative assessment will be the instructional strategies utilized to differentiate instruction and increase achievement. Adding these practices to a teacher's arsenal could potentially lead to more efficient instruction and ultimately increase student achievement. Small group instruction and formative assessment assist in creating environments that are more conducive to the educational landscape of a diverse classroom. In order to teach culturally and academically diverse populations effectively, schools will have to move from standardized instruction to personalized instruction (Rasheed & Wahid, 2018). Making sure teachers are equipped with the resources necessary to produce successful student

outcomes for all students is a priority. The goal is to meet students' academic needs, but teachers should also be growing.

The study will seek to answer the following questions: (1) How can formative assessment be used to differentiate instruction and support the needs of all students? (2) To what extent can formative assessment improve math achievement on the STAAR test? (3) How can small group instruction be used to differentiate instruction and support the needs of all students? and (4) To what extent can small group instruction be used to improve math achievement on the STAAR test?

Theory of Change

Differentiated instruction is the current improvement theory in this study to address the needed increase in seventh-grade mathematics scores. That said, results based on accountability scores do not show the desired results that should come from differentiated instruction. The literature supports differentiated instruction as a research-based intervention that should improve achievement outcomes.

Differentiating instruction aims to maximize each student's growth and individual success by meeting each student where he or she is and assisting in the learning process (Thakur, 2014). This mixed-methods study examines whether differentiated instructional strategies can improve math achievement. The strategy has many different versions and varies in presentation from classroom to classroom. Differentiated instruction is a teacher's dedication to planning for academic diversity in the classroom to help students succeed by attending to their needs and interests (Goddard et al., 2015). There is no designated way to implement differentiated instruction in a classroom; the only thing necessary for utilizing the practice is the commitment to academic diversity. According to Goddard et al. (2015), providing various classroom activities

and assignment alternatives are critical approaches to differentiating instruction. In other words, teachers who differentiate provide specific alternatives for individuals to learn as deeply and quickly as possible without assuming one student's road map for learning is identical to anyone else's (Brevik et al., 2018).

The local differentiation model requires a more explicit definition and enhanced training to ensure proper implementation. Currently, there is a minimal understanding of what differentiation entails and how it should be effectively applied. This lack of clarity significantly hampers support for students who struggle with grasping the content, consequently impeding overall math academic achievement.

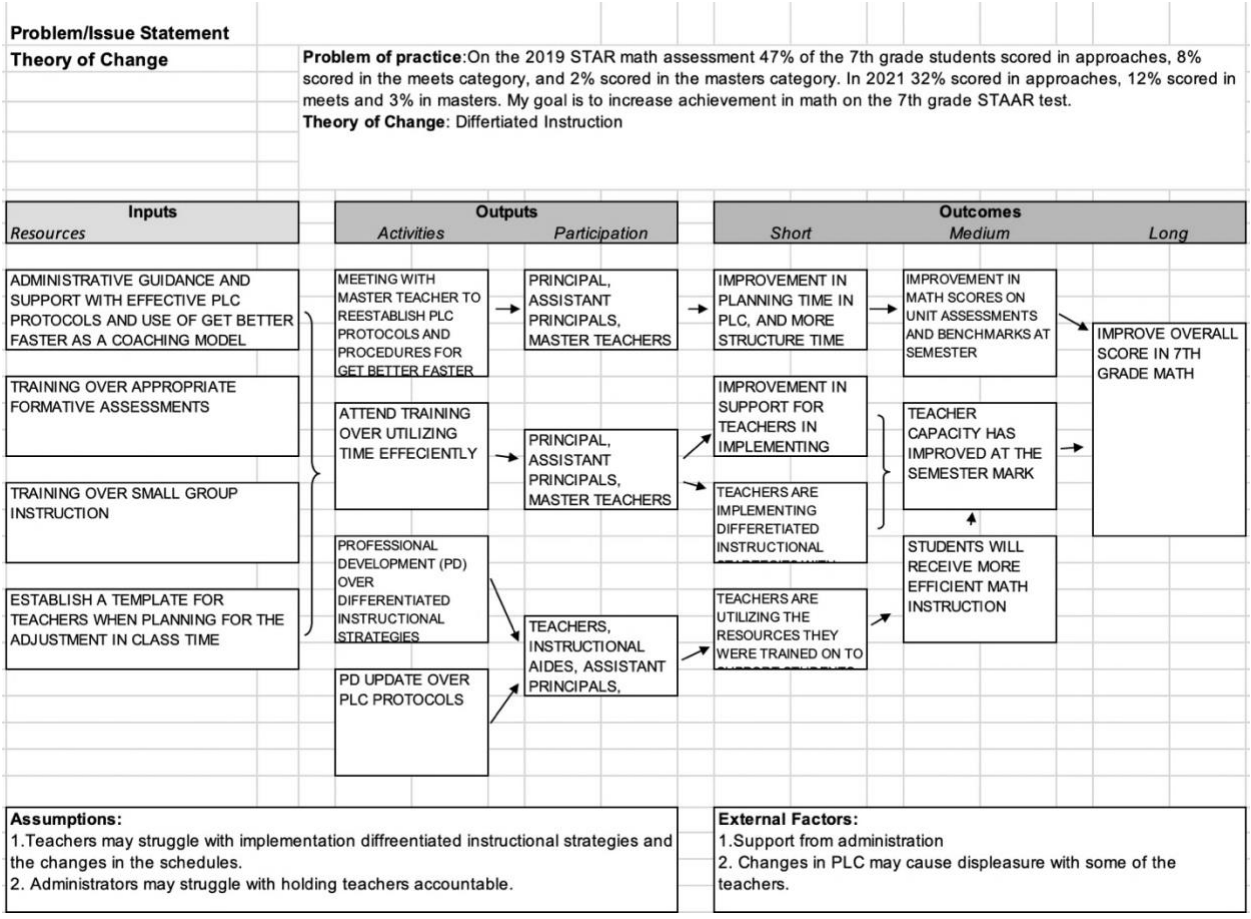
The fidelity with which instructional strategies such as formative assessment and small group instruction are implemented is of particular concern. While small group instruction is utilized, the emphasis appears to be more on the stations and activities rather than the quality of instruction within the small group setting. Similarly, formative assessment is predominantly employed in the form of exit tickets, neglecting its potential use throughout the lesson to inform ongoing instruction and determine the next steps for student learning.

Addressing these shortcomings is paramount to optimizing the effectiveness of the local differentiation model. By providing comprehensive training and clarification on differentiation principles and best practices, educators can better support students' diverse learning needs and facilitate improved math academic achievement. Additionally, ensuring fidelity in the implementation of instructional strategies such as small group instruction and formative assessment will enable educators to more accurately gauge student progress and tailor instruction accordingly, ultimately fostering a more equitable and inclusive learning environment.

The following logic model shows how the current implementation of differentiated instruction will be evaluated. Improvement science offers several tools to assist in the implementation process, one of which is a logic model. A logic model is a tool used in evaluation to conceptualize why and how objectives or outcomes are achieved; it provides a graphic representation of the relationship between program resources, the activities they support, and the generated outcomes (Rajashekara et al., 2020). Logic models are used in various organizations to assist in problem identification and plans on how to address them. Logic models are also effective in the design and evaluation of curricula for educational training programs, allowing program directors to identify the resources they need for curriculum delivery, define learning objectives and desired learner outcomes, and plan for the assessment of learners (Rajashekara et al., 2020). Figure 1.4 details the inputs and outputs employed in the implementation of differentiated instruction through the use of specific instructional strategies.

Figure 1.4

Logic Model 7th grade Math Achievement



Long Term Goals

The ultimate goal of implementing differentiated instruction is to increase math achievement on the seventh-grade STAAR. Additional goals are (1) improvements to PLC protocols to assist in planning for utilizing differentiated instructional strategies and (2) increased instructional coaching using observational feedback.

Intermediate Goals

The intermediate goals of the program are aligned with the overall goals of the program. Improvements in PLC and instructional coaching using the observation feedback model will improve the capacity of teachers and ultimately increase math achievement on the STAAR assessment. The protocol improvement in our professional learning community (PLC) will allow time to focus on adequately implementing differentiated instructional strategies in their classroom. Master teacher support will lead to the overall goal of teachers' feelings of increased self-efficacy. In addition, the success of their student's improvement in their understanding of the math content will also contribute to the goal of comfort level in implementing differentiated instruction.

Methodology

This study is positioned within the Improvement Science Dissertation in Practice framework, as elucidated by Perry et al. (2020). This innovative approach empowers researchers to address pertinent problems of practice, applying iterative improvements through the dissertation process. Initially, the study undertook a comprehensive assessment of an existing intervention—differentiated instruction in seventh-grade math—based on the 2021 STAAR results. Subsequently, a second iteration expanded the scope to incorporate job-embedded professional learning and observation feedback, augmenting the intervention's efficacy. Action plans are implemented through processes –one thing we have almost complete control over in the educational setting (Bernhardt, 2018). School processes are actions administrators and teachers take to achieve the purpose of the school or the vision (Bernhardt, 2018). One of the first action steps will be to examine teachers' use of differentiation instructional strategies to support academic progress.

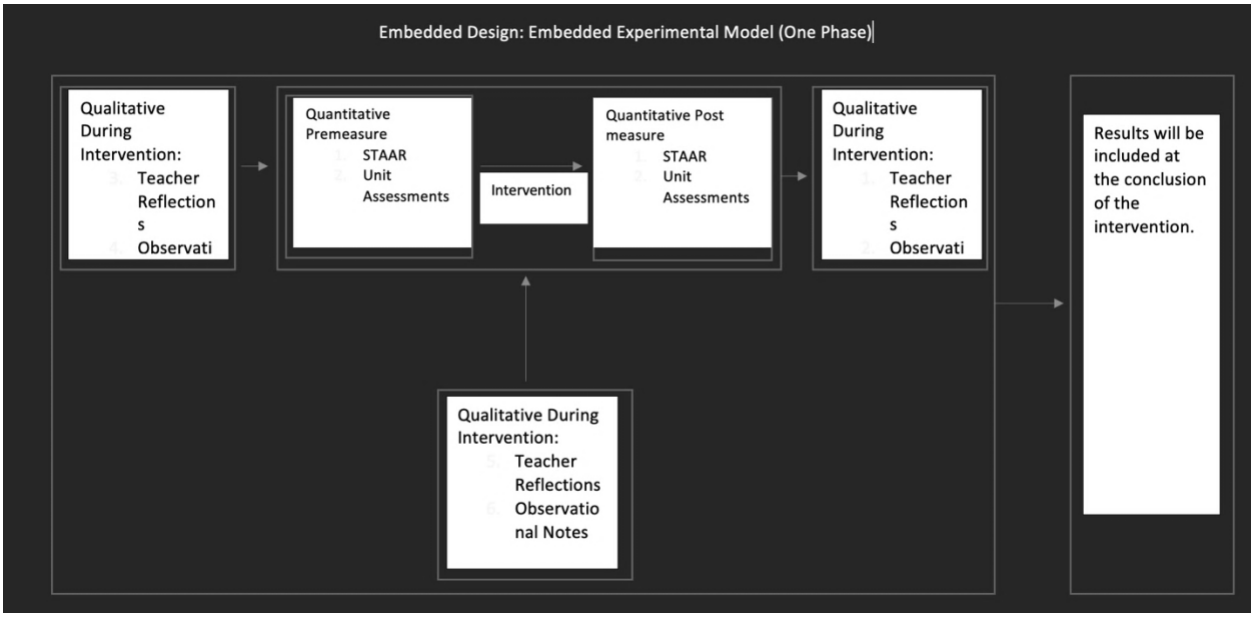
Central to the study's methodology is the Plan-Do-Study-Act (PDSA) cycle, as articulated by Christoff (2018). This iterative approach facilitated the planning, execution, assessment, and adaptation of interventions, enabling a systematic evaluation of their effectiveness. Leveraging the principles of Design-Based Intervention Research (DBIR), the study transcended traditional disciplinary boundaries, fostering collaborative partnerships between researchers and practitioners to drive systematic change (LeMahieu et al., 2017, as cited in Pellegrino et al., 2021).

The Embedded Experimental Model, chosen for its compatibility with quantitative and qualitative data, serves as the study's methodological backbone. Opting for a one-phase approach, qualitative data collection is seamlessly embedded within the intervention of differentiated instruction. This holistic approach enables a nuanced understanding of the intervention's impact, capturing both quantitative outcomes and qualitative insights.

The DBIR process will guide ongoing improvements as the study progresses and will be informed by quantitative and qualitative data synthesis. Surveys will play a pivotal role in gauging the effectiveness of interventions and informing subsequent adjustments. Figure 1.5 visually represents the qualitative and quantitative data utilized throughout the DBIR process, illustrating the iterative nature of improvement efforts and the symbiotic relationship between research and practice. Through this iterative approach, the study endeavors to advance our understanding of effective instructional practices and foster meaningful improvements in educational outcomes.

Figure 1.5

Embedded Design: Embedded Experimental Model (One Phase)



Context

Hogwarts Middle School, located within Hogsmeade Independent School District, is one of its community's sole middle school campuses. With a student body comprising 904 students, Hogwarts epitomizes diversity, reflecting a demographic mosaic consisting of 37.4% African American, 57.3% Hispanic, 2.9% White, 0.1% American Indian, 0.1% Asian, and 2.2% Two or More Races. Notably, the school boasts a minority student enrollment of 97%.

Despite facing various challenges, including a student-teacher ratio of 15:1, the dedicated staff at Hogwarts remains steadfast in their mission to nurture and empower every student. The campus demographics underscore the socioeconomic realities of its community, with 93% of students classified as economically disadvantaged, highlighting the prevalent impact of financial hardships on educational opportunities.

Over the past years, Hogwarts has navigated the complexities of state accountability ratings, receiving a D in the 2017-2018 academic year and improving to a C in 2018-2019. The pandemic-induced disruptions further exacerbated existing academic disparities, amplifying the challenges students face with achievement gaps.

Situated in the Northern Hogsmeade area—a part of town characterized by underdevelopment—Hogwarts Middle School grapples with unique socio-economic and behavioral dynamics. Academic support from parents is limited, and behavioral concerns hinder student success. Moreover, the pandemic-induced upheavals magnified these challenges, underscoring the need for targeted interventions to address the widening gaps in student achievement.

As Figure 1.6 illustrates, the middle school scores within Hogsmeade ISD. The data provides valuable insights into the broader educational landscape. Despite the hurdles faced, the resilient spirit of the Hogwarts community perseveres, driving collective efforts towards academic excellence and inclusive learning environments.

Figure 1.6

Middle School Comparison Data

	2020-2021			2021-2022		
	Approaches	Meets	Masters	Approaches	Meets	Masters
Hogwarts	51	22	6	60	29	11
Gryffindor	56	28	10	60	31	15
Hufflepuff	72	45	20	77	52	29
Ravenclaw	69	41	20	71	43	29
Slytherin	65	37	17	69	39	21

Participants

The evaluation methodology employed in this study adopts criterion sampling to assess the impact of differentiated instruction, along with the Get Better Faster Observation Feedback protocol, on the academic achievement of seventh-grade students. Specifically, the study focuses on all four seventh-grade math classrooms within the campus, encompassing 289 students and four teachers. The primary objective is to examine these teachers' implementation of differentiated instruction and its effect on academic performance.

Notably, the selected classrooms represent a diverse student population, with a demographic composition comprising 33% African American, 62% Hispanic, 3% White, and 2% Two or more races. Moreover, gender distribution among students is nearly evenly split, with approximately 49.83% male and 50.17% female students.

Regarding teacher characteristics, the study encompasses educators with varying experience levels, ranging from one to ten years. This diversity in teacher experience levels adds depth to the evaluation, allowing for insights into how different tenure lengths may influence the implementation and effectiveness of differentiated instructional strategies.

By focusing specifically on the implementation of differentiated instruction within these classrooms, the evaluation aims to illuminate the efficacy of this pedagogical approach in meeting students' diverse learning needs. Additionally, incorporating the Get Better Faster Observation Feedback protocol provides a structured framework for assessing and refining instructional practices, further enhancing the study's capacity to identify best practices for promoting student achievement.

Data Collection/Instruments

As part of the mixed-methods approach, quantitative data will be collected through STAAR, Star Renaissance, and unit assessment assessments before and after implementing the intervention. Qualitative data will be collected during the intervention to understand the implementation level and teachers' perceptions of differentiated instruction's effectiveness. I will use teacher and master-teacher surveys and observation notes as my qualitative data. The quantitative data collected will answer the question: To what extent does differentiated instruction improve seventh-grade math achievement?

Additionally, qualitative data was collected from a survey administered in the spring to teachers and master teachers. The survey consisted of open-ended questions to determine teachers' perceptions of the effectiveness of the differentiated instructional strategies of small group instruction and formative assessment. The questions on the survey will answer the following questions: To what extent have small group instruction and formative assessment assisted in differentiating instruction to meet the needs of all students?

The study's data collection process encompassed a multifaceted approach, drawing insights from various sources to understand the educational landscape comprehensively. Primary data sources included STAAR results and beginning, middle, and end-of-year Star Renaissance scores. Additionally, the study incorporated qualitative data gathered through surveys administered to teachers and master teachers within the educational community.

Through rigorous quantitative analysis, significant patterns emerged, highlighting a notable distinction in scores between seventh-grade math assessments and those of both sixth and eighth grades. This observed disparity in baseline data served as a pivotal discovery, underscoring the necessity for further investigation and prompting the initiation of the study.

In the qualitative analysis phase, the research methodology employed thematic analysis, a robust approach allowing for the systematic extraction of themes from open-ended survey responses. Thematic analysis, as described by Sundler et al. (2019), facilitates the organic identification of recurring patterns and insights derived from participants' lived experiences, thus offering rich and nuanced interpretations.

After the survey closed, the researcher organized and aggregated all responses, grouping them by respective questions to ensure clarity and coherence. Each response was meticulously reviewed, particularly to discern prevalent themes and overarching narratives embedded within the data. Additionally, an inductive thematic analysis method was utilized for the open-ended qualitative questions to understand better the participants' perceptions (Hewitt-Taylor, 2001).

After an initial reading, each response was coded by summarizing each sentence with a relevant word or phrase (Linneberg & Korsgaard, 2019). Based on the response, codes were organized into categories that shared key elements (Saldaña, 2015). By scrutinizing these thematic categories across different survey questions, the researcher sought to discern interrelated patterns and potential associations, enriching the qualitative analysis with a deeper understanding of the underlying phenomena.

Limitations of the Research

Indeed, the study acknowledges a significant limitation regarding the generalizability of its findings beyond the confines of Hogwarts. The interventions examined, specifically instructional coaching utilizing observation feedback and modifications to Professional Learning Community (PLC) protocols to bolster the effective deployment of differentiated instructional strategies, are deeply intertwined with the unique contextual factors prevailing at Hogwarts.

It is imperative to recognize that the success or efficacy of these interventions is intricately linked to the specific conditions, dynamics, and personnel characteristics at Hogwarts. Central to this limitation is the irreplaceability of certain critical elements, such as the individual teachers involved, the organizational culture, and the prevailing instructional norms, collectively shaping the outcomes of the interventions.

The personnel factor, in particular, emerges as a salient determinant of the study's limited generalizability. Teachers are not interchangeable entities; each brings a distinct set of skills, experiences, and pedagogical approaches to their practice. Likewise, the broader educational climate at Hogwarts, including its unique student demographics, community dynamics, and institutional resources, plays a vital role in shaping the outcomes of the effectiveness of differentiation in Tier 1 instruction.

Therefore, while this study's findings offer valuable insights and implications for instructional practice within the specific context of Hogwarts, it is crucial to exercise caution when extrapolating these results to other educational settings. The distinctive nature of each school environment necessitates a nuanced understanding of how contextual factors interact with intervention strategies, thereby preventing a one-size-fits-all approach to educational reform.

Positionality

It is essential to note the researcher's position regarding the organization as a whole and the researcher's background. The researcher is an African American female who has been in education for eleven years. The researcher's experiences include teaching middle school math, creating professional development for teachers in math and science, and being an assistant principal at an elementary school grade K-5 and middle school grades 6-8. Additionally, the

researcher serves as the Dean of Instruction for the organization where the study takes place; therefore, the researcher's position is an “insider collaborating with other insiders” (Herr & Anderson, 2005). The data collected, such as teacher observations and student assessment data, would have been collected regardless of this study. Teacher observations are done through the master teachers, and teachers administer the assessments. Member checking is a crucial piece of analysis of all data collected throughout the evaluations.

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CHAPTER 2: INCREASING MATH ACADEMIC ACHIEVEMENT THROUGH DIFFERENTIATED INSTRUCTION

Evolution of school differentiation: Tracing the roots of educational diversity

The synthesis of literature presented in this chapter offers a targeted exploration of differentiated instruction, focusing on the strategic deployment of instructional methodologies such as small group instruction and formative assessment. Through a review of scholarly articles, this document explains instances where implementing these practices with fidelity has yielded favorable outcomes, scenarios where desired results were not attained, and contributing factors.

Historically, the foundation of differentiated instruction can be traced back to the early 1600s, wherein educational provision was characterized by the one-room schoolhouse model (BrightHub Education, 2011). Even in these early educational settings, educators grappled with the need to address the diverse learning struggles of their students. Educational models operate under the assumption that children of the same age possess uniform learning capacities and could produce identical outcomes. Consequently, students who struggled to keep pace with conventional instructional approaches often faced marginalization, eventually leading to their disengagement from the educational system (BrightHub Education, 2011).

In the early years of the nation, schooling was haphazard. Many children were excluded based on income, race or ethnicity, gender, geographic location, and other reasons (Colber, 2020). Those who could attend school had to pay tuition, and the education was very rudimentary. Preparing people for democratic citizenship was a primary reason for creating public schools. The Founding Fathers maintained that the success of the fragile American democracy would depend on the competency of its citizens (Colber, 2020). The development and

maintenance of a competent society require opportunities for knowledge attainment; in the nation's early years, that was not consistently available.

The founding fathers attempted to remedy the lack of educational opportunities by establishing an educational system. The nation’s founders recognized that educating people would be difficult without a more systematic approach to schooling. Soon after the American Revolution, Thomas Jefferson, John Adams, and other early leaders proposed creating a more formal and unified system of publicly funded schools (Colber, 2020). Although the primary responsibility for schooling rested with states and localities, federal ordinances passed in 1785 and 1787 gave substantial acreage of federal lands in trust to new states entering the union, as long as the states agreed to set aside a portion of these lands for the support of public schools (Colber, 2020). The federal ordinances assisted in establishing the foundation of an educational system in the United States, and with the government's backing, schools became more common.

Although steps had been taken to expand the country's educational landscape, there was still room for improvement. In the 1830s, Horace Mann, a Massachusetts legislator and secretary of that state’s board of education, began to advocate for creating public schools that would be universally available to all children, free of charge, and funded by the state. Mann and other proponents of “common schools” emphasized that public investment in education would benefit the whole nation by transforming children into literate, moral, and productive citizens (Colber, 2020). Establishing common schools was the initial step toward the current educational system in the United States. The path toward providing universal access to free education was gradual and uneven. Gradually, more states accepted responsibility for providing universal public education and embedded this principle in their constitutions. Not until the latter part of the 19th century, however, did public elementary schools become available to all children in nearly all parts of the

country; high school attendance did not become commonplace until the 20th century (Colber, 2020). Many schools are struggling to meet this goal of ensuring a high-quality education for all, and challenges and changes unknown to earlier generations complicate their efforts. Addressing these problems will require different strategies than in the past and a national will to improve public education (Colber, 2020).

The challenges associated with middle school mathematics instruction are multifaceted in the current educational context, impacting students, educators, and policymakers alike. Capone (2023) astutely observes that a nuanced understanding of the intricate factors influencing mathematical proficiency is indispensable for formulating effective interventions across various educational tiers. Navigating these complexities requires a concerted effort to leverage evidence-based instructional strategies, such as small group instruction and formative assessment, to address the diverse learning needs of students.

By synthesizing insights from scholarly literature, this chapter underscores the need for educators and policymakers to adopt a proactive stance in addressing the complexities of middle school mathematics instruction. Through the strategic deployment of differentiated instructional practices, informed by empirical evidence and contextual nuances, stakeholders can work collaboratively to foster an inclusive and supportive learning environment conducive to the academic success of all students. As the educational landscape evolves, the insights gleaned from this synthesis serve as a foundational framework for advancing educational practices to enhance mathematical proficiency and promote equitable access to quality education using differentiated instructional tools.

One of the primary hurdles to successful student achievement at the middle school level lies in the transition from elementary to middle school mathematics. As students progress beyond

fifth grade, they encounter a significant shift in the complexity of the mathematical concepts in the curriculum, characterized by a greater emphasis on abstract concepts and higher-order thinking skills. Without a solid foundation and intentional instruction, students risk falling behind, impeding their future academic trajectories. National and international comparisons of student achievement, such as the National Assessment of Educational Progress (NAEP) and the Program for International Student Assessment (PISA), underscore the critical juncture between fourth and eighth grade, where students often experience a rapid decline in achievement levels (Beaton et al., 1996; Schmidt et al., 1999, as cited in Balfanz & Byrnes, 2006).

The intensifying focus on mathematics achievement stems from national academic accountability expectations. With educational stakeholders increasingly scrutinizing student performance metrics, there is heightened pressure to address deficiencies and ensure that students are adequately prepared for future academic pursuits. Consequently, the imperative to bolster middle school math instruction has become a nationwide priority of educational reform efforts.

Effective engagement strategies can help middle school students connect to math content meaningfully and build the skills needed for success (Ibama-Johnson, 2023). According to Walker (2023), differentiated instruction enhances student engagement and motivation. Specific differentiated instructional approaches, such as formative assessment and small group instruction, can be utilized to cultivate a culture of mathematical excellence and empower all students to thrive in mathematics.

International

Assessments are used to determine academic achievement. One assessment used at the international level is the Trends in International Mathematics and Science Study (TIMSS). This

assessment compares data on the mathematics and science achievement of fourth- and eighth-grade students in the United States with those of other countries (National Association of Secondary School Principals [NASSP], 2018). Recent test results have shown a decline in the performance and ranking of U.S. students relative to their overseas peers. The TIMSS assessment asks our students to do something they are not taught: apply math and science concepts to real-world problems (NASSP, 2018).

Another assessment given at the international level is the Program for International Student Assessment (PISA). "PISA measures 15-year-olds' ability to use their reading, mathematics, and science knowledge and skills to meet real-life challenges" (Organization for Economic Co-operation and Development [OECD], 2018b, para. 1). When the PISA assessment was given in 2018, the students in the United States scored above the OECD average of the other countries that participated in the assessment in reading and science (Bouchrika, 2022). Overall, American students placed 24th in reading, 38th in mathematics, and 25th in science. The total average of the student's performance was 470. The OECD average was 490, putting the U.S. students' academic achievement well below many of the high academic achievements of their OECD peers (Heim, 2016, as cited in Bouchrika, 2022). In PISA 2022, however, the OECD average dropped by almost 15 points in mathematics and about ten score points in reading compared to PISA 2018 (OECD, 2022). The unprecedented drops in mathematics and reading point to the shock effect of COVID-19 on most countries.

National

The United States uses the National Assessment of Educational Progress (NAEP) to assess student achievement. The NAEP provides essential information about student academic achievement and learning experiences in various subjects (U.S. Department of Education

[USDE], 2022). Also known as The Nation's Report Card, NAEP has provided meaningful results to improve education policy and practice since 1969. Results are available for the nation, states, and 27 urban districts (USDE, 2022). NAEP is an excellent instrument for assessing student achievement in various content areas for fourth- and eighth-grade students. Average scores are reported on the NAEP mathematics scale at grade 8, which ranges from 0 to 500 (USDE, 2022). The last time the NAEP was administered in 2022, the average mathematics score for eighth-grade students was 12 points higher compared to the first assessment year in 1990. However, the average mathematics score for eighth-grade students in 2022 was 8 points lower than in 2019, the previous assessment year (USDE, 2022). This data shows that there has not been much change since the assessment's inception, and more recently, the scores have declined. States also administer assessments for accountability purposes and to determine student achievement at grade levels and within specific content areas.

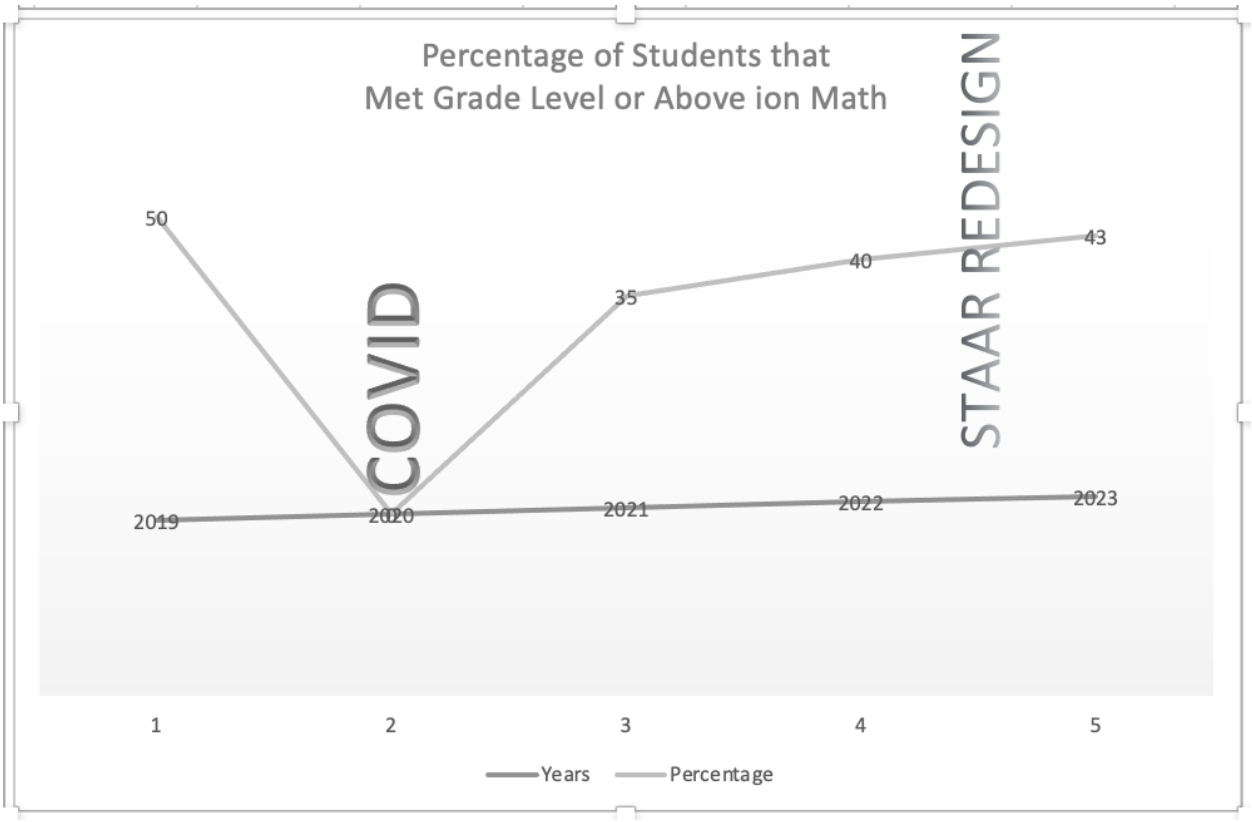
State Assessment

Since the passage of the federal No Child Left Behind Act (NCLB), every state is now required to develop standards, standardized tests, and accountability systems (Hursh, 2005). In Texas, the State of Texas Assessment of Academic Readiness (STAAR) is the state's testing program. It is based on the mastery of grade-level standards, also known as the Texas Essential Knowledge and Skills (TEKS) in core subjects, including reading, writing, mathematics, science, and social studies (Texas Education Agency). The STAAR test has three versions: STAAR, STAAR Alternate 2, and STAAR EOC. Grades 3–8 STAAR tests are given in the spring. End-of-course assessments (EOC) are given throughout the year. The number of tests students take each year will depend on their grade level. Most students will have two to four testing days during the school year (Texas Education Agency).

The most recent results of the math STAAR assessment reveal that the number of students who scored in the meets proficiency level between third and 12th grade slightly improved from 2022. Forty-three percent of students met their grade level proficiency in 2023; it was 40% the year before. Before the pandemic, however, the number of students meeting their grade level in math was significantly higher at 50%. The graph below shows the results.

Figure 2.1

Percentage of Students Who Met Grade Level or Above in Math



Accountability and assessment have been tools used to determine student achievement. Assessments are given, and the results are examined at the international, national, and state levels. There is much controversy about whether the assessments do more harm than good. Accountability systems are built on the assumption that a single high-stakes test can determine a

child's, schools, or district's future. According to Orlich (2004), Linda Darling-Hammond (2003) reported that doubt lingers on the reliability of state test score gains because, in Texas, students showed gains on the state-mandated assessment but did not make comparable gains on national standardized tests or the Texas college entrance test. Additionally, a study on the readability of the STAAR assessment found that reading passages did not align with the grade level being assessed (Szabo & Sinclair, 2019). As a result of the declining data at the international, national, and state levels, there is a need to identify how to improve student achievement in mathematics in middle school. Differentiated instruction is a potential strategy to reverse the decline in mathematics scores.

Theoretical Framework

The underlying theory behind differentiated instruction is rooted in the belief that students have diverse learning needs, preferences, abilities, and interests. Traditional one-size-fits-all approaches often fail to adequately address these differences, leading to some students being under-challenged while others struggle to keep up. Multiple theoretical frameworks are associated with differentiated instruction. The foundational belief for differentiation is that every student is different and learns differently from others.

Differentiated instruction aligns with Piaget's constructivist theory (Thakur, 2014). The constructivist theory is based on the idea that learners are active participants in their learning journey; knowledge is constructed based on experiences (Kurt, 2021). In the constructivist classroom, the goal is to create a welcoming environment that promotes active engagement in learning (Kurt, 2021). There should be opportunities for collaboration, and lessons should be based on the level of student understanding in the classroom. In the constructivist classroom, teachers guide learning by implementing group activities, creating collaborative dialogue, and

facilitating interactive experiences. Students build on their prior knowledge and construct new understandings based on the lessons taught (Kurt, 2021). This theory suggests that humans create and construct knowledge to bring meaning to their experiences. In the differentiated classroom, teachers should facilitate the learning process by organizing learning activities and using various aid materials according to the level of functioning of the student's cognitive structure to enable them to construct knowledge through their experiences (Thakur, 2014).

Howard Gardner's theory of multiple intelligences is another theoretical framework that supports differentiated instruction (Kurt, 2021). Gardner's (1983) theory suggests a nontraditional approach to the construct of intelligence and asserts that there are multiple ways in which people process the world and demonstrate strengths (Crim et al., 2013). Gardner's theory of multiple intelligences posits that individuals possess various types of intelligence rather than a single general intelligence. These types encompass areas like linguistic, logical-mathematical, musical, spatial, bodily-kinesthetic, interpersonal, intrapersonal, and naturalistic intelligence, emphasizing a broader understanding of human capability (Marenus, 2024).

The theory of multiple intelligences offers support for instructional approaches that incorporate a variety of connections for teaching and learning that validate the unique experiences, interests, and cultures of all students. Given that individuals gravitate to the areas in which they have strengths and can incorporate these areas into their learning, the concept of multiple intelligences is uniquely suited to support and enhance a differentiated classroom (Crim et al., 2013). The multiple intelligence theory provides additional alternatives for teachers to meet the needs of diverse learners and allows students to be better sustained in their learning. When differentiation is fostered, teachers recognize, accept, and value various ways students acquire and understand new information (Crim et al., 2013).

Several educationalists, researchers, and school administrators view the social constructivist learning theory engendered by Russian psychologist Vygotsky (1896-1934) as central to instructional enhancement, classroom change, and redevelopment (Subban, 2006). Vygotsky's notion of the zone of proximal development refers to a level of development attained when learners engage in social behavior. Vygotsky (1978) defines the zone of proximal development (ZPD) as the distance between the actual development level and the level of potential development. Vygotsky believed that when a student is in the zone of proximal development for a particular task, providing the appropriate assistance will give the student enough of a "boost" to achieve the task (Mcleod, 2024).

In differentiated instruction, first, the teacher needs to identify what the students can achieve independently (level of actual development) and for further learning of the more challenging tasks, differentiate learning tasks accordingly and provide academic support from the teacher as well as from more proficient peers so that students acquire necessary academic skills for independent learning (level of potential development) (Thakur, 2014). Differentiated instructional strategies such as small group instruction and formative assessment assist teachers in identifying the zone of proximal development and create opportunities for students to engage in and take ownership of their learning.

Differentiated instruction embodies a pedagogical philosophy rooted in the acknowledgment of learner diversity. It is supported by the belief that instructional methodologies should include the ability to accommodate learners' complex needs. The objective resides in developing student engagement, intrinsic motivation, and successful academic achievement through customized learning opportunities and intentionally designed instruction to elevate individual students' potential.

Historical Development

The one-room schoolhouses of centuries gone by are often mentioned when the research topic is "the history of differentiated instruction." Though not called by that name, it was understood that teachers in the traditional one-room schoolhouse setting, out of necessity, had to develop strategies for teaching students of different ages, abilities, literacy levels, and backgrounds (Lathan, 2024). Teachers in the early stages of education faced many of the challenges teachers face today. Although the challenges teachers faced may not have been to the extent that is presently faced in the current academic climate, even then, all students were not at the same level academically and learned in various ways.

Over the last 20 years, education has evolved, and so has the support for students. Some educational historians also draw connections between the No Child Left Behind Act of 2001, which emphasized helping disadvantaged students and improving individual educational outcomes, and some of the core principles of differentiated instruction (Lathan, 2024). Additionally, laws such as the Individuals with Disabilities Education Act (IDEA) of 2004 were reauthorized to ensure all learners received the support they needed to succeed. IDEA sought to create an educational environment that was equitable for all. As a result of the reauthorization, educators had to adjust their approaches to providing instruction for students. Teachers were required to provide instruction for learners with varying academic profiles, ranging from students who struggle to learn to advanced learners (Goddard et al., 2015).

Models and Approaches

The concept of differentiated instruction acknowledges the existence of multiple models and methodologies within the approach to providing instruction. This pedagogical method is characterized by its commitment to accommodating different learning methods through

intentional adjustments to content, instructional methods, and learning outcomes. Contrary to a uniform approach, differentiated instruction encompasses a variety of strategies and frameworks, each offering specific perspectives on tailoring educational experiences to individual learners. Among the plethora of recognized models and approaches are:

1. ***Carol Ann Tomlinson's Model***: In Tomlinson's approach, differentiation means tailoring instruction to meet individual needs. Whether teachers differentiate content, process, products, or the learning environment, ongoing assessment and flexible grouping make this a successful approach to instruction (Tomlinson, 2024).

2. ***Universal Design for Learning (UDL)*****:** UDL is a theoretical framework developed by CAST (the Center for Applied Special Technology) to guide the design and development of learning environments that represent materials in flexible ways and offer a variety of options for learners to comprehend information, demonstrate their knowledge and skills, and be motivated to learn (Hall et al., 2020).

3. ***Howard Gardner's Multiple Intelligences***: Gardner's theory proposes that intelligence is constructed from a series of modalities rather than one element. While each of us has these intelligences, we learn differently and are more proficient in certain areas than others (Zucker, 2022).

4. ***Tiered Instruction*****:** Tiered instruction is a powerful tool because it allows you to differentiate instruction and meet the needs of all students, regardless of their abilities or learning styles. By providing multiple levels of instruction, you can ensure that all of your students are challenged and engaged in the learning process (Wahl, 2023).

5. ***Choice Boards and Menus***: A choice board is a menu of activity options allowing students to choose how they practice a skill or show what they know. Choice boards are also a great way to differentiate learning, which has many benefits, including increased student engagement and improved academic outcomes (Iasevoli, 2023).

6. ***Flexible Grouping***: Flexible grouping is at the heart of differentiated instruction. It provides opportunities for students to be part of many different groups based on their readiness, interest, or learning style (Mursky, 2011).

Utilizing these models and approaches may be done in combination or singularly, developing a differentiated learning environment conducive to fulfilling diverse student needs. Attaining efficacy in implementation requires a continual cycle of assessment, reflective inquiry, and pedagogical refinement, thereby fostering instructional responsiveness adequate for the evolving academic needs of students.

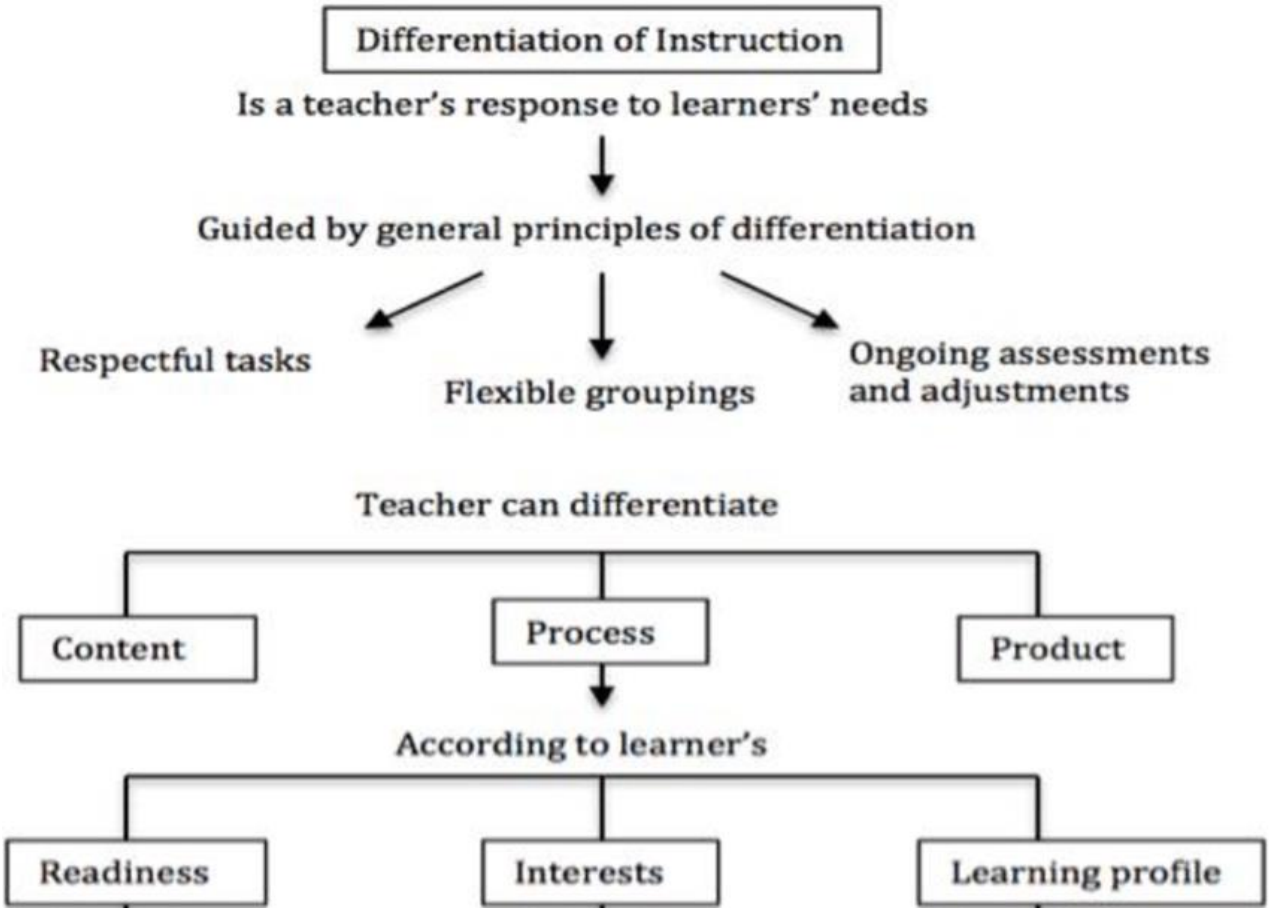
Differentiated instruction is rooted in the belief that student diversity is ubiquitous in education. Therefore, teachers should expect students to have diverse learning needs and adjust their instruction accordingly (Griful-Freixenet et al., 2021). As the student population becomes more diverse, pedagogical methods must be adjusted to support this change. We, as educators, must include instructional practices that help address all our students' needs.

Carol Tomlinson was an advocate of differentiated instruction. Tomlinson, a former elementary school teacher of 21 years (and Virginia Teacher of the Year in 1974), has written over 200 articles, chapters, and books about differentiated instruction (Tomlinson, 2008). She has championed the use of differentiated instruction to meet the needs of all learners in the classroom. Characterized by rigorous professionalism and a strong underlying belief in both

teachers' and students' potential, her work has given many educators both practical and philosophical frameworks for modifying instruction to meet the individual needs of all students (Tomlinson, 2008). According to Tomlinson, the best approach to supporting all learners is to keep kids together in the context of a high-quality curriculum while attending to their readiness, needs, interests, and preferred ways of learning. "Let us assume they can all do good work, and let us attend to the ways they need us to teach them to get there" (Tomlinson, 2008, p. xx).

Figure 2.2

Differentiated Instruction Model



The differentiated instruction model above serves as the foundational framework for data analysis. Tomlinson's model of differentiated instruction explains the pedagogical strategies

required for addressing students' various learning needs. Central to this model is the notion that a differentiated lesson depends on continual assessment and adaptation, facilitating flexible grouping and the provision of cognitively respectful tasks. Educators can tailor instruction by differentiating content, processes, or products by students' readiness levels, interests, or cognitive profiles.

Research indicates that many teachers began to see the benefits of differentiated instruction and identify where traditional instructional practices have fallen short for students. Rock et al. (2008) declare that a significant drawback of traditional instruction is that many teachers "teach to the middle" (Haager & Klinger, 2005, p. 19), which means that the needs of a growing number of students will not be addressed. Accountability frameworks have unintentionally encouraged this practice by the need to get students to "pass" rather than grow. Improvements in accountability across the United States have supported the need for differentiated instruction. There is a push for accountability frameworks to acknowledge the growth and initial levels of achievement compared to where students are at the end of the school year. The theoretical framework that supports differentiated instruction is rooted in cognitive psychology and is based mainly on research on student achievement (McTighe & Brown, 2005; Rock et al., 2008). Supporting the framework are four guiding principles that relate to differentiating classroom practices:

- a focus on essential ideas and skills in each content area,

- responsiveness to individual student differences,

- integration of assessment and instruction,

- an ongoing adjustment of content, process, and products to meet individual students' levels of prior knowledge, critical thinking, and expression styles (Tieso, 2003; Tomlinson, 1999).

Although differentiated instruction has increased in implementation over the past 20 years, some educators are still hesitant about its benefits. There are several misconceptions regarding differentiated instruction. The most common misconceptions include:

- students will be ill-prepared for standardized tests;

- if teachers differentiate instruction, they create unfair workloads among students;

- it is not fair to give students credit for learning if they have not demonstrated the same knowledge as other students;

- students will not be able to compete in the real world;

- there is only one way to differentiate instruction (Wormeli, 2005; Rock et al., 2008).

According to Tomlinson, there is no empirical support for these assertions; it is incorrect to assume there is only one way to differentiate instruction (Rock et al., 2008). Differentiated instruction has many benefits for students academically. Goddard et al. (2015) refer to the research of VanTassel-Baska, who examined teacher use of differentiated instruction and found that in classrooms where teachers received specific support to differentiate instruction, students evidenced growth in their instructional engagement. The increase in instructional engagement will lead to overall improvement in academic achievement. Differentiated instruction to increase math achievement will require practices and strategies that align with its four guiding principles.

Instructional Strategies

Small group instruction and formative assessment are the instructional strategies identified for improving math achievement at Hogwarts Middle School. These strategies align with Tomlinson's differentiated instructional model and refer to specific methods and approaches that "provide the conditions under which learning goals will most likely be attained" (Driscoll, 2000, p. 344; Yang, 2017). Instructional strategies, curriculum development, and classroom management comprise three pillars of effective practice categories (Ford, 2018).

Empowering educators to leverage instructional strategies holds profound implications for building teacher capacity and fostering student success. By equipping teachers with the tools and techniques necessary for effective differentiation, they are better positioned to address the diverse learning needs present within their classrooms. It is worth noting that while differentiated instruction transcends the confines of a prescriptive teaching formula (Tomlinson, 2000), it serves as a flexible framework that empowers educators to tailor their instructional practices to meet the unique needs of their students.

The identified instructional strategies, namely small group instruction and formative assessment, epitomize this balance between specificity and flexibility. While offering educators autonomy in their pedagogical approach, these strategies remain sufficiently focused to target specific areas of student difficulty. Small group instruction, for instance, facilitates personalized learning experiences by allowing educators to tailor instruction to the individual needs and abilities of small groups of students. Similarly, formative assessment is a dynamic tool for gauging student understanding in real time, providing educators with actionable insights to inform instructional decision-making.

Adopting instructional strategies represents an intentional decision to create an active and responsive learning environment at Hogwarts Middle School. By adopting these methodologies, educators embark on a journey of continuous improvement, wherein pedagogical practices are continually refined to optimize student learning outcomes. As the educational landscape evolves, the proactive integration of Tomlinson's differentiated instructional model through instructional strategies at Hogwarts Middle School could be an initial step to educational excellence and increase student achievement. The following section describes small group instruction and formative assessment as strategies within differentiated instruction.

Small Group Instruction

The growing interest in small-group mathematics teaching (Lindquist, 1989; Noddings, 1989; Taylor, 1989) underscores the importance of examining teaching practices (Good et al., 1990), particularly in guided math instruction. According to Gereleman (1987), teachers typically adopt one of two general formats: Type 1 grouping, where groups cover content separately but simultaneously, or Type 2 grouping, where each group receives different content and progresses at its own pace (Good et al., 1990).

My district's practice aligns closely with Type 1 grouping, which has evolved into guided math instruction. Guided math is not merely a curriculum or strategy; it represents a pedagogical framework wherein teachers assess students' proficiencies and group them accordingly, thereby shifting the responsibility for learning from teacher to student (Pickering, 2019). This approach emphasizes self-sufficiency while providing targeted support for students struggling with grasping certain concepts.

A key feature of guided math is its alignment with the gradual release model, wherein teachers provide targeted small-group instruction followed by opportunities for independent or

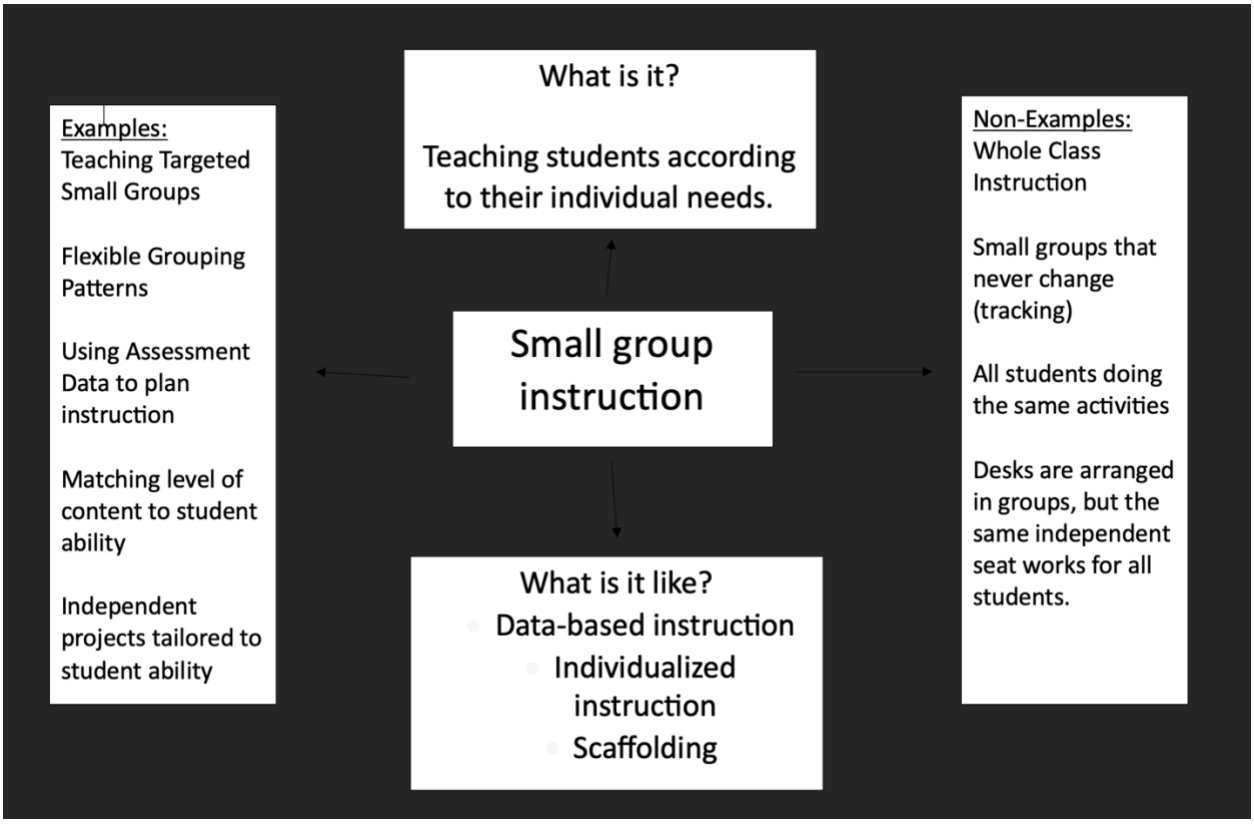
collaborative practice (Pickering, 2019; Starr, 2021). Significant components of guided math include formal and informal assessments to inform instruction, flexible grouping, and small group instruction tailored to students' instructional levels within a concept (Starr, 2021). While the teacher conducts small group sessions, the rest of the class engages in targeted center work, fostering independent learning (Starr, 2021).

Despite its effectiveness, educators sometimes hesitate to implement guided math due to misconceptions about its complexity, especially at the secondary level. However, like the Guided Reading model, successful implementation of guided math relies on establishing solid structures and routines. This entails ensuring that students have internalized expectations for learning within whole groups, small groups, and independent center settings and how to transition between them (Starr, 2021).

Management of behaviors can pose challenges in secondary education, particularly in middle school. However, effective classroom management is contingent upon establishing clear expectations and procedures and creating an environment conducive to small-group instruction and meaningful learning experiences.

Figure 2.3

Small Group Instruction



Formative Assessment

Formative assessment is a great way to be proactive about math instruction; it helps uncover student misunderstandings and make instructional adjustments (Rose et al., 2007; Duke et al., 2013). Because there has been so much attention lavished on formative assessment lately, most of today's teachers and administrators have at least a rough idea of what it is (Popham, 2008). Formative assessment is the process "to recognize and respond to student learning to enhance that learning during the learning" (Clinchot et al., 2017, p. 74). Suppose you ask teachers to explain formative assessment in the classrooms. Teachers might tell you it involves

testing students amid an ongoing instructional sequence and using the results to improve instruction (Popham, 2008).

Educators have drawn use of the term formative from Michael Scriven's (1967) groundbreaking essay about educational evaluation, in which he contrasts summative evaluation with formative evaluation. According to Scriven (1967), if the quality of an early-version educational program is evaluated while the program is still malleable—capable of being improved because of an evaluation's results—this constitutes formative evaluation.

Utilizing formative assessment in class is an excellent tool for teachers to understand clearly what their students know and to drive instruction based on the results. It is also something that can be easily implemented in class. Formative assessment has become what some consider a best practice in education. One of the most popular ways to formatively assess is through exit tickets. Incorporating exit slips as a standard routine to end class provides teachers with valuable information about students' progress, enabling them to plan for the next day's math assignment (Duke et al., 2013).

Formative assessment helps teachers identify strengths and weaknesses in their students' understanding, focuses students' attention on relevant information and ideas, and provides scaffolds that guide and support student progress (National Research Council [NRC], 2011; Clinchot et al., 2017). The information gained from formative assessments should drive small group instruction and put the teacher in a better position to know what to focus on in his/her instruction. When utilizing formative assessment, educators should take on more responsive approaches that provide "time for students to engage in and achieve a depth of understanding of the core ideas presented" (Clinchot et al., 2017, p. 74). This mindset requires understanding what you want students to take away from the lesson. Clinchot et al. (2017) suggest considering the

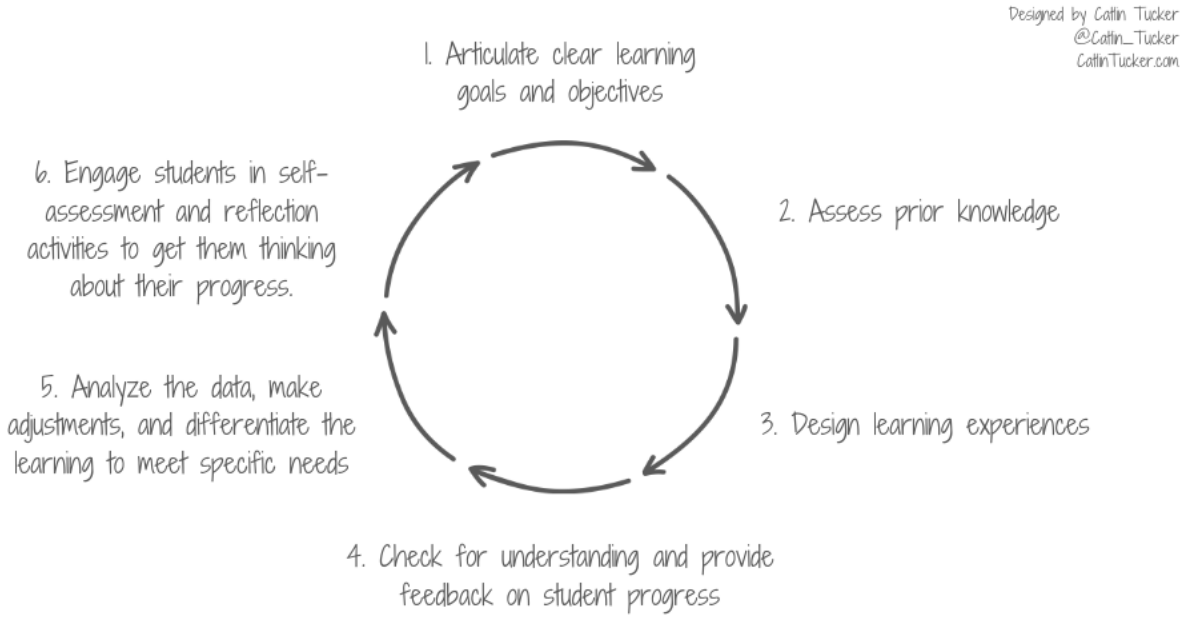
following questions when attempting to shift from a prescriptive to a responsive assessment style:

> "What is this task intended to reveal about students' thinking?" As we consider the answer, we reflect on other questions, such as: "What do students cue on, and what do they not pay attention to?" "Which issues are worth opening discussion about, and which are better approached by repeated practice?" These questions have helped us to identify teaching strategies that move us toward more responsive modes of formative assessment (p. 74).

These questions will help you better understand the lesson's end goal. This can drive instruction and allow for a clear picture of student understanding.

Figure 2.4

Formative Assessment Cycle



Formative assessment is a pivotal component in modern educational paradigms, with its transformative potential extending to reshape teachers' instructional methodologies (Popham, 2008). The evolving landscape of educational accountability highlights the imperative for teachers to possess comprehensive insights into their students' academic progress. Formative assessment emerges as a powerful tool, offering educators invaluable insights into their students' learning struggles and facilitating targeted interventions tailored to their needs.

Central to the efficacy of formative assessment is providing constructive feedback to students, a practice rooted in research-supported views on its positive impact on student learning (Weurlander et al., 2012). Regardless of which form of formative assessment is utilized, its fundamental purpose remains consistent: to furnish students with actionable feedback to enhance their learning outcomes (Falchikov, 2005; Sadler, 1998; Weurlander et al., 2012). Works by Black and William (1998) corroborate the assertion that formative assessment and supportive feedback mechanisms create potential improvements in student learning (Weurlander et al., 2012).

Moreover, the efficacy of formative assessment transcends its immediate impact on students, extending to enriching educators' pedagogical practices. Through formative assessment, teachers glean invaluable insights into the collective abilities of their classes, enabling them to tailor instructional approaches to suit their students' needs better. Simultaneously, students are empowered to develop a deeper understanding of their capabilities, fostering a sense of agency and autonomy in their learning journey.

Recent research on assessment underscores the profound influence of assessment task design on students' learning experiences, emphasizing its role in signaling the significance of

certain knowledge domains and shaping students' approaches to learning (Weurlander et al., 2012). As such, students and teachers are urged to actively engage in the educational process, with assessment as an integral facet of teaching and learning dynamics. The model proposed by Hattie and Jaeger (1998) advocates for educational practices where assessment assumes a central role in the teaching-learning continuum, with feedback mechanisms playing a pivotal role in amplifying students' academic achievements (Weurlander et al., 2012).

Formative assessment emerges as a cornerstone of educational practices, facilitating a reciprocal relationship between educators and students to create continuous growth and development. As educators embrace the principles of formative assessment, they embark on a journey toward enriched teaching and learning experiences characterized by iterative feedback loops and a shared commitment to academic excellence.

Effectiveness and Outcomes

Ayten Pinar Bal (2023) published her findings from a study conducted to assess the impact of differentiated instruction on mathematics achievement and the attitudes of secondary school learners to reveal their views on differentiated instruction. The study concluded that secondary school learners conventionally vary in academic abilities and achievement levels. Thus, due to the increase in learner diversity in the classroom, the need for teaching strategies such as differentiated instruction is increasing (Bal, 2023). Additionally, the study revealed that in students' response to the implementation of differentiated instruction, learners' academic achievement and interest in the lesson had increased – especially in mathematics, where learners' achievement was low (Bal, 2023). Differentiated instruction can help support the needs of all students in a classroom by diversifying how information is presented.

Some of the successes associated with implementing differentiated instruction include increased student motivation in approaching academic tasks, improved study habits and problem-solving skills for students, and students recognizing the value of paying attention to different learning styles and the need to apply this approach to their classroom teaching during practicum, bringing the topics of curriculum studies to life; increased meaning and understanding by making connections to real life classroom and world situations, group cooperation and collaboration, greater involvement, understanding and improved academic performance by all students, and building improved relationships between students and instructors (Joseph et al., 2013). Several factors contribute to the success of differentiated instruction. When students are given choices about materials, activities, and assessments, they feel empowered, heightening interest in the course and contributing to overall student achievement (Joseph et al., 2013).

Teacher Preparation and Professional Development

Lack of teacher preparation hinders the effective implementation of differentiated instruction. Holloway (2000) references Patricia Renick's (1996) findings that suggest that regardless of how much university preparation regular educators received in differentiated instruction, their preparation was typically "washed out" by their student-teaching experiences. As a result, very little university preservice preparation reaches the regular educator's classroom. Similarly, Brian McGarvey and his colleagues (1997) found that teachers were trying to apply the principles of differentiation in their classrooms. However, many teachers needed help incorporating various instructional skills (Holloway, 2000).

There is a concern about teachers' ability to implement differentiated instruction due to the lack of training in teacher preparation programs and subpar professional development and support. Holloway (2000) suggests two events must occur to implement differentiated instruction

in schools successfully. First, universities must develop pre-service programs that provide prospective teachers a meaningful understanding of the elements of differentiated instruction. Second, school leaders must provide all teachers encouragement, support, and nurturing—all delivered through effective professional development founded on competent training and effective mentoring and conducted by experienced, skilled professionals (Holloway, 2000). Concern about the practical implementation of differentiated instruction is present due to teachers' lack of understanding of the profession.

Additionally, teachers cannot be expected to learn to implement differentiated instruction without a well-designed and intensive teacher professional development program (Brown, 2016, as cited in Smets & Struyven, 2020). Consistent and intentional professional development must occur for teachers to become comfortable implementing differentiated instructional strategies. Teachers need support in understanding differentiated instruction and what it looks like in the classroom. Sustained teacher professional development is needed to foster teachers' responsive teaching skills (Smets & Struyven, 2020).

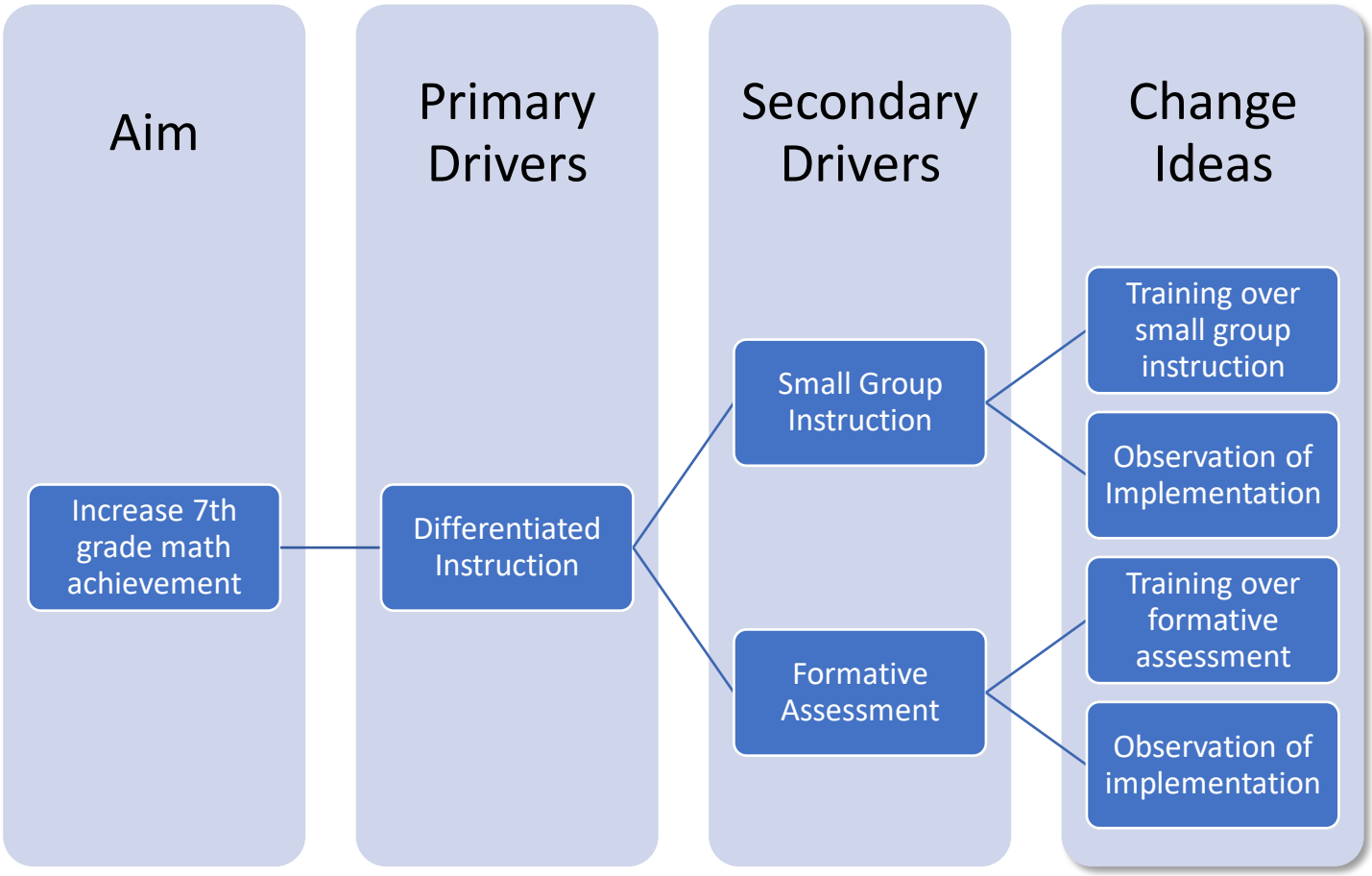
Working Theory of Improvement

Based on the research collected on improving student achievement in math and the differentiated instructional strategies of small group instruction and formative assessment, a driver diagram was created to identify the anticipated outcomes and goals of implementation. Integrating differentiated instructional strategies into teachers' pedagogical practices could improve student achievement in math by an additional 30% of students in the meets category and 20% of students in the masters' category. Primary and secondary drivers were identified as essential parts of the system that can impact or influence the aim (Hinnant-Crawford, 2020). These drivers will support the continuous improvement process throughout the implementation

of differentiated instruction. Through continuous improvement practices, these and other potential influential factors can be explored and addressed by shifting focus from the more significant problem of practice to those that contribute to improvement (Elgart, 2017). Figure 2 outlines the primary and secondary drivers that may influence the attainment of the aim for increased math achievement in math.

Figure 2.5

Driver Diagram



Conclusion

Student achievement is a priority in the United States, so improving math achievement at the middle school level is imperative. Studies have shown the benefits of differentiated instruction and its impact on math achievement. Implementing effective instructional strategies such as small group instruction and formative assessment will assist in creating a better learning environment and improving math achievement.

To implement differentiated instruction, the process has to be very intentional. The change is achievable with the support of the administration, teachers, and campus stakeholders to assist in implementation. The process measure would include professional development for teachers on the practical and appropriate use of differentiated instructional strategies of small group instruction and formative assessment, as well as providing support from master teachers so classroom teachers are adequately equipped with resources for implementation. The balancing measure would be to ensure teachers are not overwhelmed and feel supported through this transition of math instruction.

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CHAPTER 3: EVALUATION OF THE PROBLEM OF PRACTICE

Abstract

This evaluation research aimed to equip school professionals with comprehensive quantitative and qualitative data on the progress and effects of differentiated instructional strategies implemented at a middle school campus. The primary focus was to assess their effectiveness in increasing student achievement in mathematics, as evidenced by data collected from the State of Texas Assessment of Academic Readiness (STAAR) assessment. Differentiated instruction is a teaching philosophy predicated on the idea that teachers should tailor their instructional methods to address the diverse learning needs of all students. Responses from the teacher surveys revealed that there was a lack of consistent implementation of differentiated instructional strategies across the campus. Many teachers expressed that their limited understanding of what differentiated instruction entailed was a significant barrier. Despite professional development efforts, there appeared to be a gap between the theoretical knowledge of differentiated instruction and its practical application in the classroom. Due to the challenges related to the consistent implementation of these strategies, the findings pointed to the need for sustained professional development, collaborative opportunities, and feedback and support.

Keywords: student achievement, differentiated instruction, small-group instruction, formative assessment, students

Introduction

Hogwarts Middle School is a Title 1 public school that has struggled to consistently maintain an accountability rating of “C” or higher on the A-F accountability scale. Several attempts have been made to rectify the situation and create more successful student outcomes. Some potential strategies to improve accountability include focusing on Science, Technology Education, and Mathematics (STEM), targeting students on the verge of meeting standards, and campus-wide organizational initiatives such as Advancement Via Individual Determination (AVID).

The current vision of the campus is that Hogwarts Middle School fosters an environment where all students show growth academically, socially, and emotionally through partnerships with school leaders and stakeholders. The campus mission is to equip and influence every student at their level with skills that will help them reach their highest level of academic, social, and emotional success. Hogwarts Middle School plans to implement a culture where community and families are instrumental to students' growth by keeping all communicative outlets open.

Literature Review

When data from students in the American education system is compared to data from students in other nations, the lack of accomplishments and success in mathematics has been a source of concern. Over time, several educational techniques and resources have been suggested and implemented to address the disparity. Differentiated instruction emerged as a promising practice for improving achievement in various educational settings. Differentiated instruction comprises several instructional strategies that are discussed in detail to assist in understanding how they are incorporated into the PDSA cycle.

One of the more popular ways to implement differentiated instruction is through small group instruction. Small group instruction allows teachers to determine and support student academic needs more intentionally. It enables teachers to address the fundamental challenges of instructing in ways that respond to students' diverse capabilities and differences (Goddard et al., 2015). Teachers must have the tools to support all learners in the constantly changing educational landscape. Students are different; they need a variety of strategies. Unfortunately, some educators use a one-size-fits-all approach and do not consider the best instructional practices for students. Goddard et al. (2015) suggest that when a school climate encourages systematic flexibility regarding how teachers deliver instruction and allow students opportunities to access and express their learning in various ways, students may be more likely to achieve at higher levels than those in schools where a one-size-fits-all approach is more common. Differentiated instruction allows for flexibility, students can focus on their academic needs, and teachers can ensure everyone learns through small group instruction.

Another critical component of differentiated instruction is ongoing formative assessment. Utilizing formative assessment allows teachers to monitor individual student progress and make the necessary changes to instruction (Goddard et al., 2015). Formative assessment is the process "to recognize and respond to student learning to enhance that learning during the learning" (Clinchot et al., 2017). Employing formative assessment in classrooms is an excellent tool for teachers to understand students' knowledge. This information is very beneficial in planning for small-group instruction. Formative assessment has become a staple in effective classroom instruction. One of the more popular ways to formatively assess is through exit tickets; they determine the degree to which students have mastered the concepts for that day. Incorporating exit slips as a standard routine to end class provides teachers with valuable information about

students' progress and enables them to plan for the next day's mathematics assignment (Duke et al., 2013). Another way formative assessment can be used is throughout the lesson. Best practices suggest that assessing during the lesson using class discussions, quick writes, or turn and talks can help teachers determine precisely where and in what areas students struggle. Once the area of concern has been identified, small group instruction can be used to address the needs of the students. Incorporating the assessment within the lesson allows for more learning and increases opportunities to correct misconceptions early rather than waiting until the end.

Effective instruction is about being able to adapt and pivot when needed. Differentiated instruction through small group instruction and formative assessments are best practices in education. Implementing these strategies in classrooms creates opportunities for all students to learn. These methods used in the mathematics classes at Hogwarts could help improve the number of students who score in the meets and masters proficiency levels on the state test at the end of the school year.

Over the years, education reform has taken on many different iterations. Instructional coaching has emerged as one of the ways to support teaching and learning in mathematics (Harbour & Saclarides, 2020). Using instructional coaching as professional development to improve teacher quality has significantly changed how teachers approach their craft (Tanner et al., 2017). Many districts have attempted to employ instructional coaches to help improve teacher capacity and increase academic achievement. However, some districts have not achieved the desired results due to ineffective implementation and lack of training. While coach and specialist can be defined in several ways (National Mathematics Advisory Panel, 2008), a common definition distinguishes a coach as someone who directly supports teachers by providing them with professional learning opportunities, whereas a specialist is someone who

works directly with students (Harbour & Saclarides, 2020). East Texas ISD employs instructional specialists within the curriculum and instruction department. Their role is to develop curriculum and support campuses that struggle with implementation. The instructional specialist coordinates with campus administration and master teachers to address academic concerns that may arise throughout the year.

Uncommon Schools has created a toolbox for coaches to use when developing successful teachers. The book "Get Better Faster" (2016) is designed to help you see, name, and do it. In theory, it is a written instruction manual for school leaders to support coaching teachers (Bambrick-Santoyo, 2016). The book's purpose is to guide coaches and administrators when going into classrooms to identify areas of concern. When teachers struggle, it can be challenging to determine where they need help. The book provides bite-size pieces teachers can work on to improve with the assistance of master teachers. According to Bambrick-Santoyo (2016), when we begin to recognize teaching as a performance profession, we will see that what is more important than assessing how teachers did yesterday is ensuring they will succeed today, tomorrow, and throughout their careers.

The "Get Better Faster" approach to coaching will be utilized to help improve the meets and masters scores. The practice focuses on teaching as a performance profession (Bambrick-Santoyo, 2016). Supporting teachers through their improvement is an essential step in building teacher capacity. Any school improvement is contingent on teachers' ability to help students succeed. Additionally, there must be a collaboration between teachers, master teachers, and administrators. The "Get Better Faster" approach incorporates teamwork and improvement through constant feedback. Teachers cannot expect to get better without feedback; master teachers and administrators must intentionally provide constructive criticism so growth can

occur. The goal is to build teacher capacity to improve student achievement. Everyone wins if teachers are equipped with the necessary tools to support students. Education is a field that requires teamwork administrators, teachers, and instructional personnel working together to help students.

Effective instruction has been a struggle at Hogwarts due to teachers' inexperience with differentiated instruction. Teachers would often teach the way they were taught and not utilize various instructional strategies to support the needs of the entire class. The district provided curriculum documents, a pacing calendar, and suggested strategies to teach the content. Despite the resources provided, teachers struggled with internalizing the lessons and differentiating the content to support learners who could not master the presented information. During this time, teacher accountability and support needed to improve. Teachers were expected to figure out their struggles and determine ways to adjust without administrative input or feedback.

The practice for provided instruction has been to teach to the middle, but by doing this, all students are not getting the support they need. Teachers should be able to differentiate the content for students above and below grade level. Several instructional strategies can be utilized to assist students in differentiating. The instructional strategies support identifying where students are struggling and using that information to guide the instruction needed. Teachers made statements like, “I am not sure what they do not understand.” Their responses indicated that teachers cannot assess and support the needs of the students.

Another factor affecting seventh-grade academic achievement was that the course sequence did not support students not on the accelerated path in mathematics. Up until the 2020-21 school year, middle school mathematics courses were as follows: Students enrolled in sixth grade on-level mathematics were taught sixth grade TEKS and took the sixth grade STAAR test;

students enrolled in sixth-grade pre-advanced placement (PAP) were taught sixth and seventh-grade TEKS and took the sixth-grade STAAR test. Students enrolled in seventh grade on-level mathematics were taught seventh grade TEKS and took the seventh grade STAAR test; students enrolled in seventh-grade PAP were taught only eighth-grade TEKS and took the eighth-grade STAAR test. Students enrolled in eighth grade on-level mathematics were taught eighth grade TEKS and took the eighth grade STAAR test; students enrolled in eighth-grade PAP were taught eighth-grade TEKS and took the eighth-grade STAAR test. Students enrolled in Algebra 1 PAP were taught Algebra TEKS and took Algebra EOC. Students enrolled in Geometry PAP were taught high school geometry TEKS and eighth grade TEKS and took the eighth grade STAAR. Students enrolled in eighth grade on-level mathematics were taught eighth grade TEKS and took the eighth grade STAAR test; students enrolled in eighth-grade PAP were taught eighth-grade TEKS and took the eighth-grade STAAR test. This pathway limited the academic achievement of seventh-grade mathematics students because the advanced students took the eighth grade STAAR test. This district made some changes after reflecting on how this course sequence impacted accountability. Starting in the 2020-21 school year, students enrolled in grades 6, 7, or 8, whether on-level or PAP/Honors, took the STAAR test of their designated grade level.

Additionally, guidelines were provided for students who desired to follow the accelerated pathway. Explicit criteria were created to assist with identifying students who would be successful at each level. A graphic of the criteria is listed below:

Figure 3.1

Middle School Advanced Math Placement Criteria

Middle School Advanced Math Placement Criteria

Prerequisite	2023-2024 Course Placement	PLACEMENT CRITERIA				
		STAAR Assessment*		Cumulative Average	District Placement Exam (2022 Released STAAR)	
		Grade Level	Raw Score		Grade Level	Raw Score
	Math 6 Honors	Grade 5	25+ (Meets Grade Level)	80+		
	Math 6 Accelerated [This course is not offered on every campus.]	Grade 5	30+ (Masters Grade Level)	90+		
	Math 7 Honors	Grade 6	23+ (Meets Grade Level)	80+		
	Math 7 Accelerated [This course is not offered on every campus.]	Grade 6	30+ (Masters Grade Level)	90+		
	Math 8 Honors	Grade 7	25+ (Meets Grade Level)	80+		
8th Grade Math or Equivalent	**Pre-AP Algebra 1 (HS credit)** *7th or 8th Grader*	Grade 6 (From 6 Accelerated)	30+ (Masters Grade Level)	90+	Grade 8	28+ (Meets Grade Level)
		Grade 7 (From 7 Honors)	25+ (Meets Grade Level)	80+	Grade 8	28+ (Meets Grade Level)
		Grade 8 (From 7 Accelerated)	28+ (Meets Grade Level)	80+		
Pre-AP Algebra 1 (HS credit)	**Pre-AP Geometry with Statistics (HS credit)** *8th Grader* [This course is not offered on every campus.]	Algebra 1 EOC	21+ (Approaches Grade Level)	70+		

* Raw Score is based on performance categories for the 2022 STAAR Math Assessments as defined by Commissioner Rule 19 TAC §101.3041.

Although the district adjusted the mathematics course sequence, the seventh-grade academic achievement on STAAR at Hogwarts needed to improve. The state of Texas determines academic achievement in Domain 1 of the accountability system. After analyzing the STAAR test results, it was determined that seventh-grade mathematics achievement was significantly lower compared to grades 6 and 8. The problem of practice was evident; according to state assessment results, there was a need for improvement in seventh-grade mathematics achievement.

For this study, the Plan-Study-Act (PSA) cycle was utilized to evaluate how differentiated instruction was currently being implemented in the classroom. Two focuses were being evaluated: differentiated instruction and the Get Better Faster process for supporting

teachers. The two practices could be executed simultaneously because they support one another. Get Better Faster will help teachers utilize differentiated instruction in their classes. Teachers were struggling to support the needs of all students; there was particular concern about teachers' ability to scaffold down to the instructional levels of the students they supported.

The primary drivers of the low academic achievement in seventh-grade mathematics were that the structures in place did not support students who were not on the accelerated path in mathematics and that the instructors lacked the ability to help students succeed. Since the adjustment to the mathematics pathways did not result in improved achievement, the focus now is on improving teacher capacity by incorporating differentiated instruction into their practice and supporting them using Get Better Faster as a guidance tool. The intervention would entail providing guidance and support for teachers on implementing the differentiated instructional strategies of small group instruction and formative assessment. Master teachers on campus will assist in helping teachers adjust to the instructional strategies and reinforce campus expectations.

Change ideas were identified by the administrative team and other stakeholders working to support the needs of our campus. A plan of action was developed to implement the differentiated instructional strategies of small group instruction and formative assessment. Additionally, it was decided that to support implementation from the teachers, Get Better Faster would be the tool used for teacher accountability and coaching to assist teachers in their ability to use the strategies in their classrooms.

First, the administrative team identified two strategies that would focus on differentiating instruction in the classroom. Due to the differing definitions and the level of understanding of differentiated instruction, it was essential to ease into implementation. Small group instruction and formative assessment were identified as the instructional strategies teachers could use to

differentiate instruction in their classrooms. Second, the roles of the administration and master teachers were defined; master teachers would be tasked with observing teachers, giving feedback, co-teaching lessons, and leading PLCs in the afternoons embedded into the workday.

The changes were studied over the course of a year, with adjustments made based on teacher observations, data from unit assessments, and the fall benchmark. By the end of the first semester, gains could be identified based on unit assessment data, but we knew additional improvements were needed. Even though the district saw gains due to the course sequence, Hogwarts continued to struggle with academic achievement in grade 7. The second semester of the school year continued to examine teachers' use of the differentiated instructional strategies of small-group instruction and formative assessment. As a result of the Get Better Faster feedback observation toolkit, additional interventions, such as the need for better classroom management and establishing best practices to assist with classroom instruction, were identified. In response to the primary intervention, more modeling took place from the master teacher, PLC time became more intentional, and a schedule was developed for master teachers to observe and provide frequent feedback about areas of improvement.

By the end of the second semester, the first full school year, there were slight improvements to the overall mathematics academic achievement for the district, but much of that was due to the changes in the course sequence. Seventh-grade mathematics achievement increased by eight percentage points in the approaches proficiency level, eleven percentage points in the meets proficiency level, and four percentage points in the master's proficiency level after the first year of intervention.

Background

The setting is a public middle school in Texas that serves students in grades 6-8. Historically, the campus has struggled to achieve the state requirements for an acceptable rating. The campus has recently begun focusing on implementing differentiated instruction to improve successful student outcomes. The new administration team identified two instructional strategies that align with differentiated instruction: formative assessment and small group instruction.

East Texas Independent School District (East Texas ISD) received an accountability rating of "B" for the 2021-22 school year. Although the district's accountability rating qualifies as a good performance, Hogwarts had a rating of "C." For years, the campus has struggled with maintaining an acceptable accountability rating. Specific difficulties have centered around seventh-grade mathematics achievement. The seventh-grade achievement in mathematics has always trailed behind the success of the other grade levels on campus. The table below highlights the differences in campus mathematics scores for sixth, seventh, eighth, and Algebra each year.

Figure 3.2

Mathematics STAAR score from 2018-2022

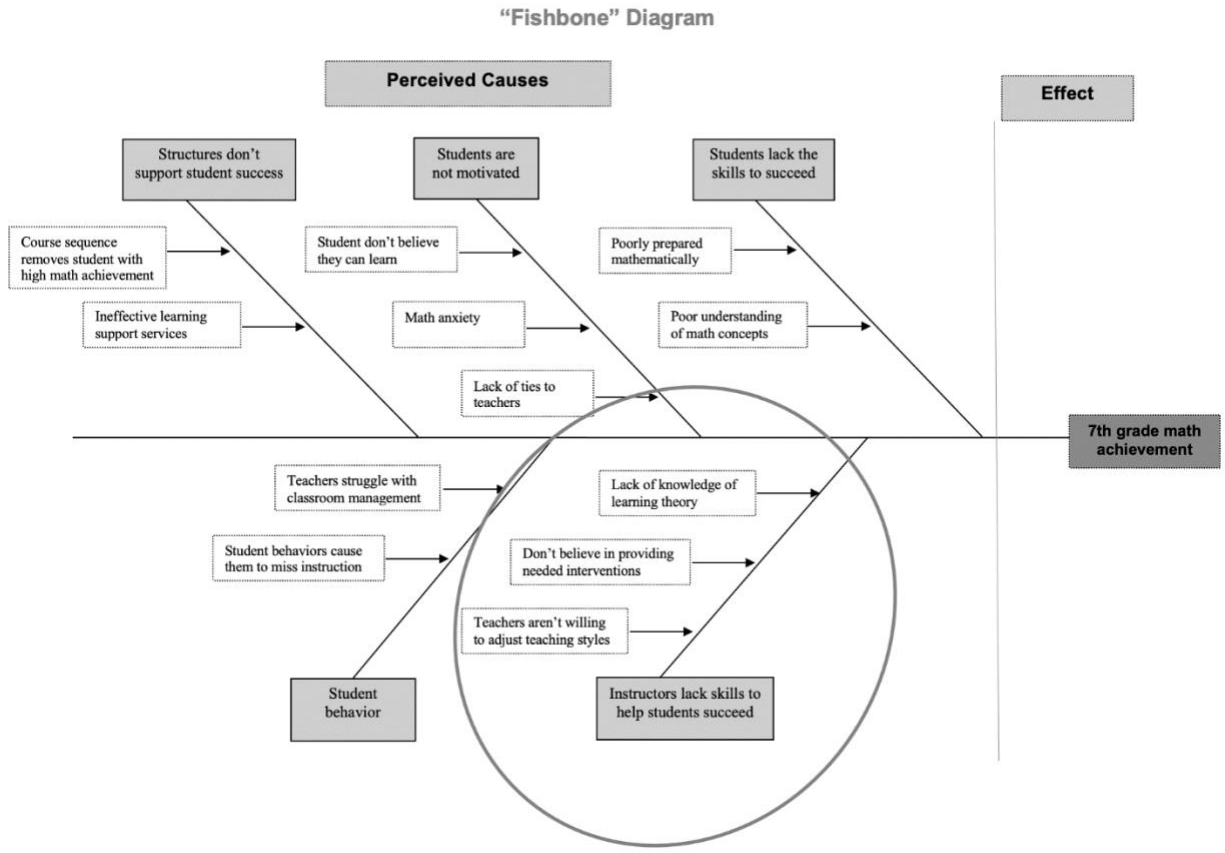
Subject/Grade	Proficiency	2017-18	2018-19	2019-20	2020-21	2021-22
Math	Domain 1	35	36		31	33
	Approaches	64	68		57	61
	Meets	29	29		29	28
	Masters	11	10		8	9
6th Grade	Domain 1	31	30		30	31
	Approaches	57	62		57	65
	Meets	25	21		27	23
	Masters	11	7		5	4
7th Grade	Domain 1	19	19		16	20
	Approaches	45	47		32	41
	Meets	10	8		12	15
	Masters	2	2		3	4
8th Grade	Domain 1	46	41		36	34
	Approaches	85	80		66	64
	Meets	41	36		34	30
	Masters	11	7		8	8
Algebra I	Domain 1	89	89		69	76
	Approaches	100	100		100	96
	Meets	100	97		75	86
	Masters	67	69		33	46

The needs assessment identified several factors that could contribute to the achievement gap between grade levels. Some perceived causes include structures that do not support student success, lack of student motivation, foundational skills not present, student behavior, and teachers lacking the skills needed to help students succeed. This PDSA cycle will address teachers lacking the skills to help students succeed. Teachers need support in addressing the needs of all students. The campus has increased its focus on ensuring teachers utilize strategies

aligned with adjusting instruction based on student needs. Teachers should be equipped to identify if and where students are struggling and create opportunities for intervention and amended instruction. The diagram below is an illustration of part of the needs assessment that took place.

Figure 3.3

Fishbone Diagram Identifying Campus Needs



The needs assessment also identified drivers that contributed to the perceived causes. The instruction provided by the seventh-grade mathematics teachers needed to be more conducive to meeting the needs of all students. Interventions were not provided for struggling students, there was unfamiliarity with current instructional practices, creating a barrier to successful

implementation, and a lack of exposure to the different learning theories that reduced positive interactions that could result in a better learning environment.

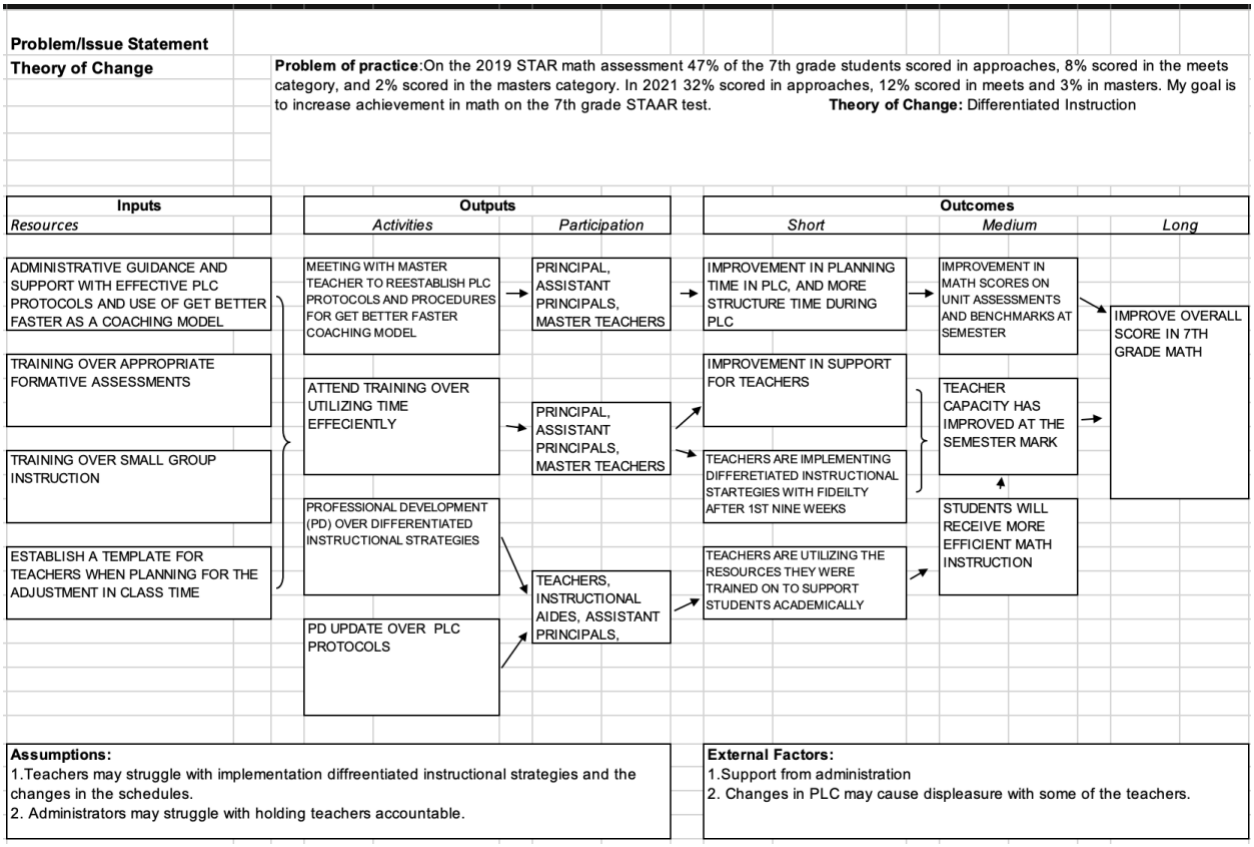
Purpose

As noted, the focus of the examination was to determine if there was an increase in academic achievement in seventh-grade mathematics through the use of the differentiated instructional strategies of formative assessment and small group instruction. Furthermore, the Get Better Faster Observation Feedback model was examined to identify the benefits of assisting master teachers with their support of teachers implementing differentiated instruction.

This study aims to evaluate the effects of differentiated instructional strategies (small group instruction and formative assessment) implemented in seventh-grade classrooms to improve mathematics achievement. The study will seek to answer the following questions: (1) How can formative assessment and small group instruction be used to differentiate instruction and support the needs of all students? (2) To what extent can formative assessment and small group instruction improve mathematics achievement on the STAAR test? Below is a logic model explaining the suggested intervention for improving seventh-grade mathematics achievement.

Figure 3.4

Logic Model for Improving Seventh-Grade Mathematics Achievement



Setting

Hogwarts is a middle school in Hogsmeade, Texas, with 904 students. The demographic breakdown is 37.4% African American, 57.3% Hispanic, 2.9% White, 0.1% American Indian, 0.1% Asian, and 2.2% Two or More Races. The school's minority student enrollment is 97%. The student-teacher ratio is 15:1, which is worse than the district's ratio. The student population is composed of 47% female students and 53% male students. The school enrolls 93% of economically disadvantaged students.

In 2017-2018, the campus received a D in state accountability and a C for the 2018-2019 school year. Because of the coronavirus pandemic, the state waived accountability ratings for the 2020-2021 school year. This school serves a community located in North Hogsmeade, an area that is not as developed. The school does not have significant academic support from parents, and behavior is a concern. Many students on this campus suffered tremendously from the challenges presented due to the coronavirus pandemic. At a campus that has struggled with academic achievement, the pandemic increased the gaps in achievement some of the students were already experiencing.

Participants/Demographics

For the purpose of this evaluation, criterion sampling was used to evaluate the effects of differentiated instruction and the effects of using the Get Better Faster Observation Feedback protocol on all seventh-grade students' academic achievement. The campus's four seventh-grade mathematics classrooms will be studied. These classrooms include 289 students and four teachers; the focus will be on the teachers' implementation of differentiated instruction. The teachers' total years of experience range from one to ten. Students are demographically represented as 33% African American, 62% Hispanic, 3% White, and 2% Two or More Races. The students are almost evenly split between male and female, with 49.83% being male and 50.17% being female. The evaluation will study the implementation of differentiated instruction by the four classroom teachers and the effect its usage has on academic achievement.

Differentiated Instruction

Small group instruction and formative assessment were selected as the instructional strategies of focus. Small group instruction allows you to determine and support student needs more intentionally. It enables teachers to address the fundamental challenges of instructing in

ways that respond to students' diverse capabilities and differences (Goddard et al., 2015). In the constantly changing educational landscape, teachers must be equipped with the necessary tools to support all learners. Students are different; they need a variety of strategies. Unfortunately, some educators use a one-size-fits-all approach and do not consider the best instructional practices for students. Goddard et al. (2015) suggest that when a school climate encourages systematic flexibility regarding how teachers deliver instruction and allows students opportunities to access and express their learning in various ways, students may be more likely to achieve at higher levels than those in schools where a one-size-fits-all approach is more common. Differentiated instruction allows for flexibility; students can focus on their academic needs, and teachers can ensure everyone is learning through small group instruction.

Another critical component of efficiently using differentiated instruction is ongoing formative assessment. Utilizing formative assessment allows teachers to monitor individual student progress and make the necessary changes to instruction (Goddard et al., 2015). Formative assessment is defined as the process "to recognize and respond to student learning to enhance that learning during the learning" (Clinchot et al., 2017, p. 2). Employing formative assessment in classrooms is an excellent tool for teachers to understand students' knowledge. This information is very beneficial in planning for small-group instruction. Formative assessment has become a staple in effective classroom instruction. One of the more popular ways to formatively assess is through exit tickets; they are used to determine the degree to which students have mastered the concepts for that day. Incorporating exit slips as a standard routine to end class provides teachers with valuable information about how the students are progressing, enabling them to plan for the next day's mathematics assignment (Duke et al., 2013). Another way formative assessment can be used is throughout the lesson. Best practices suggest that assessing

during the lesson using class discussions, quick writes, or turn and talks can help teachers determine precisely where and in what areas students struggle. Once the area of concern has been identified, small groups can be used to address the needs of the students. Formative assessment within the lesson allows for more learning and increases opportunities to correct misconceptions early rather than waiting until the end.

Master teachers will assist teachers in the implementation of differentiated instructional strategies. When school administrators, teachers, and instructional coaches work together, student achievement increases (Van Pelt & Poparad, 2008, as cited in Tanner et al., 2017). Everyone must be on the same page to improve seventh-grade mathematics achievement. Employing master teachers will take a concentrated effort from the entire campus. According to Tanner et al. (2017), when school administrators, teachers, and instructional coaches do not work together, student achievement tends to stagnate because the team is dysfunctional. Campus improvements require everyone to work together in a structured and intentional way toward an identified goal.

This evaluation study focused on the crucial role of differentiated instructional strategies in enhancing seventh-grade mathematics achievement. By tailoring entry points, learning tasks, and outcomes to students' individual learning needs, differentiated instruction enables all students to engage with the same classroom curriculum (Hall et al., 2003, as cited in Watts-Taffe et al., 2012). Implementing such strategies primarily aimed to cater to each student's unique needs rather than merely teaching to the average. The instructional leadership team pinpointed two critical strategies for differentiating instruction:

1. Formative assessment

2. Small group instruction

The administration postulated that differentiated instruction could tailor teaching to meet the unique needs of all students. This customization, in turn, was expected to significantly increase seventh-grade mathematics achievement.

Research Methodology

A mixed methods research design was identified as the best way to examine the effects of differentiated instruction on mathematics achievement. There is a great deal of controversy about the mixed methods research design. Proponents claim that mixed methods research, when designed and executed correctly, can offset the weaknesses inherent in qualitative and quantitative methods and join their respective strengths to provide a more in-depth understanding (Hendren et al., 2018; Creswell & Plano Clark, 2011; Greene, Caracelli, & Graham, 1989; Johnson & Onwuegbuzie, 2004; Pluye & Hong, 2014, as cited in Hendren et al., 2018). The reason for selecting the mixed methods research design was to ensure there was a good understanding of teacher perception and to have a baseline for why there was a need for the study.

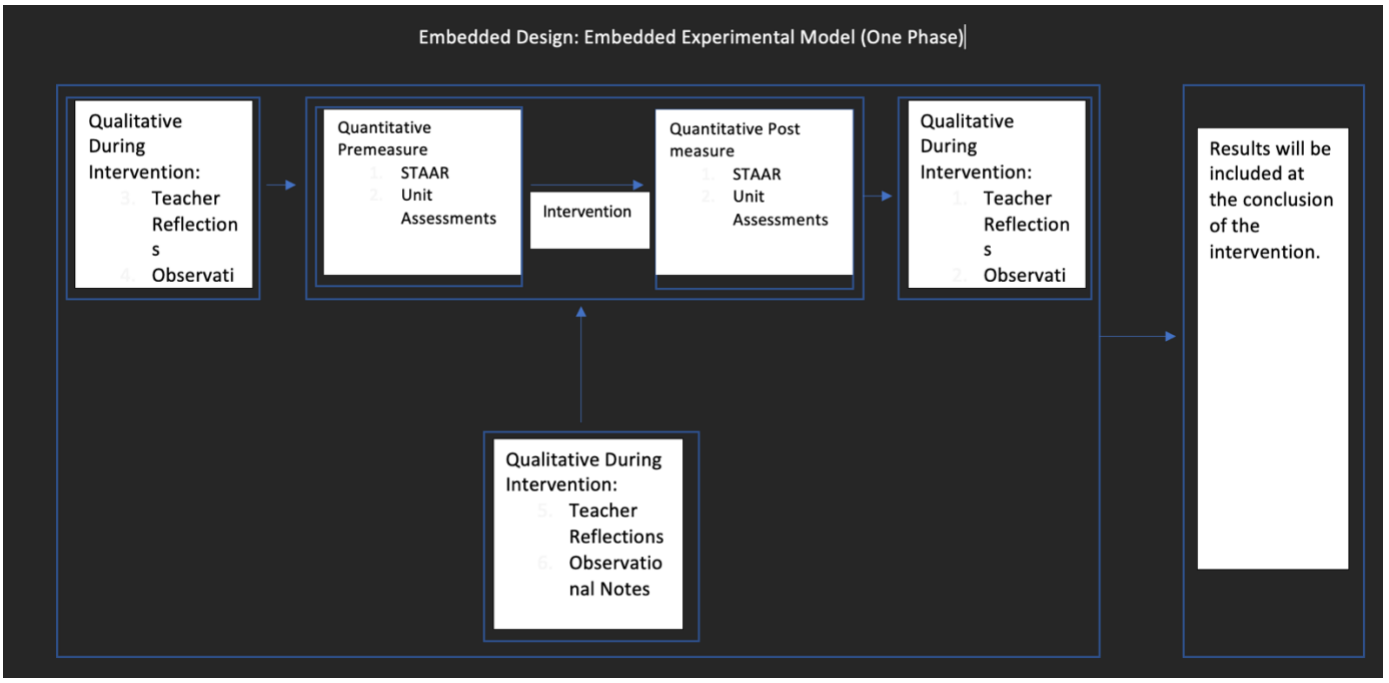
Before and after the intervention is put into practice, quantitative data will be gathered using STAAR, Star Renaissance, and unit assessments. The quantitative data will be used to track academic achievement as well as progress over the year. Qualitative data will be collected from surveys from teachers and master teachers, along with observational notes. The goal of gathering qualitative data is to gain a comprehensive picture of the degree of implementation and instructors' opinions on the efficacy of differentiated instructional strategies. When qualitative

and quantitative methods are mixed in a single study, one method is usually given priority over the other (Östlund et al., 2011). The priority of this study will be the qualitative data.

Research Design

Figure 3.5

Embedded Experimental Model for Data Collection



Data Collection

Quantitative data was stored on the district-created campus data tracker and in Edugence, a data housing software. The campus data tracker was created to assist with campus accountability projections. Students' projected proficiency levels are developed based on assessments taken and compared to the previous year's STAAR scores and growth expectations. The projected proficiency level estimates what students may score on the STAAR test.

District unit assessments were taken throughout the year in Edugence, and data was disaggregated to support data analysis. Additionally, data was transferred to the tracker to provide a projection for campus accountability. Benchmarks were also taken in the spring and fall semesters; results of the assessments were added to the tracker as well. The state of Texas requires students to make one year of growth in the mathematics and reading content areas; each student has an expected growth based on the previous year's STAAR test result and the instruction for that school year.

Qualitative data was also gathered throughout the academic year. We will administer teacher surveys as a data point. The format and questions in each survey were the same. Both closed- and open-ended survey questions about the lesson's topic and students' comprehension were included. In addition, the surveys asked about the teachers' degree of comfort using differentiated instructional strategies.

Assistant principals and master teachers observed teachers throughout the year. The observations aimed to gather information on how small group instruction and formative assessment are applied to differentiate instruction. Weekly observations were conducted all year round.

Data Analysis

IRB approval was obtained before data was collected. Teacher surveys are anonymous and stored in a password-protected account. Reports were shared with the master teachers and assistant principals each time they were collected. The results were analyzed for themes in response. The information collected was beneficial in determining the next steps and whether additional training was needed to achieve success in implementation.

Observations made by the master teachers are shared with the teachers and assistant principals. The researcher is in the role of assistant principal. The observations collected would regularly be shared regardless of the research per district requirements. The researcher analyzed and coded the observations into themes. Additional themes were extracted from observation and field notes to determine commonalities.

Member checking occurred throughout the data collection process. Due to the researcher's role as an assistant principal, member checking is an additional way to ensure bias does not interfere with analysis. It is important to ensure that generalizations are not made about all teachers if evidence is only seen in one classroom. By combining the master teachers and assistant principals analyzing the data and convening to discuss it weekly, the team understood the data more accurately.

Results

Qualitative:

The results from the first year of intervention showed that teachers needed additional support to implement differentiated instructional strategies successfully. Observations and surveys revealed varying levels of understanding and teacher capacity regarding implementing formative assessment and small-group instruction.

Observations and surveys from master teachers, along with teacher surveys, were collected in the spring semester of 2023. The data from the spring semester included surveys and observational field notes. The data was extricated into one document and examined using open coding. After the semester, open coding was completed, and themes were identified. The

qualitative data analysis identified two themes: a lack of understanding of differentiated instruction and struggles with implementing the instructional strategies.

According to observational data, teachers are not regularly implementing differentiated instructional strategies effectively. The master teacher indicated that “there was limited use of formative assessment throughout the lesson.” Another direct quote was that “small group was not being used consistently.” These quotes are evidence that teachers were not using the instructional strategies in the way that they were intended. While there were some instances of implementation of formative assessment and small group instruction, the instructional strategies were not being utilized with fidelity. Teachers expressed in their weekly reflections that they were unfamiliar with implementing formative assessment within the lesson and were unsure of what instruction to provide when pulling a small group.

The second theme identified from the data was the lack of understanding of differentiated instruction. Although differentiated instruction has been a common practice in education, the depth of understanding is not equal, and it is often used as a buzzword rather than a practice in the classroom. Pedagogical content knowledge (PCK) is vital to a teacher’s ability to differentiate instruction (Gess-Newsome, 2015). Differentiated instruction is a complex process that relies on strong and skillful teachers to plan and teach different levels of the same content simultaneously (Woolcott et al., 2021). If there is a lack of understanding, implementation will be impacted. Observations from master teachers revealed that teachers “were just going through the motions.” Based on what was observed, they missed the mark on the purpose of differentiated instruction and did not implement the instructional strategies with fidelity. The following adjustments were needed in order to improve implementation and increase student achievement:

1. A clear definition of differentiated instruction and the instructional practices of small group instruction and formative assessment
2. Professional development throughout the year over small group instruction and formative assessment
3. Professional development throughout the year over the Get Better Faster observational feedback protocol

Quantitative:

The data used to determine effectiveness were end-of-year STAAR scores. The STAAR data from the 2021-2022 school year were compared to the 2022-2023 STAAR data to determine the effectiveness of implementing differentiated instructional strategies. The results reveal increased achievement at each proficiency level and domain 1 in campus accountability.

The table below compares data from the 2021-2022 to the 2022-2023 school year. Although seventh-grade data increased from the previous year, a significant gap still exists between seventh-grade mathematics academic achievement and the other grade levels.

Table 3.1

Mathematics Achievement PSA Cycle

Subject/Grade	Proficiency	21-22	22-23
Seventh Mathematics	Domain 1	20	27**
	Approaches	41	49**
	Meets	15	23**

	Masters	4	8**

** Increase in percentage from previous year

Discussion

The study's results indicate that student achievement in seventh-grade mathematics increased based on the data from the 2023 STAAR results. However, these findings did not align with the teachers' responses or the observations of the master teachers.

The data revealed that teachers were not implementing differentiated instructional strategies of formative assessment and small group instruction with fidelity. Dixon et al. (2014) argue that teacher efficacy (a teacher's belief or judgment of their capabilities) underpins the ability to differentiate instruction effectively. Teacher surveys suggest a lack of confidence in implementing differentiated instruction in their classes. The data showed that teachers needed an understanding of differentiated instruction and how to utilize formative assessment and small-group instruction in the classroom.

Although teacher responses were unfavorable regarding implementing differentiated instruction, they identified the need for more intentional professional development and support for teachers utilizing formative assessment and small group instruction. If a school is willing to devote time and money to educate staff on differentiated instruction through the engagement of consultants and workshops, then it follows that they should be vigilant in ensuring that the theory becomes practice in the classroom (Dixon et al., 2014).

The study had limitations. Limitations represent weaknesses within the study that may influence the outcomes and conclusions of the research (Ross & Zaidi, 2019). One limitation was that there was no control group to compare data from students whose teachers were implementing differentiated instruction strategies to those who were not. Additionally, STAAR data was the only quantitative data collected and analyzed to determine effectiveness. Although data was collected throughout the year, surveys should have aligned with the results of data points to examine implementation effects. Lastly, responses from the teachers may be biased.

Conclusion

The study resulted in surprising outcomes. The survey revealed that teachers were uncomfortable with implementing differentiated instructional strategies. Despite the teachers' discomfort, there was a slight increase in STAAR scores. In response to the results of the study, it is recommended that professional development be provided at the beginning of the year and throughout the year over differentiated instruction, the recommended instructional strategies of formative assessment and small group instruction, and the Get Better Faster observation protocols. Furthermore, in future iterations, survey questions should include questions about what support was needed to assist with implementing differentiated instructional strategies of formative assessment and small group instruction. The results from the enhanced survey will provide information about how support can be given and what adjustments can be made. Finally, including other teachers from campuses in the district can determine if the results are limited to this set of circumstances or if they can be replicated.

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CHAPTER 4: EVALUATION OF THE INTERVENTION

Abstract

The mixed-methods study investigated the impact of differentiated instruction on student academic achievement, emphasizing the role of job-embedded professional learning in enhancing teacher efficacy in the implementation of these strategies. Student achievement was measured through a comprehensive analysis of data from iReady assessments administered at the beginning, middle, and end of the academic year, district unit assessments, and the State of Texas Assessments of Academic Readiness (STAAR). In addition to quantitative data, qualitative insights were gathered via a survey administered to four teachers. The survey results indicated that while teachers possessed a moderate understanding of differentiated instruction and felt confident in their ability to implement instructional strategies associated with it, they expressed a need for further professional development. Specifically, they highlighted a gap in their understanding of the pedagogical foundations of differentiated instruction and the rationale behind its necessity for improving student achievement. These findings suggest that while teachers are familiar with the practical aspects of differentiated instruction, there is a critical need for deeper professional learning opportunities that focus on the theoretical underpinnings and evidence-based benefits of differentiation. Such professional development would likely enhance their ability to effectively tailor instruction to meet diverse student needs, thereby potentially leading to improved academic outcomes.

Keywords: student achievement, differentiated instruction, small-group instruction, formative assessment, students

Introduction

At the conclusion of the evaluation completed in Chapter 3, it became evident that teachers required substantial support in both understanding and implementing the differentiated instructional strategies of formative assessment and small group instruction. This evaluation highlighted several critical areas where additional guidance and resources are essential for effective practice.

The findings indicate that many teachers struggle with the practical application of formative assessment techniques, often lacking the understanding necessary to utilize these strategies to differentiate for the needs of the students in their classroom. Similarly, small group instruction, while recognized for its potential benefits in addressing diverse learning needs, is not being utilized to its fullest potential due to insufficient training and support. Based on these insights, the following recommendations are proposed to enhance teacher proficiency and student outcomes in these areas:

1. **Comprehensive Professional Development:**
    - Professional development should be systematically structured and initiated at the beginning of the school year. This foundational training will equip teachers with a robust understanding of both formative assessment and small-group instruction methodologies.
    - Continuous professional development sessions should be scheduled throughout the academic year. These sessions will provide opportunities for teachers to

refine their skills, share best practices, and address any challenges they encounter in real time.

2. **Enhanced Support Through Professional Learning Communities (PLCs):**
    - Modifications to existing PLCs are essential to foster an environment where formative assessment and small group instruction are routinely discussed, modeled, and practiced.
    - PLCs should be structured to include dedicated time for collaborative planning, peer observations, and feedback sessions. This approach will enable teachers to learn from each other's experiences and collectively develop more effective instructional strategies.
    - PLCs can also serve as a platform for ongoing professional development, with sessions led by instructional coaches or external experts who can provide targeted support and introduce new ideas and approaches.
3. **Ongoing Monitoring and Feedback:**
    - An enhanced survey mechanism should be developed to capture teacher feedback regularly. This feedback will be crucial in identifying specific areas where additional support or adjustments are needed.
    - Regular monitoring and evaluation of instructional practices through classroom observations and student performance data will help track the effectiveness of the implemented strategies. This approach will inform future professional development efforts and ensure they are aligned with teachers' evolving needs.

In conclusion, a multi-faceted approach that combines comprehensive professional development, robust PLCs, and ongoing feedback mechanisms is essential for the successful implementation of differentiated instructional strategies. By addressing these areas, an environment can be developed where both teachers and students thrive, ultimately leading to improved educational outcomes.

Background

A teacher's ability to effectively differentiate instruction in the classroom is crucial in catering to student individuality and diversity, especially in the context of inclusive learning—differentiated instruction is aimed at optimizing the educational outcomes for all students (Banks, 2007; OECD, 2010, 2018; Tomlinson, 2004, 2005; UNESCO, 2005, 2015, as cited in Woolcott et al., 2021). Educators should thoroughly understand differentiated instruction to be genuinely internalized and implemented. Although teacher preparation programs seem to be a natural fit for learning how to differentiate instruction for mixed abilities, often, they provide only an introduction to the theory, which is presented in a survey course along with other theories of curriculum and instruction (Dixon et al., 2014). As a result, the cursory glimpses of differentiation may not provide enough depth to put it into practice (Dixon et al., 2014). Teachers wanting to implement differentiated instruction need knowledge about instructional strategies (e.g., collaborative learning structures), skills to assess and respond to diversity (e.g., assessment or classroom management), and beliefs to engage in it (e.g., growth mindset, ethical compass) (Smetts & Struyven, 2020). This is where in-service teacher professional development plays a crucial role, as it has been explicitly recommended for teachers' understanding of differentiated instruction (Smetts & Struyven, 2020).

Professional development is defined as structured professional learning that results in changes in teacher practices and improvements in student learning outcomes (Darling-Hammond et al., 2017). The purpose of professional development is to create learning opportunities that will support teachers' efforts to provide instruction. The aim is for teachers to learn something valuable for their profession and encourage teachers in their personal growth (Fullan & Hargreaves, 2016; Ostinelli & Crescentini, 2021, as referenced in Kahmann et al., 2022). Professional learning can be presented in a variety of ways. Some examples of professional development include professional learning communities, curriculum-based PD, coaching and peer observations, conferences, seminars, institutes, national board certification, and university courses (Schwartz, 2024). However, it is essential to note that professional development can also face challenges, such as a lack of time, resources, or buy-in from all staff members. It is important to determine which type of professional development best supports the educational landscape of your campus based on the employed personnel. Another type of professional development is job-embedded professional development; this model is common practice within education.

Literature Review

Job-embedded professional development (JEPD), professional learning communities, coaching, and peer observations were selected as the models for improving the practice of the differentiated instructional strategies being implemented. Carnegie Learning identifies six secrets to effective professional development:

1. Effective professional development must be relevant and content-focused.
2. Effective professional development is active.

3. Effective professional development supports collaboration.
4. Effective professional development provides expert coaching and support.
5. Effective professional development offers space for reflection and feedback.
6. Effective professional development must be ongoing (Bratcher, 2023).

If these elements are present, professional development can effectively improve practices that could result in enhanced practices for teachers and successful student outcomes.

Job-Embedded Professional Development

Job-embedded professional development (JEPD) refers to teacher learning that is not just theoretical but grounded in day-to-day teaching practice and designed to enhance teachers' content-specific instructional practices with the intent of improving student learning (Darling-Hammond & McLaughlin, 1995; Hirsh, 2009, as cited in Croft et al., 2010). JEPD is not just a popular form of professional development but also an effective one, because it is integrated into the workday. For instance, JEPD could involve regular lesson planning sessions with colleagues, where teachers can share and receive feedback on their differentiated instructional strategies. One of the inhibitors of effective professional development is that it is not accessible. JEPD is set up to address the accessibility obstacle by providing training on campus. Additionally, teachers learning during the educator's workday allows access to necessary resources, including materials, curriculum experts, and knowledgeable assistance (Minnesota Department of Education). This professional development model is a process and a reassurance that educators have the support and resources to enhance their instructional practices and improve student learning outcomes.

When designing professional learning programs, stakeholders must coordinate efforts to maximize their potential positive effects (Nawab & Sharar, 2022). Once the type of professional development has been determined based on the campus's needs, JEPD helps to support teaching and learning at the campus level. Job-embedded professional learning is learning that is grounded in day-to-day practice and is designed to enhance professional practice with the intent of improving children's learning and development. … It consists of teams of professionals assessing and finding solutions for authentic and immediate problems of practice as part of a cycle of continuous improvement (Pacchiano et al., 2016). Continuous improvement should be a focus on all campuses. JEPD creates environments for continuous improvement through accessible professional development opportunities.

Professional Learning Communities

The most promising strategy for sustained, substantive school improvement is developing the ability of school personnel to function as professional learning communities (DuFour & Eaker, 2009). Professional learning communities (PLCs) are a form of improvement science, an approach to social inquiry that seeks to bridge the divide and increase the likelihood that team-based improvement processes in complex adaptive organizational settings such as education (Berwick, 2008; Langley et al., 2009 as cited in Woodland, 2016). PLCs have become one of the tools districts use for school improvement. PLCs aim to create an environment that fosters mutual cooperation, emotional support, and personal growth as educators work together to achieve what they cannot accomplish alone (DuFour & Eaker, 2009). PLCs encourage collaboration and coordination between teachers and instructional personnel to make a difference

in instruction. PLCs vary in how they are implemented within districts; they even look different at campuses within the same district.

In the reform movement to establish a collaborative culture, schools have adopted common planning time for teachers and administrators to share vision and leadership through directional discourse (Tam, 2015, as cited in Carpenter, 2018). One of the most critical aspects of PLCs is collaboration. Collaboration may be the physical action of communicating and working with others to produce or create something (Vangrieken et al., 2015, as cited in Carpenter, 2018). Although collaboration is essential, without guidance about how to use that time, most collaboration is reduced to planning the what and the when (Venables, 2019). Over time, collaboration has become a norm in education. However, while we have moved steadily across the isolation-collaboration continuum, we still have a long way to go (Venables, 2019)—the guidance needed for effective PLCs centers around changing the when and what to the how. PLC is a place to determine best practices and demonstrate how to teach engaging lessons. Collaborative lesson design encourages teachers to set more ambitious learning goals and develop rigorous lessons with the appropriate level of student challenge to reach these goals (Jacobson, 2010).

If PLCs will make a difference for kids and affect student achievement. It goes without saying that at some point, they must ask each other, "How will we teach this?" (Venables, 2019). "How" should be the focus of the conversations. Structuring PLC to determine "the how" will have the most significant impact on instruction. The time during PLC should not be taken up by planning "what" you will teach or "when" you will teach it. These topics, while important, are not tools to improve achievement. PLCs should be utilized to plan out the way you are going to

use the suggested instructional strategies. Teachers can take this time to incorporate small group instruction and formative assessment within their lessons. Teams must evaluate the instructional options available through discussion and collaboration (Venables, 2019). Appropriate collaboration in PLC does not come naturally; teachers need assistance determining the "how" when planning. Many schools operate as though their personnel know everything; they will ever need to know the day they enter the profession (DuFour & Eaker, 2009). Neglecting to support teachers during the PLC process will result in collaborative time being more focused on "housekeeping" tasks instead of determining the how.

Using PLC to improve math achievement in 7th grade math is one of the strategies that will be utilized in the 2023-24 school year. Developing PLC protocols with the master teachers to guide teachers in planning during their collaboration time will be essential to improving academic achievement. Administrators, master teachers, and teachers need to all work together to support the shift in PLCs in determining the "how" rather than the "when" or "what." The district provides the curriculum; we must identify the best way to teach it. Figure 1.2 shows the primary and secondary drivers in the process of improving achievement for 7th-grade math scores.

Coaching

Instructional coaching is a crucial job-embedded professional learning strategy that provides focused support to bolster teacher effectiveness. According to Shoukry and Cox (2018), instructional coaching offers numerous benefits and can significantly support the implementation of effective practices in the classroom. Coaching representations can include various forms such as co-teaching, modeling, observation, co-planning, or other supportive actions (McKee, 2024).

One of the key features of a successful coaching interaction is the reflective process between the teacher and the instructional coach. They assess the impact of the coaching cycle using evidence such as student work, assessment data, video recordings, student surveys, and observation tools (McKee, 2024). This partnership necessitates transparent communication and constructive feedback to effectively address the teacher's needs.

When instructional coaches work one-on-one with teachers, they can tailor discussions and activities to specific subject areas. Desimone and Pak (2016) emphasize that some coaches offer real-time feedback during lesson implementation to ensure that students accurately and deeply acquire subject matter knowledge. Real-time feedback is particularly valuable as it allows for immediate adjustments, preventing the continuation of incorrect practices and enhancing the teacher's effectiveness on the spot. The "Get Better Faster" sequence has been used as a tool to provide such feedback, especially for teachers facing challenges related to rigor or classroom management.

Uncommon Schools has developed a comprehensive toolbox for coaches to support teacher development. The book "Get Better Faster" by Bambrick-Santoyo (2016) serves as a practical guide for school leaders, offering structured support for coaching teachers. This resource helps coaches and administrators identify areas of concern when observing classrooms, providing clear, actionable steps for improvement. The book breaks down the feedback process into manageable components, helping teachers improve incrementally with the guidance of master teachers. The "See It, Name It, Do It" feedback protocol outlined in the book further assists in delivering precise and effective feedback, ensuring that teachers can focus on specific areas of growth and implement the necessary changes.

Moreover, instructional coaching fosters a collaborative environment where teachers feel supported in their professional growth. The personalized nature of coaching allows for tailored support that meets the unique needs of each teacher, enhancing their instructional practices and ultimately benefiting student learning outcomes. By integrating coaching into professional development programs, schools can create a culture of continuous improvement and professional excellence.

In summary, instructional coaching is a powerful strategy for enhancing teacher effectiveness and improving student achievement. The combination of personalized support, real-time feedback, and structured guidance through resources like "Get Better Faster" can significantly impact teachers' instructional practices. Future studies and professional development plans should continue to incorporate and refine instructional coaching to maximize its benefits and ensure sustained improvements in teaching and learning.

Methodology

Research Design

Design-based implementation research (DBIR) is an approach to improvement that emphasizes collaboration between researchers and practitioners to design interventions that can address practical problems of teaching and learning. Employing a Design-Based Implementation Research (DBR) methodology, a cohort of educational practitioners conducted an exhaustive analysis of the implementation of differentiated instruction within their campus. This involved meticulously examining current practices and identifying areas needing attention and enhancement. The team methodically identified evidence-based strategies for implementation to address the identified needs. In addition to examining implementation, rigorous evaluation

procedures were employed to gauge the efficacy of iterative interventions. Through this process, foundational design principles emerged, revealing the essential elements necessary for successful instructional differentiation. These findings were disseminated among the researcher and practitioner communities to enrich pedagogical practices for teachers and inform future educational decisions.

A careful selection of research methodology is important to address the complex inquiry into the impacts of differentiated instruction on mathematics achievement. Recognizing the inherent complexity of this endeavor, a mixed methods research design emerged as the most appropriate approach. The rationale underlying this methodological choice is twofold: firstly, to afford a comprehensive exploration of teacher perceptions, and secondly, to establish a robust foundational framework clarifying the need of the study. As Östlund et al. (2011) suggested, integrating qualitative and quantitative methodologies within a singular investigation is a common practice, prioritizing one method over the other. In the context of this study, the priority will be the qualitative data. This deliberate emphasis on qualitative inquiry is warranted due to the practice of delving deeply into educators' subjective experiences and perspectives, which enriches the interpretive depth and contextual relevance of the research findings. By foregrounding qualitative data, this study attempts to expound on the intricacies of teacher perceptions, thereby highlighting the underlying needs and factors that shape the implementation and efficacy of differentiated instruction strategies in the realm of mathematics education.

Context of the Study

The study occurred in a district comprised of several campuses in East Texas. The district has an enrollment of 18,328. The demographics of the students were approximately 21.5%

White, 47.79% Hispanic, 25.81% African American, 1.34% Asian, and American Indian/Alaskan, 0.28%. Forty-nine percent of the student population was female, and 51% were male. Seventy-six percent of the students were economically disadvantaged, 7% were dyslexic, 2% were English Learners, 7% were gifted and talented, and 9% received special education services. The district has 16 elementary schools, four middle schools, and four comprehensive high schools.

Within the designated school of inquiry, a comprehensive initiative centered on job-embedded professional learning was meticulously devised and implemented to foster the enhancement of teacher proficiency in executing differentiated instructional strategies, particularly focusing on formative assessment and small group instruction. Prior to the start of the academic year, master teachers facilitated professional development sessions specifically tailored to emphasize the many facets of differentiated instruction, with intentional priority placed on the pedagogical requirements for successful integration of formative assessment and small group instruction into classroom practices. These sessions served as foundational pillars, equipping educators with the requisite theoretical knowledge and practical insights essential for effective instructional implementation.

Moreover, the initial professional development was supplemented with additional training, strategically interwoven throughout the school year within Professional Learning Communities (PLCs). These collaborative opportunities provided a fertile ground for the cultivation of teacher expertise, offering targeted interventions tailored to address individualized instructional needs and fostering reflective pedagogical practices. Within the nurturing confines

of these PLCs, educators were afforded ample opportunities to engage in substantive dialogues, share best practices, and share goals aimed at optimizing instructional efficacy.

Integral to this implementation of job-embedded professional learning was the active involvement of master teachers, whose role extended beyond the confines of traditional professional development sessions. These seasoned mentors assumed multiple responsibilities, encompassing observation, modeling, and providing targeted feedback aimed at optimizing professional growth and instructional refinement among their peers. Through their skilled guidance and mentorship, master teachers played a pivotal role in scaffolding the instructional journey of their colleagues, fostering a culture of collaborative inquiry and continuous improvement.

Furthermore, the iterative nature of the job-embedded professional development during PLCs facilitated ongoing evaluation and refinement of instructional practices, underpinned by a data-driven approach. Educators were afforded ample opportunities to scrutinize and analyze student data, interrogate student work artifacts, and deliberate on the efficacy of differentiated instructional strategies deployed within the classroom. This process of monitoring not only engendered a culture of reflective practice but also served as a catalyst for the refinement and optimization of instructional approaches, thereby fostering an environment conducive to sustained pedagogical growth and student achievement.

Participants

Purposeful sampling was utilized to select teachers on the campus to participate in the study who provided direct instruction to students who received seventh-grade mathematics

instruction (Palinkas et al., 2015). Deliberate efforts were undertaken to identify and recruit teachers within the campus community who were directly engaged in providing seventh-grade mathematics instruction, thus ensuring alignment with the study's overarching objectives and scope. Of the cohort of educators who met the researcher's criteria, four teachers were identified as candidates for participation. The three consenting participants' experiential range spanned from one to seven years. Notably, two-thirds of the cohort possessed less than five years of instructional experience.

Moreover, the demographic composition of the participating cohort reflected a semblance of diversity across multiple dimensions. Gender-wise, the cohort comprised one male and two female educators. Furthermore, the racial diversity within the cohort was evident, with participants hailing from distinct racial backgrounds, including African American, white, and Indian heritage.

Instrumentation and Data Collection

This mixed-methods study was developed in accordance with the Institutional Review Board (IRB), ensuring adherence to the highest standards of research integrity and participant welfare. Central to the data collection were both quantitative and qualitative methodologies strategically orchestrated to afford a comprehensive exploration of the research questions under investigation. The quantitative data examined the i-Ready diagnostic assessment tool, administered at the beginning, middle, and end of the academic year, to track students' mathematical proficiency levels longitudinally. These i-Ready scores were contrasted against nationally established norms, providing a contextual benchmark for educators to discern students' relative performance in comparison to their peers across the nation (Curriculum

Associates, 2024). The utilization of i-Ready data served as a key instrument for addressing the overarching research inquiry pertaining to the efficacy of differentiated instruction in improving seventh-grade mathematics achievement.

Furthermore, the qualitative measurement of the study was supported by a survey instrument meticulously crafted to elicit rich insights into participants' perceptions, experiences, and pedagogical practices associated with the implementation of differentiated instructional strategies, specifically focusing on formative assessment and small group instruction. Prior to data collection, informed consent was diligently sought from all participating educators, safeguarding their autonomy and ensuring voluntary participation. The survey instrument, administered via email, comprised a series of open-ended questions meticulously designed to probe participants' perceptions regarding their proficiency in differentiating instruction, the level of support received in planning and implementing instructional strategies, and the perceived efficacy of formative assessment and small group instruction in meeting the diverse needs of students.

Complementing the survey data were observational field notes compiled by the researcher. These notes provided invaluable contextual insights into the dynamics of instructional delivery and classroom interactions. These field notes served as a corroborative source of qualitative data, enriching the examination of the research findings.

The triangulation of quantitative i-Ready data with qualitative survey responses and observational field notes engendered a deeper understanding of the intricate interplay between differentiated instructional strategies, pedagogical efficacy, and student learning outcomes. The

quantitative and qualitative data collected facilitated a comprehensive exploration of the research questions, clarifying the multi-layered differences inherent within the instructional landscape.

Data Analysis

The open-ended qualitative questions were inductively analyzed using the thematic analysis method to better understand the participants' perceptions (Hewitt-Taylor, 2001). The results obtained from the analysis of responses were meticulously scrutinized for emerging themes, providing valuable insights into the next steps required, and the potential necessity for additional training to bolster successful implementation strategies.

The observations made by experienced master teachers were systematically shared with both teachers and assistant principals, forming an integral part of the ongoing professional development process. As the researcher assumed the role of assistant principal, this dissemination of observations was a standard practice mandated by district requirements, underscoring the commitment to continuous improvement.

In the capacity of assistant principal, the researcher assumed the responsibility of analyzing and coding these observations into discernible themes. Furthermore, additional themes were extrapolated from both observation data and field notes to discern prevalent patterns and commonalities, enriching the depth of the analysis.

In order to increase the credibility of the findings, the researcher engaged in extensive iterations of refining the codes and themes as well as directly quoting participants in the discussion of results (Thomas & Magilvy, 2011). Additionally, to mitigate any potential biases inherent in the researcher's role, member checking was systematically employed throughout the

data collection process. This iterative process not only served as a means to validate the findings but also acted as a safeguard against subjective interpretations.

It was imperative to avoid making sweeping generalizations about all teachers based on evidence observed in isolated instances. To foster a more nuanced understanding of the data, regular meetings were convened wherein both master teachers and assistant principals collectively analyzed and discussed the findings on a weekly basis. This collaborative approach ensured a holistic interpretation of the data, fostering a more comprehensive understanding of the nuances inherent in the educational landscape.

Results

The comparative analysis of these two academic years focused on various proficiency levels and the overall performance in Domain 1, which is a critical component of the campus accountability system. This comprehensive evaluation provided insights into student achievement and allowed for a detailed examination of the outcomes resulting from the adoption of differentiated instructional strategies.

The results from this comparative study revealed a notable decrease in student achievement across multiple proficiency levels. Each domain showed marked reductions, which aligned with teachers' lack of understanding about how differentiated instruction would improve student achievement. The table below provides a detailed comparison of the STAAR data from the 2021-2022, 2022-2023, and 2023-2024 school years to present a clear picture of academic progress. The table highlights the year-over-year changes in student achievement, offering a quantitative measure of the effectiveness of the instructional strategies implemented.

Table 4.1

Mathematics Achievement by PSA Cycle

Subject/Grade	Proficiency	21-22	22-23	23-24
Seventh Mathematics	Domain 1	20	27**	19
Approaches	41	49**	49**	34
Meets	15	23**	23**	18
Masters	4	8**	8**	4

Note. ** Increase in percentage from the previous year

The STAAR scores reveal that the seventh-grade data continues to warrant special attention. The seventh-grade mathematics scores continue to be significantly lower than the students in other grade levels. This persistent gap underscores the need for continued focus and targeted interventions to further support seventh-grade students in closing the academic achievement disparity.

The seventh-grade scores and the extent of the gap indicate that additional measures may be necessary to improve teacher understanding and implementation of differentiated instructional strategies. These could involve more intensive professional development for teachers, the introduction of supplemental instructional resources, and increased individualized support for struggling students.

The decrease in student achievement and the continued gap in seventh-grade mathematics achievement point to the need for sustained efforts and additional strategies to ensure that all students can benefit equally from the instructional improvements. Moving forward, it is crucial to address the lack of understanding by refining and expanding differentiated instructional practices to effectively meet the diverse learning needs of all students. In addition to quantitative data, qualitative data was collected to better understand teachers' perceptions of differentiated instruction and its effectiveness in improving STAAR scores. The teachers' responses highlighted their concerns with implementing differentiated instruction and their understanding of the practice.

Teacher A began the school year with the least amount of understanding of what differentiated instruction was. When asked, "What is your definition of differentiated instruction?" her response was, "Umm, I'm not sure; I think it is like stations." This response revealed a fundamental lack of clarity regarding the concept of differentiated instruction, which is essential for effectively addressing the diverse needs of students within a classroom setting.

To gain further insight into her instructional practices, inquiry was made about the specific types of strategies she employed to implement differentiation. Her response was concise and limited: "Exit tickets." While exit tickets serve as a useful tool for gaining insight into students' understanding at the conclusion of a lesson, relying solely on this method does not capture the full spectrum of strategies necessary for comprehensive differentiated instruction. This indicated that Teacher A's approach to differentiation was overly simplistic and insufficient to address the varied learning needs of her students.

Further probing into how she met the needs of students with different levels of mathematical understanding revealed another significant challenge. When asked how she accommodated students with varying proficiency levels in mathematics, she candidly admitted, "That is something I struggle with." This acknowledgment highlighted a broader issue: without a solid grasp of differentiated instruction, teachers like Teacher A may find it difficult to provide the necessary support to students who are struggling, as well as to those who require more advanced challenges.

Following the professional development that took place at the beginning of the year and the three job-embedded professional development sessions within the first nine weeks, there was a notable increase in understanding of differentiated instruction among the teachers. For instance, Teacher A articulated a newfound clarity, stating, "I finally understand what people mean when they say differentiated instruction." This statement reflected a significant shift in her comprehension and indicated that the professional development sessions had successfully bridged the knowledge gap.

Additionally, Teacher A expressed readiness to incorporate more diverse instructional strategies to differentiate her instruction. She outlined plans to employ the aggressive monitoring strategy, a more proactive and hands-on approach to supporting student learning. This strategy involves the teacher actively circulating the classroom, observing students as they work, providing immediate feedback, and offering targeted support to those who need it. By incorporating aggressive monitoring, Teacher A aims to address the individual needs of her students more effectively, ensuring that each student receives the appropriate level of support and challenge.

The professional development sessions provided Teacher A with practical tools and strategies that she could immediately implement in her classroom. These sessions emphasized the importance of continuous assessment, student-centered instruction, and the use of data to inform teaching practices. As a result, Teacher A felt more confident in her ability to meet the diverse needs of her students and create a more inclusive and supportive learning environment.

Teacher A's journey from a limited understanding of differentiated instruction to a more comprehensive grasp of the concept emphasizes the importance of targeted professional development. Through continuous support, training, and practical application, Teacher A has developed the skills necessary to implement differentiated instruction effectively, thereby enhancing her teaching practice and supporting student learning across various proficiency levels. This transformation highlights the critical role of professional development in equipping educators with the knowledge and tools needed to meet the diverse needs of their students and foster an inclusive, supportive educational environment.

Teacher B began the school year with a basic understanding of differentiated instruction. When asked, "What is your definition of differentiated instruction?" her response was, "Making changes to content to help struggling learners." This response indicated an awareness of the need to adapt instructional materials to support students who were having difficulties, but it also revealed a somewhat narrow view of differentiated instruction as being primarily for struggling students rather than encompassing a broader range of learners.

To gain further insight into her instructional practices, we inquired about the specific types of strategies she employed to differentiate her instruction. She replied, "I just make changes based on student needs." When asked to elaborate on what that meant, she explained,

"Well, if I am teaching and I get the sense that students do not understand, I start over to make sure they get it." This response highlighted a reactive approach to differentiation, where adjustments were made only after it became apparent that students were not grasping the material, rather than proactively planning for diverse learning needs from the outset.

We then asked how she met the needs of students with varying levels of mathematical understanding. She responded, "Working with them one-on-one." This answer demonstrated her commitment to providing individualized support, but it also suggested that her strategies for differentiation were limited to personal interactions rather than incorporating a variety of instructional methods and materials designed to address the spectrum of student abilities and learning styles.

Following the professional development that took place at the beginning of the year and three job-embedded professional development sessions within the first nine weeks, there was a notable increase in the understanding of differentiated instruction among the teachers, including Teacher B. These sessions provided targeted training and practical examples of how to effectively implement differentiated instruction in various classroom contexts.

For instance, Teacher B expressed that she now had a better understanding of differentiated instruction, though she remarked, "This seems like a lot of work for a few points." This comment reflected a common concern among educators about the time and effort required to implement differentiated instruction effectively. However, it also highlighted an opportunity to emphasize the long-term benefits of differentiation, not only in terms of immediate academic outcomes but also in fostering a more inclusive and supportive learning environment that can lead to sustained student engagement and success.

The professional development sessions emphasized the importance of proactive planning and the use of varied instructional strategies to meet diverse learning needs. Teacher B began to explore new ways to differentiate her instruction beyond just one-on-one support. She learned about flexible grouping, which involves organizing students into groups based on their current understanding and skill levels, allowing for more targeted instruction within the classroom setting.

Additionally, Teacher B recognized the need for a structured approach to formative assessment. She mentioned that there was a need for a list of ways to formatively assess and implement small-group instruction. The professional development sessions provided her with a range of formative assessment techniques, such as exit tickets, quick quizzes, and peer assessments, which allowed her to gather real-time data on student learning and adjust her instruction accordingly.

Moreover, the professional development sessions emphasized the importance of using diverse instructional materials and activities to cater to different learning styles and preferences. Teacher B began to integrate visual aids, manipulatives, and technology into her lessons, ensuring that all students had access to the content in ways that suited their individual learning needs. For example, she used interactive math software to provide additional practice for students who needed it, while offering advanced problem-solving tasks for those who were ready for more challenging work.

In summary, Teacher B's journey from a basic understanding of differentiated instruction to a more comprehensive and proactive approach highlights the significant impact of targeted professional development. Through continuous training and support, she developed a deeper

comprehension of differentiation strategies and learned how to apply them effectively in her classroom. The experience underscores the importance of ongoing professional development in equipping educators with the skills and knowledge needed to meet the diverse needs of their students and foster an inclusive and supportive learning environment.

Teacher C also began the school year with a basic understanding of differentiated instruction. When asked, "What is your definition of differentiated instruction?" his response was, "Adjusting instruction to for all students." This response indicated a general awareness of the need to tailor teaching methods to accommodate diverse learning needs, but it lacked specific details about how to effectively implement such adjustments in the classroom.

To gain further insight into his instructional practices, inquiry was made about the specific types of strategies he employed to differentiate his instruction. He replied, "small group instruction." When prompted to elaborate on what small group instruction entailed, he began to describe different station activities. His explanation suggested that while he recognized the importance of small group instruction, his understanding was somewhat limited to the use of stations, which, although beneficial, does not represent the purpose of utilizing small group instruction to differentiate.

We then asked how he met the needs of students with varying levels of mathematical understanding. He responded, "Through adjusting how I present material." This answer demonstrated a foundational grasp of differentiated instruction principles, as it highlighted the importance of modifying instructional delivery to cater to different learning levels. However, it also indicated a need for a more comprehensive approach that encompasses a broader range of differentiation strategies.

Following the professional development that took place at the beginning of the year and three job-embedded professional development sessions within the first nine weeks, there was a notable increase in the understanding of differentiated instruction among the teachers, including Teacher C. These sessions provided targeted training and practical examples of how to effectively implement differentiated instruction in various classroom contexts.

For instance, Teacher C expressed that he had gained a deeper understanding of small group instruction. He stated, "I now understand that small group instruction is more than just station-based activities." This reflection indicated that the professional development sessions had successfully expanded his perspective on small group instruction. He learned that effective small group instruction involves more than rotating students through different activities; it requires intentional planning and the use of diverse instructional strategies to meet the specific needs of each student group.

Teacher C's journey from a basic understanding of differentiated instruction to a more effective implementation highlights the significant impact of targeted professional development. Through continuous training and support, he developed a deeper comprehension of differentiation strategies and learned how to apply them effectively in his classroom. This transformation not only enhanced his teaching practice but also positively impacted student learning by providing more tailored and responsive instruction.

Discussion

Differentiated instruction in mathematics has been widely studied for its impact on student performance, with various studies demonstrating its effectiveness. A closer look at the research reveals several key findings and implications for educators.

Firstly, a study involving the i-Ready unit assessments revealed significant improvements in student scores compared to the previous year. This aligns with the findings from Aguhayon et al. (2023), which evaluated the impact of differentiated instruction on reducing achievement gaps in mathematics. Both studies reported improvements in academic achievement, suggesting that differentiated instruction can effectively enhance students' math performance. However, it's important to note that the lack of a control group in these studies makes it difficult to attribute the improvements solely to the instructional strategies employed (Bal, 2023).

Further supporting the effectiveness of differentiated instruction, teachers' perceptions indicate that these instructional practices help them address the diverse learning needs of their students. Surveys showed that teachers felt more capable of managing varied learning environments and tailoring instruction to individual student needs after receiving professional development on differentiated instruction. This highlights the importance of ongoing professional development to help teachers understand and implement differentiated strategies effectively in their classrooms (Aguhayon et al., 2023).

Additionally, professional development practices such as job-embedded learning through Professional Learning Communities (PLCs), coaching, and peer observations are crucial. These methods help teachers internalize and apply differentiated instruction strategies, leading to

improved student outcomes. Despite the positive perceptions and improved capabilities reported by teachers, the study suggests that continuous professional development is necessary to fully realize the benefits of differentiated instruction. Teachers need to understand not only the "how" but also the "why" behind these practices to maximize their impact on student achievement.

In terms of practical application, there are several instructional strategies that can be employed to build teachers' capacity for differentiated instruction. These include the use of flexible small groups, targeted interventions based on real-time student data, and the incorporation of technology to provide personalized learning experiences. These strategies allow teachers to meet students at their individual levels of understanding and provide appropriate challenges to help them progress. The instructional strategies focused on for this study were small group instruction and formative assessment, but a few teachers had begun to implement additional strategies to differentiate instruction.

However, the study also had several limitations. The absence of a control group to compare outcomes from different instructional strategies and the reliance on STAAR data as the sole quantitative measure of effectiveness were noted as weaknesses. Additionally, teacher responses may have been biased, and the surveys were not always aligned with data points throughout the year, which could affect the interpretation of the results.

Overall, while the study supports the effectiveness of differentiated instruction in improving math performance, it also underscores the need for more rigorous research designs and comprehensive data collection methods. Future research should include control groups and align survey responses with continuous data points to better understand the impact of differentiated instruction on student achievement. Moreover, continued professional

development and modeling of instructional strategies are essential to build teacher capacity and create optimal learning environments for all students.

Conclusion

The findings from this study highlighted teachers' perceptions and understanding of implementing differentiated instructional strategies, emphasizing the need for further professional development. Despite the positive impact noted, it became evident that to fully support increased student achievement; teachers require more extensive and targeted professional learning opportunities. This professional development should not only cover the theoretical aspects of differentiated instruction but also provide practical strategies that teachers can readily implement in their classrooms.

In addition to the need for enhanced professional development, the study revealed several limitations that could be addressed in future research. One significant limitation was the lack of alignment between data collection and surveys. Future studies would benefit from a more synchronized approach, where quantitative and qualitative data are collected systematically and consistently throughout the study period. This alignment would provide a clearer picture of the effectiveness of differentiated instructional practices and allow for more robust conclusions.

Moreover, the absence of a control group in the current study limits the ability to attribute improvements in student achievement directly to the differentiated instruction strategies employed. Future research should include control groups to compare the outcomes of differentiated instruction against traditional teaching methods. This would help to isolate the

effects of differentiated instruction and provide more conclusive evidence of its impact on student learning.

To address these needs, it is recommended that future iterations of the study incorporate a comprehensive professional learning plan. This plan should focus on specific instructional strategies that are the focus of the differentiated instruction and detail how often these strategies will be modeled and presented in Professional Learning Communities (PLCs) through job-embedded professional development. By providing teachers with regular opportunities to observe, practice, and refine these strategies, professional learning can become more effective and impactful.

Furthermore, ongoing support and coaching should be integrated into the professional learning plan. This could involve peer observations, where teachers can observe their colleagues implementing differentiated instruction and provide feedback. Additionally, instructional coaches could work closely with teachers to help them adapt and refine their practices based on student needs and feedback.

The culmination of these efforts would be a more structured and supportive approach to professional development, ensuring that teachers are well-equipped to implement differentiated instruction effectively. This, in turn, would likely lead to improved student outcomes as teachers become more adept at addressing the diverse needs of their students and creating more inclusive and supportive learning environments.

In summary, while the study underscores the potential of differentiated instruction to enhance student achievement, it also highlights the necessity for ongoing, targeted professional

development and more rigorous research designs. By addressing these areas, future studies can provide stronger evidence of the effectiveness of differentiated instruction and help educators better support their students' learning and development.

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CHAPTER 5: DISCUSSION, CONCLUSION, AND RECOMMENDATION

The study investigated the impact of differentiated instructional strategies, specifically small group instruction and formative assessment, on improving seventh-grade mathematics academic achievement. Tomlinson (2003, 2014) defines differentiated instruction as a pedagogical approach where teachers modify curriculum content, proactively develop a variety of teaching strategies, and continually revisit the desired product of learning (Woolcott et al., 2021). This definition emphasizes the dynamic and responsive nature of differentiated instruction, aiming to cater to the diverse needs of students within a classroom setting.

The predominant goal of differentiated instruction is for teachers to maximize the potential of all learners by proactively designing learning experiences in response to the needs of diverse learners (Santangelo & Tomlinson, 2012, as cited in Ginja & Chen, 2020). By doing so, teachers can create an inclusive learning environment that recognizes and addresses the varying abilities, interests, and learning profiles of their students. To determine the impact of differentiated instruction on academic achievement, the study focused on two primary research questions: (1) How can formative assessment and small group instruction be used to differentiate instruction and support the needs of all students? (2) To what extent can formative assessment and small group instruction improve mathematics achievement on the STAAR test?

This chapter will discuss the results of the study, providing a detailed analysis of the data collected and the outcomes observed. It will also explore the implications for practice, offering insights and recommendations for educators on how to effectively incorporate differentiated

instruction in their teaching. Additionally, the chapter will outline areas for future research, identifying gaps in the current knowledge and suggesting directions for further investigation.

Moreover, the correlation of the study to the improvement science framework will be examined. Improvement science is an approach that focuses on continuous, systematic efforts to improve educational practices and outcomes. By aligning the findings of this study with the principles of improvement science, the chapter will highlight how the implementation of differentiated instructional strategies can contribute to ongoing improvements in teaching and learning.

This study provides valuable insights into the use of differentiated instructional strategies to enhance mathematics achievement. The findings underscore the importance of formative assessment and small group instruction in addressing the diverse needs of students and improving academic performance. The discussion will emphasize the practical applications of these strategies, the broader implications for educational practice, and the potential for further research to build on these results and continue advancing the field of education.

Discussion of Results

Survey data was collected to gather teachers' interpretations of various items influencing their ability to meet students' functional needs. This data was crucial for answering research question one: How can formative assessment and small group instruction be used to differentiate instruction and support the needs of all students? The survey responses revealed that teachers had a firm grasp of differentiated instruction and how to implement instructional strategies to support student learning effectively.

Formative assessment and small group instruction are pivotal in determining the students' levels of understanding and providing them with the necessary support based on their individual needs. Formative assessments, which include a variety of methods such as quizzes, observation, and class discussions, allow teachers to gauge students' comprehension and progress in real-time. This continuous feedback loop enables educators to adjust their teaching strategies promptly, ensuring that all students receive the appropriate level of challenge and support.

Small group instruction further complements formative assessments by allowing teachers to address specific learning needs in a more focused and personalized setting. By grouping students based on their abilities, interests, or specific learning gaps, teachers can tailor their instruction to meet the diverse needs of their students more effectively. This method not only helps in reinforcing concepts for those who are struggling but also provides enrichment opportunities for advanced learners.

Identifying students who are not meeting mastery of the standards early is crucial, as it provides the opportunity to negate the expansion of academic gaps (Foushee, 2011). Early identification and intervention can prevent minor misunderstandings from developing into significant obstacles to learning. This proactive approach is fundamental in ensuring that all students remain on track and can achieve their academic potential.

Despite the progress made, the survey responses also indicated a need for continued professional development to reinforce understanding and increase teacher capacity in the practice of differentiation. While teachers have developed a better understanding of differentiated instruction, ongoing training is essential to keep up with the latest educational strategies and research findings. Professional development sessions can provide teachers with new tools,

techniques, and insights into effective differentiation practices, ensuring they can meet the evolving needs of their students.

Moreover, it is important to note that addressing students' various learning needs requires teachers to be able to adequately differentiate their instruction (Pozas et al., 2020). Differentiation is not a one-time effort but a continuous process of adapting and refining teaching methods to suit the diverse learning profiles within the classroom. This ongoing process demands a deep understanding of each student's strengths, weaknesses, and preferences, as well as a commitment to creating an inclusive and supportive learning environment.

The survey data highlights the significant role that formative assessment and small group instruction play in differentiated instruction. These strategies are essential for identifying students' needs and providing the necessary support to enhance their learning outcomes. However, to fully realize the benefits of differentiated instruction, there is a clear need for ongoing professional development. This will help teachers to continually refine their practices and ensure they are equipped to meet the diverse needs of their students effectively.

Regarding question two, to what extent can formative assessment and small group instruction improve mathematics achievement on the STAAR test? The evaluation study showed an increase in scores from the previous year. However, during the intervention iteration, this improvement was not as pronounced as expected. Despite intentional professional development and coaching being provided to the teachers, there was no significant improvement in academic achievement. The absence of a control group made it challenging to determine if the results would be comparable with targeted support provided by teachers in the general education classroom who did not utilize the instructional strategies of formative assessment and small group instruction.

Teachers reported that their understanding of differentiated instruction had improved, and implementing the instructional strategies became easier due to this deeper understanding. Teachers felt that formative assessment and small group instruction could be seamlessly incorporated into their instructional practices. Despite the recognition of differentiated instruction as an effective tool for supporting diverse student needs, the lack of a comprehensive understanding has impeded the successful implementation of the practice.

Survey data from the evaluation indicated that additional information was needed for teachers to understand how the differentiated instructional strategies of formative assessment and small-group instruction could be effectively utilized in their classrooms to improve academic achievement. Teachers who do not recognize ways to differentiate or feel incapable of instructing different groups simultaneously struggle with implementing differentiated instruction (Dixon et al., 2014).

Once adjustments were made, professional development focused on increasing the pedagogical understanding of differentiated instruction was provided. Surprisingly, the data suggest that although professional development was provided, teachers still struggled to see how differentiated instruction directly improved STAAR scores. Teachers felt they understood the practice and were comfortable implementing formative assessments and small group instruction to differentiate. However, many did not see how these practices would align with improved academic achievement. This disconnect indicates a gap between theoretical understanding and practical application.

The competence of teaching differentiated instruction is not solely characterized by the ability to adapt teaching strategies (Smets & Struyven, 2020). While teachers may be proficient in executing differentiated instructional strategies, they may lack the ability to effectively link

these practices to measurable improvements in student outcomes. Although differentiated instruction research is prevalent in contemporary literature and is largely regarded as a successful framework for responding to learner diversity in a holistic manner, the quality of differentiated instruction provided by the teacher and the systematic use of the practice in mixed-ability classrooms significantly impact students' achievement (Porta & Todd, 2023).

According to Peteros et al. (2020), as cited in Aguhayon et al. (2023), promoting equity, optimizing quality, and enhancing teaching effectiveness through differentiated instruction are crucial for improving academic performance. However, the data showed that despite teachers' confidence in their understanding and implementation of differentiated instruction, classroom observations and subsequent evaluations did not consistently reflect improved academic achievement. This finding highlights the necessity for ongoing support and development to ensure that the theoretical knowledge gained through professional development translates into practical and effective classroom practices.

While teachers have made strides in understanding and implementing differentiated instruction, there remains a significant need for continued professional development. This development should focus not only on the strategies themselves but also on understanding how these strategies can lead to measurable improvements in academic achievement. Addressing this gap will require a concerted effort to bridge the disconnect between theory and practice, ensuring that differentiated instruction fulfills its potential in enhancing student learning outcomes.

Recommendations for Practice

Several limitations in the research design hindered the ability to draw definitive conclusions. One major limitation was the lack of alignment between data collection methods.

To better understand the improvement process, it would be beneficial to coordinate quantitative and qualitative data collection throughout the year. This approach would provide a comprehensive view of how teachers respond to and implement data-driven instructional strategies. Additionally, participant feedback on specific professional learning activities throughout the year could help evaluate their effectiveness and identify areas for improvement.

Another limitation was the small sample size of teachers willing to participate in the study, which affects the generalizability of the findings to other settings. A more extensive and diverse group of participants is needed to enhance the reliability and applicability of future research. Moreover, disaggregating student and teacher data to identify trends among different subgroups would provide valuable insights. Roegman et al. (2018) emphasize the importance of examining disaggregated data to understand how differentiated instruction impacts various student populations differently.

Furthermore, it would be beneficial to incorporate more robust professional development programs that include ongoing support and coaching. This could help teachers understand the principles of differentiated instruction and see its direct impact on student achievement. Professional development should be designed to bridge the gap between theory and practice, ensuring that teachers can translate their understanding into effective classroom strategies that yield tangible results in student performance.

In conclusion, while teachers may feel confident in their understanding and implementation of differentiated instruction, there is a clear need for more targeted professional development and research designs that address the practical application of these strategies. By aligning data collection methods, expanding the participant pool, and providing continuous

support, future studies can better evaluate the effectiveness of differentiated instruction and its impact on student achievement.

Recommendations for Further Study

More research is needed on using differentiated instruction (DI) to support the needs of secondary students. Findings indicated that U.S. research studies examining DI in general classroom settings from 2001 to 2015 primarily took place in elementary school settings (Bondie et al., 2019). While components of differentiated instruction are very popular at the elementary level, classroom diversity does not end once students reach the secondary level. In fact, the complexity and diversity of student needs may increase as students progress through the education system. High-quality teacher-led differentiated instruction studies in secondary education are scarce, although the literature on ICT (Information and Communication Technology) applications for differentiated instruction seems to be on the rise (Smale-Jacobse et al., 2019).

Future studies on developing and evaluating differentiated instruction interventions could add to the knowledge base about how to reach differentiated instruction's potential in practice (Smale-Jacobse et al., 2019). It is critical to expand research efforts to include secondary education, where students experience a broader range of academic abilities, interests, and learning styles. Differentiated instruction in this context must address these varied needs more comprehensively. Secondary education subjects often involve more complex content, and the developmental differences among adolescents make it essential to tailor teaching strategies that can engage all students effectively.

The successful practice of differentiated instruction depends significantly on the teachers, who must be equipped with the knowledge, skills, and tools necessary to implement DI strategies effectively. Therefore, understanding the underlying variables that influence teachers' DI practice is crucial (Bi et al., 2023). Research should focus on identifying specific strategies and tools that secondary educators can use to differentiate instruction in practical and sustainable ways within the constraints of their teaching environments. This includes examining how teachers can manage diverse classrooms, plan differentiated lessons, and assess student progress effectively.

Moreover, as students progress to secondary education, their individual differences become more pronounced, necessitating a more nuanced approach to differentiation. Students at this level often face a wider array of academic, social, and emotional challenges that can impact their learning. Therefore, differentiated instruction must be responsive to these challenges by incorporating flexible grouping, varied instructional materials, and diverse assessment methods. Teachers must be adept at recognizing and addressing the distinct learning needs of each student, fostering an inclusive learning environment where all students can thrive.

The literature on ICT applications for differentiated instruction provides a promising avenue for enhancing DI practices in secondary education. Technology can offer personalized learning experiences, enabling teachers to tailor instruction to meet the diverse needs of their students. For instance, educational software can provide adaptive learning pathways, real-time feedback, and interactive content that can engage students at different levels of understanding. However, the integration of ICT in DI also requires careful consideration of accessibility, teacher training, and the alignment of technology with pedagogical goals.

While differentiated instruction is well-documented at the elementary level, there is a pressing need to extend research and practical applications to the secondary level. This will involve exploring innovative strategies, leveraging technology, and understanding the unique challenges and opportunities present in secondary education. By doing so, educators can better support the diverse needs of secondary students, ensuring that all learners have the opportunity to succeed. Addressing these research gaps will ultimately contribute to a more equitable and effective education system, where differentiated instruction is not just a theoretical framework but a practical reality in classrooms.

Conclusion

The Plan-Do-Study-Act (PDSA) cycle was utilized in this study with the aim of using differentiated instructional strategies to improve student achievement in seventh-grade mathematics. The PDSA cycle is a systematic series of steps for gaining valuable learning and knowledge for the continual improvement of a process or product. This methodology was employed to ensure a structured approach to problem-solving and to make informed decisions based on data collected throughout the study.

First Cycle: Plan and Do

In the first cycle of the study, the practice of differentiated instruction was evaluated using both student achievement data and survey responses from teachers who taught seventh-grade math. The planning phase involved identifying the specific differentiated instructional strategies to be implemented, including formative assessment and small group instruction.

During the doing phase, these strategies were applied in the classroom, with teachers adjusting their instruction to meet the diverse needs of their students.

Data Collection and Analysis

Throughout the semester, student achievement data were collected and analyzed to assess the impact of the implemented strategies. The data showcased that student achievement did improve; however, the gains were not significant enough to meet grade-level expectations. This indicated that while differentiated instruction had a positive effect, it was not sufficient to close the achievement gap entirely.

Additionally, survey responses were gathered from the participating teachers. These responses provided valuable insights into the teachers' experiences and perceptions regarding the use of differentiated instruction. The survey highlighted several areas for improvement, including the need for additional professional learning on differentiated instruction and more guidance on how to implement formative assessment and small group instruction effectively in the classroom.

Findings and Adjustments

Based on the findings from the first cycle, it was clear that further support was necessary to enhance the effectiveness of differentiated instruction. The survey responses underscored the importance of ongoing professional development to equip teachers with the skills and knowledge

required to implement these strategies successfully. Therefore, professional learning became a focal point for the second iteration of the study.

Second Cycle: Plan, Do, Study, and Act

In the second iteration of the study, the plan phase involved designing a comprehensive professional development program aimed at increasing teachers' understanding of differentiated instruction and providing support in effectively implementing formative assessment and small group instruction. The professional development occurred through multiple avenues, ensuring that teachers received continuous and relevant training throughout the year.

Professional Development Activities

1. **Initial Training**: At the beginning of the academic year, teachers participated in a detailed training session focused on defining differentiated instruction, its benefits for students, and the instructional strategies that would be emphasized during the year. This initial training provided a strong foundation for teachers to build upon.
2. **Job-Embedded Professional Development**: Throughout the year, job-embedded professional development was integrated into the teachers' routine during Professional Learning Communities (PLCs). These sessions allowed teachers to collaborate, share experiences, and receive ongoing support as they incorporated differentiated instruction into their lessons.
3. **Instructional Coaching**: Master teachers played a crucial role in the professional development process by providing instructional coaching. Using the Get Better Faster waterfall document, coaches offered personalized support to teachers, helping them apply

differentiated instructional practices effectively in their classrooms. This hands-on coaching ensured that teachers could translate theoretical knowledge into practical application.

Data Collection and Evaluation

Data were collected from multiple sources to evaluate the impact of the second iteration of professional development. This included STAAR mathematics scores, teacher survey responses, and observational notes taken during classroom visits. The comprehensive data collection allowed for a thorough analysis of the effectiveness of the implemented strategies.

Outcomes and Reflections

Teachers felt that the practice of differentiated instruction did assist in supporting students' needs. They reported a better understanding of how to use formative assessment and small group instruction to tailor their teaching to the diverse needs of their students. However, despite the improved instructional practices, the impact was not reflected in a significant increase in academic achievement on the STAAR test. This discrepancy highlighted a gap between improved teaching strategies and measurable student outcomes.

Continued Implementation and Future Directions

Recognizing the value of differentiated instruction in meeting students' diverse needs, the campus decided to continue implementing the framework through an iterative cycle of improvements. The PDSA cycle will be employed in future iterations to refine and enhance the strategies based on ongoing data collection and analysis. Future professional development will focus on addressing the specific challenges identified in the study, ensuring that teachers receive

the support needed to effectively link differentiated instruction with improved academic achievement.

In conclusion, the PDSA cycle proved to be a valuable tool in systematically implementing and evaluating differentiated instructional strategies. While the initial results indicated areas for improvement, the iterative nature of the PDSA cycle allows for continuous refinement and adaptation. By committing to ongoing professional development and data-driven decision-making, the campus aims to achieve significant and sustained improvements in student achievement through differentiated instruction.

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