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Coaching First-Grade Teachers On Differentiated Instructional Practices For Learners With Mathematical Promise: An Action Research Study

Alicia Schroeder-Schock
William & Mary - School of Education, aschroe1@cord.edu

COACHING FIRST-GRADE TEACHERS ON DIFFERENTIATED INSTRUCTIONAL PRACTICES FOR LEARNERS WITH MATHEMATICAL PROMISE: AN ACTION RESEARCH STUDY

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Alicia Schroeder-Schock

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By

Alicia Schroeder-Schock

Approved March 11, 2024 by

Jennifer Riedl Cross
Committee Member

Ashley Carpenter
Committee Member

Tracy Cross
Chairperson of Doctoral Committee

Dedication

This is dedicated to all educators striving to take the next best step forward every day.

Acknowledgments

Thank you to my husband, my family, and my professors who helped me through this journey. Whether it was answering questions, talking through ideas, providing feedback, reading drafts of my writing, sending a supportive text message, or giving me a hug when things became difficult, I am grateful to have had the support of those around me. I am thankful for this experience and know that I have changed as an educator because of it.

Justin and Aiden

Mom, Dad, Monica, Adam

Dr. Tracy Cross, Dr. Jennifer Riedl Cross, Dr. Ashley Carpenter

William & Mary

UConn's Three Summers Program

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Abstract

This action research study in a North Dakota public school addresses the need for effective professional development (PD) to enhance instruction and academic outcomes for mathematically promising learners. Despite annual PD investments, concerns persist regarding the limited efficacy of short-term workshops (Knight & Skrtic, 2021; Kraft et al., 2018). Instructional coaching offers promise in implementing research-based instructional methods (Johnson, 2016). However, empirical support for coaching in differentiated instruction for high ability learners remains scarce. This study examined coaching's impact on first-grade teachers' differentiation practices for mathematically promising learners. It was selected as despite teachers' awareness of differentiation benefits, many struggle with implementation, necessitating targeted support (Gavin, Casa, Firmender, and Carroll, 2013; VanTassel-Baska et al., 2020; Yuen et al., 2018). Through a mixed-methods approach, data were collected via teacher surveys and learner achievement growth scores to assess changes in differentiation practices, effects on learner performance, and influence on a teacher's sense of efficacy. Results indicated noticeable shifts in teacher practice and increased sense of efficacy, despite a lack of improvement in learner achievement outcomes. Coaching positively influenced teacher perceptions and confidence surrounding differentiation practices, but improving academic performance for high ability learners remains complex. This dissertation contributes to instructional coaching and differentiation literature, highlighting coaching's potential to support educators in serving mathematically promising learners and informing the development of more effective PD initiatives.

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CHAPTER 1

INTRODUCTION

Teachers impact student achievement more than any other aspect of schooling, and they can enhance their effectiveness with high ability learners when they differentiate and use strategies and materials that elicit high performance (Johnson, 2016; VanTassel-Baska et al., 2020). Those who implement differentiation have classrooms where goals are clear, individual growth is emphasized, and there is a link between assessment and instruction (Cox, 2008). This is important from the very beginning of formal schooling where incorporating differentiated curricular lessons and pedagogy can uncover potential among our youngest learners (Kaplan, 2022; Olszewski-Kubilius & Clarenbach, 2012; VanTassel-Baska & Wood, 2010). It also acknowledges that high ability learners have special needs that require intentional supports to grow and develop (National Association for Gifted Children, 2021).

To help teachers incorporate differentiated practices to elicit high performance, their curriculum units should explicitly describe differentiation opportunities and provide standards-based materials and tasks that incorporate varied difficulty levels and scaffolding (Beasley et al., 2017; Tomlinson, 2000). These explicit differentiation components in curriculum help teachers gain more awareness on differentiation strategies and encourage advanced thinking processes for learners ready to move through basic content at a faster pace (Allen & Hunsaker, 2016; Hockett & Brighton, 2016; Housand, 2016). Exposing all learners to an enriched curriculum can not only help high ability learners but it can help propel learners of all abilities (Robinson, et al., 2017). The use of advanced language arts units aligned to national and state standards have been found

to contribute to significant progress and growth gains for high ability learners in multiple instructional settings (Callahan et al., 2015; VanTassel-Baska et al., 2002). Open-response assessments for first- and second-grade students exposed to advanced geometry and measurement concepts were also found to be statistically significant (Gavin, Casa, Adelson, and Firmender, 2013; Gavin, Casa, Adelson, and Firmender, 2013). Additionally, social studies curriculum designed for high ability learners in elementary and middle school heterogeneous classrooms resulted in significant differences in content learning, and positive achievement effects were found in all ability groups for primary learners in Title I schools exposed to higher level, inquiry-based science curricula (Little et al., 2007).

An additional factor in increasing the achievement of high ability learners is a teacher's sense of efficacy. Teachers with a higher sense of efficacy are better able to adapt in and manage situations with flexibility, which can lead to less teacher stress and burnout (Daniilidou et al., 2020). Guskey (2002) claims it is the experience of successful implementation of a new instructional approach that changes teacher attitude and beliefs, and that demonstrated results in student learning outcomes are key to the endurance of any change in instructional practice. This is in alignment with Bandura's (1977) seminal work on self-efficacy which argues performance accomplishments, vicarious learning, emotional arousal, and verbal persuasion are the four major sources that can affect self-efficacy.

Instructional coaching, a more individualized form of professional development (PD), has been shown to increase teacher efficacy and changes in teacher practice, which can lead to increases in student learning (Walsh et al., 2020; Witherspoon et al., 2021). Teachers working with an instructional coach are more likely to implement differentiated supports because of the nature of its PD design where the coach and teacher work together to prioritize instructional

needs, establish goals, create implementation plans, and reflect through ongoing collaboration (Reddy et al., 2019; Reddy et al., 2021). Because most curricula are not designed with explicit differentiation opportunities for high ability learners, instructional coaching could be a key component in helping teachers grow and improve their practices and efficacy around teaching these learners (Mofield & Phelps, 2020).

Statement of the Action Research Problem

When it comes to differentiated instruction, while many general education teachers believe learners across all ability levels should receive comparable attention, it is naïve to believe teachers are, or even know how to, modify curriculum to meet the needs and interests of their high ability learners (Brown, 2016; Peters & Jolly, 2018). As a result, despite widespread support for differentiated instruction, it is the exception rather than the rule to find systematic, consistent, or robust implementation of it (Santangelo & Tomlinson, 2012). To combat this problem, there is a need to know more about how coaching teachers through curriculum revisions that incorporate explicit differentiated instructional methods affects (a) teacher practice, (b) learner achievement, and (c) a teacher's sense of efficacy.

Evidence Supporting the Existence of the Problem

Many high ability learners are showing growth stagnation or even regression toward the norm by upper elementary, which could be a result of them frequently experiencing curriculum that represents previously mastered content at a pace that is too slow and lacks complexity, limiting their opportunities for growth (Gavin, Casa, Adelson, and Firmender, 2013; Little, 2012). Lohman and Korb's (2006) longitudinal study on regression to the mean concluded that approximately half of the learners who score in the top 3% one year will not do so the next. With many high ability learners beginning one school year or more above grade level in some content

areas, underachievement and unfulfilled potential become major areas of concern (Firmender et al., 2012; Steenbergen-Hu et al., 2020).

Probable Causes Related to the Problem

Federal policies on formal identification or program practices for high ability learners do not exist, leading to variable state-by-state policies and practices (Gallagher, 2002). Additionally, teacher preparation programs often exclude gifted education courses and teachers focus heavily on learners who are struggling. This leaves less instructional time for extending the learning of those performing beyond their grade level (Brulles et al., 2012).

While a greater number of PD hours in differentiated instruction has been positively associated with teacher efficacy and comfort level, the most difficult expectation from PD seems to be the transfer of learning into classroom implementation (Bogen et al., 2019; Dixon et al., 2014; Kaplan, 2022). Both general education teachers working with mixed ability classes and gifted education teachers underutilize differentiation practices, find it difficult to differentiate, or fail to implement differentiation practices effectively enough to have an impact on high ability learners (VanTassel-Baska et al., 2020; Yuen et al., 2018). Additionally, teachers typically do not use differentiated instruction for high ability learners proactively nor on a regular basis due to lack of time, resources, knowledge, training, or misconceptions (Ziernwald et al, 2022). One of those misconceptions is the perceived need to distinguish and separate the differentiated curriculum and pedagogy of high ability learners from all other students, which leads to teachers becoming hesitant to fully translate their knowledge of differentiation into heterogeneous classrooms (Kaplan, 2022).

Addressing the problem of teachers struggling with differentiation is essential to increasing our understanding of how to enhance student learning outcomes. Without adequate

support and guidance, educators who find themselves overwhelmed by the diverse needs of their learners might lead to inequitable learning experiences and limited academic growth. Recognizing this challenge, with this action research study I aimed to delve into instructional coaching as an approach to foster effective differentiation strategies by creating leveled choice boards. By bridging theory with practice, I endeavored to empower teachers and enrich educational experiences for learners with mathematical promise.

Context of the Action Research Study

This action research study took place in an elementary school in one of the largest school districts in North Dakota (ND) with enrollment around 13,000 learners, with learner population demographics broken down in Table 1. The 2022-2023 demographics are listed as the 2023-2024 data were not yet available.

Table 1

District and School Demographics Breakdown for the 2022-2023 School Year

Subgroup	District		School
	Enrollment %	Advanced Scoring %	Enrollment %
Total Learner Population	100%	12%	100%
English Learner	7%	1%	24%
Low Income	30%	6%	47%
White	70%	13%	46%
Black	18%	5%	30%
Asian American	4%	19%	13%
Hispanic	5%	6%	6%
Native American	3%	5%	5%
Native Hawaiian or Pacific Islander	0-1	N/A	N/A

Note. N = 12,648 learners for the district and N = 398 for the elementary school in which the action research study took place. Advanced scoring percentages for the school are not provided as the sample size for those scoring in the advanced range is too low to be provided without compromising learner privacy.

The district's 2022-2027 strategic plan has three overarching goals regarding the wellness, academics, and choice readiness of their learners with six belief pillars that include: (a) self-efficacy and agency, (b) relationships, (c) guaranteed and viable curriculum, (d) assessment and feedback, (e) goal setting and reflection, and (f) pathways and pacing.

The ND State Assessment for Mathematics is given to all third through eighth graders, 10th graders, and 11th graders. The percentage of learners who scored in the "advanced" category (Table 1), is defined by the state as those who demonstrate exemplary understanding and exceed expected levels of performance on the ND state content standards. This group follows the nationwide excellence gap trend where large differences exist between the subgroups

of learners performing at advanced levels of achievement (Plucker et al., 2010). More specifically, the proportion of English Learner and low-income students performing at an advanced level remain low and stagnant despite the rising number of culturally, linguistically, and economically diverse learners in our schools (Olszewski-Kubilius & Clarenbach, 2012; Mun et al., 2020).

Information Related to the Organization

In alignment with the district's new strategic plan, educators from around the district were invited to a 2-day personalized learning PD opportunity led by KnowledgeWorks in June of 2022 where they were given permission to start their work toward personalized, competency-based learning in whichever way they felt would be the best first step in supporting the district's new strategic plan and belief pillars. The first day of the training focused on what personalized, competency-based learning was, why the district was moving in that direction, and how depth of knowledge ties into personalized, competency-based learning. Time was also given for schools to begin working on their implementation plan. Although this directive felt unclear at first, it recognized that the best way to create ownership is for those responsible for implementing a plan to develop the plan for themselves (Wheatley, 2006).

This PD opportunity was attended by the principal, instructional coach, gifted and talented teacher/math interventionist (me), and two first-grade teachers from the elementary school in which the action research study was implemented. It was determined that incorporating personalized, competency-based learning into mathematics instruction would be the focus area, and work began on mapping out what the group wanted mathematics instruction to look and sound like, then outlined how unit one could be more inquiry-based with intentional differentiated scaffolding for mathematically promising learners built in from the beginning. Day

2 of the training allowed for continued work on the plan and time for groups to share their implementation plan with other schools across the district.

Information Related to the Intended Stakeholders

The primary stakeholders for this action research study were the two first-grade teachers who attended the personalized learning training and a third first-grade teacher who is part of their team. The secondary stakeholders were the first-grade learners, with an intentional focus on those identified as mathematically promising by either scoring at or above the 85th percentile on Star Math in the fall or showing early mastery as assessed by the unit pre-assessments. The curricular revisions were developed through collaboration between the school's first grade teachers and the school's gifted and talented teacher/math interventionist, who will be referred to as the differentiation coach. Beyond the stakeholders, the results on how the differentiation coaching affected (a) teacher practice, (b) learner achievement, and (c) a teacher's sense of efficacy were shared with the school administrator and district office as the study was directly aligned with their strategic plan.

Brief Description of the Action Research Intervention

In this study, I was the action researcher and differentiation coach. It included a comprehensive analysis of the effects of differentiation coaching on (a) teacher practice, (b) learner achievement in mathematics, and (c) a teacher's sense of efficacy. Action research was the selected mode because the instructional coaching was rooted in a plan of action (Stringer & Ortiz Aragon, 2020). This plan engaged teachers who were on the front lines when it came to implementing the revised mathematics units. The purpose of revising the curriculum units was to incorporate explicit, standards-based differentiation opportunities for those showing mathematical promise.

This analysis occurred during the 2023-2024 school year, although it is a continuation of the curriculum revision collaboration between the differentiation coach and first-grade team that occurred about every other week during the 2022-2023 school year in 30–60-minute increments. During the 2023-2024 school year, the team continued to reflect and refine their curriculum work that was started to strengthen the units designed during the 2022-2023 school year, since that was considered a pilot year.

I used historical data as well as data from the fall and winter of the 2023-2024 school year. These data addressed how the coaching focused on curriculum revisions affected (a) teacher practice, (b) learner achievement in mathematics, and (c) a teacher's sense of efficacy. Star Math assessments were used for analyzing learner growth. The Classroom Practices Survey-Revised (CPS-R; Appendix A) was used for analyzing teacher differentiation practices (Pereira et al., 2021). For analyzing teacher efficacy, the Teachers' Sense of Efficacy Scale (TSES; Appendix B), was used (Tschannen-Moran & Woolfolk Hoy, 2001). Because this was the second year of the differentiation coaching and curriculum revision process, some open-ended responses (Appendix C), were requested to gain a more holistic picture of teacher practice changes that may not be apparent in the CPS-R.

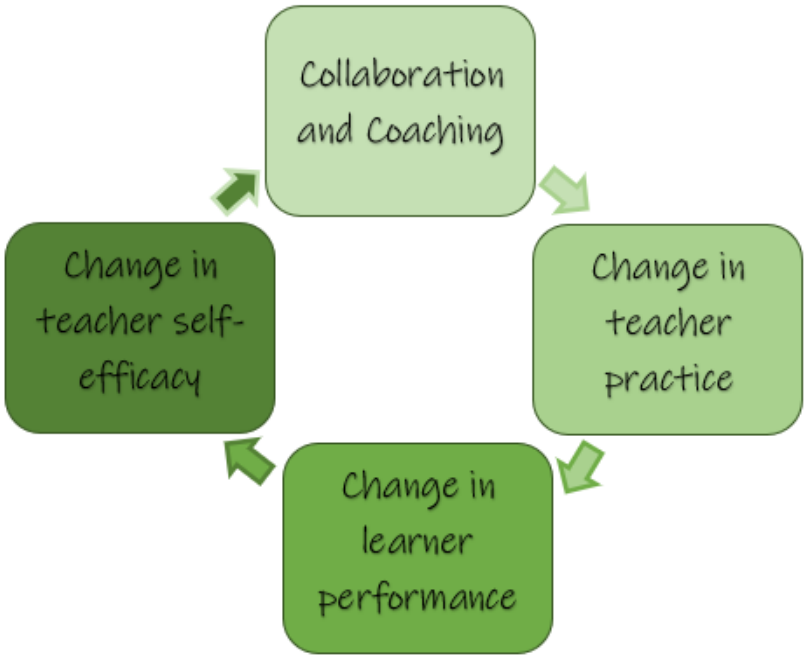
Conceptual Framework

The intervention was cyclical in nature and encompassed all the components in the Sustainable Teacher Change Conceptual Framework, as seen in Figure 1. This conceptual framework was designed by the researcher and is an adaptation and combination of Guskey's (2002) PD and teacher change model and Bandura's (1977) self-efficacy theory. This framework emphasizes that a change in teacher self-efficacy is preceded by, and more powerful, when paired with coaching and mastery experiences, especially when implementing a new

instructional strategy (Tschannen-Moran & McMaster, 2009). Teachers who work together to improve learning outcomes often know their students better. Success can also be compounded when they receive additional support from school leadership or an instructional coach and take actionable steps to change their practice (Goddard & Kim, 2018). When this occurs and teachers start to witness positive changes in achievement, this is when Guskey (2002) claimed the change in self-efficacy takes place. In other words, they need to see it before they believe it. Underlying the cyclical nature of the framework is the acknowledgement that change occurs in cycles and that systems need to have the capacity to react, reflect, clarify, and change to survive, grow, and attempt other challenging approaches (Tschannen-Moran & McMaster, 2009; Wheatley, 2006).

Figure 1

Sustainable Teacher Change Conceptual Framework



Within this action research study, the collaboration and coaching portion of the framework was represented by the curriculum revision work completed between the first-grade teachers and differentiation coach. Between each revision session, the teachers changed their practice by implementing the curriculum revisions. Change in learner performance and each teachers' sense of efficacy was also measured. Because of the consistent and ongoing collaboration and coaching, this framework was repeated in many mini cycles over the course of the school year.

Action Research Questions

To gain insight into the effectiveness of the differentiation coaching, this action research study was rooted in three essential questions which explored and measured the following questions through data from the first semester of the 2023-2024 school year:

1. To what extent does coaching first-grade classroom teachers affect their differentiation practices for mathematically promising learners?
2. If teachers change their differentiation practices, to what extent does the change affect the academic performance of mathematically promising learners?
3. If there is a change in the academic performance of mathematically promising learners, to what extent does the change affect a teacher's sense of efficacy?

Definitions of Terms

Action Research - an approach to investigation that uses continuing cycles of observation, reflection, and action to reveal effective solutions to issues and problems experienced by people in their everyday lives (Stringer & Ortiz Aragon, 2020)

CPS-R - Classroom Practices Survey–Revised is an instrument to measure teachers' differentiation practices across all achievement levels (Pereira et al., 2021)

Differentiation - the act of ensuring what a student learns (content), how they learn it (process), and how they demonstrate it (products) is a match for that student's readiness level, interest, and preferred mode of learning (Tomlinson, 2004)

Instructional Coaching - building capacity in other teachers to improve practices, refine skills, and encounter new possibilities in teaching by providing contexts for self-reflection and growth (Mofield & Phelps, 2020)

Mathematically Promising - a broadened and dynamic definition of mathematical talent or giftedness that recognizes and develops traditionally underserved students, such as those from diverse or socio-economically disadvantaged backgrounds (Gavin et al., 2009).

Personalized, competency-based learning – a nontraditional form of instruction where learner progression is based upon mastery of academic content (Duffy & Eddins, 2022)

PD - professional development is the continued training or education to build knowledge and skills in a specific field (Peters & Jolly, 2018)

SGP - Student Growth Percentile is a contextual growth measurement that shows how a learner has grown by comparing their growth to academic peers who are in the same grade and who started with a similar scaled score and history of performance (Renaissance Learning Inc., 2023).

Star Math - the district's standardized assessment tool given every fall, winter, and spring (Renaissance Learning Inc., 2020)

Teacher Self-Efficacy - a teacher's beliefs about their ability to instruct others and bring about change through their efforts (Bandura, 1977)

TSES - Teacher's Sense of Efficacy Scale (Tschannen-Moran & Woolfolk Hoy, 2001)

CHAPTER 2

REVIEW OF RELATED LITERATURE

This literature review provides a comprehensive look into how studies on differentiated instruction have related to changes in teacher practice, academic achievement gains, and collaboration or coaching. It starts with an overview of what differentiation is, along with its common criticisms and challenges. From there it moves into reasoning behind differentiating instruction and some of its effects, with an additional look into how it relates to students with mathematical promise and mathematics achievement. Because of the real and present criticisms and challenges tied to differentiation, the next section moves into how preassessment and flexible grouping, leadership or coaching, and collaboration can work as powerful change agents in promoting positive differentiation experiences and results. The next section focuses on influences behind changes in teacher efficacy, with a focus on the connection between PD and efficacy. Finally, the literature review moves into a synthesis of research completed in the past 10 years on how differentiated instruction ties to teacher practice, academic achievement, collaboration, and efficacy along with implications for future research.

Differentiation Overview

Differentiation is a proactive pedagogical and philosophical approach to teaching (Brigandi et al., 2019; Tomlinson, 2004). It is an interaction between learners and teachers where routine opportunities for pre-assessment, both formative and summative, occur to adjust instructional methods so students of all ability levels can learn at their level and achieve maximum growth (Goddard et al., 2019; Johnsen et al., 2020; Lee et al., 2022; Saclarides &

Harbour, 2023; Tricarico & Yendol-Hoppey, 2012). By proactively assessing, teachers can design learning experiences for flexible learning groups where adjustments to content (what is taught), process (how it is taught), and product (how it is assessed) can be made according to a learner's readiness, learning profile, and interests to help all learners reach their learning objectives (Tomlinson, 2001). These learning experiences are responsive to and respectful of the diversity within classrooms because they cater and provide access to the wide spectrum of learners in the classroom environment (Brigandi et al., 2019; Graham et al., 2021; Yuen et al., 2018).

The adjustments that occur through differentiation should be based upon a solid curricular foundation but allow for flexibility for learners at different stages of development to engage with content at their level (Goddard & Kim, 2018; Graham et al., 2021). Differentiation often occurs through flexible grouping where content can be adapted and taught at an appropriate pace in a small group environment that adjusts the presentation of curriculum that acknowledges and honors learners' needs (Johnsen et al., 2020; Ritzema et al., 2016; Santangelo & Tomlinson, 2012). In a study that engaged experts in primary school mathematics, effective differentiation was found to follow a five-step cycle: (a) identify educational needs, (b) differentiate goals, (c) differentiate instruction, (d) differentiate practice, and (e) evaluate progress and process (Prast et al., 2015). Tomlinson and Moon (2013) also developed a framework for differentiation that is built on five classroom elements: (a) high-quality curriculum with clear learning goals; (b) ongoing assessment; (c) respectful tasks; (d) flexible grouping; and (e) learning environment focused on students' readiness, interests, and learning profiles.

Criticism of Differentiation

Despite teachers understanding the strategies of differentiation and identifying the diverse needs of their learners, their knowledge may not translate into practice, resulting in minimal differentiation occurring in classrooms (Dixon et al., 2014; Santangelo & Tomlinson, 2012). One criticism is there is neither a consistent nor cohesive picture of what differentiation should look like in a classroom (VanTassel-Baska et al., 2020). This criticism is compounded when many teachers have not been trained in how to differentiate, making it a challenging and overwhelming approach to adopt (Bondie et al., 2019; Goddard et al., 2019). While teachers want to implement differentiated instruction, there remains a gap between their desired and actual use (Hersi & Bal, 2021). With differentiated instruction moving toward personalized learning in recent educational reform efforts, this feeling of abstractness can feel even more daunting and result in a supplemental or reactive approach (Lee et al., 2022). Differentiation takes time to implement because of the additional planning involved and teachers often struggle with modifying learning tasks and providing diverse groups of learners with activities designed to what works best for them (Dixon et al., 2014; Goddard & Kim, 2018; Tricarico & Yendol-Hoppey, 2012).

When teachers are expected to differentiate instruction, despite their lack of training, a varying degree of effective practices occur (Cho et al., 2015). This could result in learning tasks that do not align with instructional objectives and might simply be "busy work" (Johnsen et al., 2020). The lack of clarity in what differentiation should look like can also create internal struggles and concern with teachers who feel they are departing from the traditional norms of instruction (Bishop et al., 2020). This may make teachers feel they need their principal's permission to build in flexibility or that systemic factors such as their schedule or prescribed curriculum are too daunting to overcome (Johnsen et al., 2020; Santangelo & Tomlinson, 2012).

A second criticism of differentiated instruction is it can be equated to fixed ability grouping and tracking, which is a controversial topic in education (Ansalone, 2010). When teachers incorrectly implement differentiated instruction by creating rigid rather than flexible grouping, the low-tracked groups often disproportionately represent poor or minority groups which can exacerbate achievement inequalities (Domina et al., 2019; Petrilli, 2011). This can result in learners developing negative feelings or anxiety toward education and may turn into a self-fulfilling prophesy where learners internalize these feelings and allow them to define who they believe themselves to be (Ansalone, 2010; Webel & Dwiggins, 2019). Fixed tracking can also create the misconception that lower-tracked groups have limited access to quality learning opportunities while higher-tracked groups enjoy educational advantages such as higher expectations and more rigorous instruction (Domina et al., 2019).

Challenges of Differentiation

Not only is there a lack of teacher preparation for differentiated instruction but there is a lack of preparation in knowing and understanding high ability learners, creating a situation where teachers know little about how to educate or plan for them (Brigandi et al., 2019; Yuen et al., 2018). This lack of skills in adjusting curriculum results in low or misused use of differentiation for high-achieving learners in whole-class, small-group, or individual settings (Prast et al., 2015; Rakow, 2012; Ritzema et al., 2016). Teachers need extensive support in developing lessons and quality instruction for advanced learners and without it they may become resistant to providing differentiated instruction for this population (Livers et al., 2018; Pierce et al., 2011). Some teachers become apologetic in this lack of knowledge while others may incorrectly match activities to their intended instructional purpose, resulting in “fun” or “interesting” choices that

sacrifice high level content for cute activities (Rubenstein et al., 2015; VanTassel-Baska et al., 2020).

Reasoning for Differentiation With High Ability Learners

Any classroom with more than one learner presents diverse needs, and with schools shifting toward an era of inclusiveness where learners find themselves in regular school settings rather than special groups or classes this can pose a challenge for high-ability learners when the prescribed mainstream curriculum often lacks enough depth and complexity (Dixon et al., 2014; Trinter et al., 2015; Yuen et al., 2018). Even if learners participate in a gifted program, this challenge can be exacerbated when findings in a three-state study of gifted education curriculum showed that, out of nearly 2000 schools, only 24% said they used a separate mathematics curriculum designed for gifted learners (Siegle et al., 2019). This can have dire effects on academic growth and achievement. In the same three-state study (Siegle et al., 2019), findings showed that although advanced third grade learners start about two grade levels above their peers, they show slower academic growth between third and fifth grade.

Although some schools have shifted toward cluster grouping, which is the top delivery model in elementary gifted programs, some cluster group settings offer no differentiated instruction within their groups, which negates the effectiveness of this delivery model (Gentry, 2014; VanTassel-Baska et al., 2020). If learners demonstrate mastery on a pre-assessment, but a misapplication or misunderstanding of differentiation is present, advanced learners are denied the opportunity to learn something new (Rakow, 2012).

High-achieving learners need guidance when working on sufficiently challenging tasks, but disproportionate attention is paid to peers having trouble (Prast et al., 2015; Santangelo & Tomlinson, 2012). The attitudes of students with gifts and talents play a significant role in their

academic achievement, yet many advanced learners in one study stated they were not receiving sufficient challenge or differentiation in school (McGrath, 2019). With many districts incorporating mission statements where the word “all” is present, educational programs and differentiation practices that adequately meet the needs of and challenge high ability learners are necessary (Smith et al., 2017).

Effects of Differentiation

Although differentiated instruction remains a popular and promoted strategy for classrooms, few studies have measured its impact on learners or teachers, making it difficult to tout its benefits (Rubenstein et al., 2015). This includes a lack of empirical or large-scale studies focused on the effectiveness of differentiated instruction, the impact differentiated instruction has on student learning and achievement, changes in teacher practice, or a comprehensive evaluation of differentiated instructional models (Bondie et al., 2019; Dixon et al., 2014; Goddard & Kim, 2018). However, the research that has been done shows that effective use of differentiation can increase student motivation and achievement for diverse populations but without preassessment, there is no significant differentiation (Bogen et al., 2019; Rakow, 2012; Santangelo & Tomlinson, 2012).

Independent studies have positively and significantly linked differentiated instruction to student engagement and achievement in mathematics and reading with the best results occurring when learners can switch between instructional groups based on need (Cho et al., 2015; Goddard et al., 2019; Goddard et al., 2015; Prast et al., 2015; VanTassel-Baska et al., 2008). Additionally, a systematic review of 299 studies that spanned from 2000-2017 that were mostly carried out in the United States, Europe, and Australia found that teaching methods that individualized and adapted instruction according to learners’ needs, abilities, and interests helped improve learning

achievement (Bernard et al., 2019). A second review meant to identify the key characteristics and conceptualizations on differentiation published from 1999-2019 found the impact on differentiation on student learning to vary between neutral to positive but that even a small effect is important to note (Graham et al., 2021).

Effects of Differentiation in Students With Mathematical Promise

When narrowing the search to the effects of differentiation on mathematics achievement, a study on differentiated educational games for primary grade learners found that the incorporation of the games was more effective at promoting mathematical performance than traditional mathematics instruction (Trinter et al., 2015). Additionally, a study on the impact of advanced geometry and measurement curriculum units in first grade general education classrooms found the experimental group showed a deeper understanding of geometry and measurement concepts on open-response assessments than the comparison group (Gavin, Casa, Firmender, and Carroll, 2013).

Effects of differentiation for students with mathematical promise can be challenging to measure as there has been minimal effectiveness shown in gifted education programs regarding achievement as many gifted programs focus more on critical and creative thinking than accelerated instruction (Siegle et al., 2019; Smith et al., 2017). Despite this challenge, there is evidence that effective differentiation for students with mathematical promise is dependent on the quality of teaching. However, when curriculum was delivered as designed and cluster grouping students with mathematical promise occurred, both students with mathematical promise and comparison learners enjoyed achievement gains over time (Pierce et al., 2011; VanTassel-Baska et al., 2020). Clustering learners into similar ability groups, known as cluster grouping, allows for more direct contact with similar ability learners and has shown to shift the

instructional mindset from a class-based approach to a whole cohort approach that both teachers and learners prefer as it leads to both positive teacher professional growth and improved learning outcomes for students (Muir et al., 2021; Pierce et al., 2011). A study that cluster grouped fourth grade learners found a significant positive effect in reading and math scores among high achieving learners, with gains concentrated among black and Hispanic learners (Card & Giuliano, 2016). Additionally, studies completed in Turkey on the impact of differentiated mathematics instruction for clustered, advanced fifth grade and middle school learners found positive effects on their attitudes and academic achievements (Altintas & Ozdemir, 2015; Deringol & Davasligil, 2020).

Differentiation Change Influencers

If differentiation is to regularly occur in classrooms, PD focused on effective classroom practices needs to take place. Traditional PD that is top-down, passive, prescribed, and single-shot does not create effective nor sustainable change in teacher practice or impact student achievement (Peters & Jolly, 2018; Muir et al., 2021). Conferences also tend to be ineffective as they may become overwhelming and participants do not know where to start when they are back in their regular setting (Brigandi et al., 2019).

To start, a combination of teacher-centered and learner-centered instruction may be more productive than trying to fully implement personalized learning (Bernard et al., 2019). Targeted and incremental change should be viewed as a positive result achieved through intentional small goals as change is a long-term process that develops as training and positive relationships build a teacher's comfort level which can have a positive impact on employing differentiated instructional practices (Bogen et al., 2019; Brigandi et al., 2019). In the center of the five-step cycle of differentiation (Prast et al., 2015) lies organization, which recognizes that effective

differentiation relies on a strong organizational structure and good classroom management. Once the organizational foundation is in place, An and Mindrila (2020) suggest six major categories for strategies and tools for learner-centered instruction: (a) getting to know students, (b) building a positive and supportive culture, (c) providing personalized learning experiences, (d) providing authentic learning experiences, (e) facilitating collaborative learning, and (f) facilitating self-regulated learning.

Pre-Assessment and Flexible Grouping

For educators who feel overwhelmed at the thought of differentiation or personalized learning, starting with something small, manageable, and supported by research is a suggested first step (Rakow, 2012). Pre-assessments and flexible grouping are essential elements in successful differentiation practices (Santangelo & Tomlinson, 2012; VanTassel-Baska et al., 2020). When learners know you are using the data gathered from the pre-assessments, they become more involved in their learning process as you can discuss their growth throughout a unit in a setting where small groups are flexible and frequently re-evaluated (Rakow, 2012; VanTassel-Baska & Johnsen, 2016). In a study where teachers used pre-assessments with an enriched mathematics curriculum, many teachers and administrators had such positive experiences with the pre-assessments they wanted to continue the practice outside of the enriched curriculum (Rubenstein et al., 2015).

Leadership and Coaching

Looking beyond the classroom setting, instructional leadership is one of the strongest predictors of schoolwide differentiated instruction (Goddard et al., 2019). A principal's vision and commitment for differentiation can create a shared understanding of high-quality instructional practices and a sense of collective responsibility within a school (De Neve &

Devos, 2016 Jarvis et al., 2016). The more teachers have a shared understanding, the more they will persist in the face of challenges, which will have a greater impact on student learning. A positive instructional climate where there are group norms and high expectations for differentiation while also allowing for autonomy creates an environment where teachers are encouraged to experiment and take risks because they know their school leader will provide opportunities for engagement and time to share effective practices (Goddard et al., 2019; Graham et al., 2021).

Ongoing support in the form of instructional coaches can also increase differentiated instructional practices (Saclarides & Harbour, 2023). Many teachers can differentiate if they are provided the appropriate support and materials to do so, and an instructional coach provides a way for teachers to discuss student growth in a workshop setting where the coach can help teachers reflect, write, and review their lessons (Rubenstein et al., 2015). Teacher buy-in is essential for regularly implemented differentiation practices and schools that require the implementation of differentiation can use coaching support to provide additional, ongoing PD to teachers (Dixon et al., 2014).

Collaboration

Collaboration is another vehicle for strengthening the lesson planning process, and PD that supports collaborative learning allows for teachers to work together, engage in professional experimentation, embrace challenges, and see results in academic achievement (Muir et al., 2021; Pierce et al., 2011; Tricarico & Yendol-Hoppey, 2012). A study in Hong Kong that focused on enhancing confidence in differentiation through PD found their participants appreciated the chance to co-plan, present their lesson plans, and share experiences with colleagues from other schools (Yuen et al., 2018). In a review of United States studies from 2001

to 2015, reported changes in teacher differentiation practices found there was a change in feelings of control of differentiated instruction when an assessment cycle was used as well as collaboration with other educators to make decisions (Bondie et al., 2019).

These findings are supported by additional studies on professional learning experiences where relevant, personalized opportunities that explored new instructional strategies and ideas in the context of their classrooms were most effective in promoting and supporting change when they were collaborative, evidence-based, and sustained over time (Muir et al., 2021; VanTassel-Baska & Johnsen, 2016). Constructing knowledge in practice can be supported through collaborative discussion, which has been found to be the strongest predictor of change in instructional practices (Goddard & Kim, 2018; Tricarico & Yendol-Hoppey, 2012). An additional component to collaborative meetings can be added where teachers observe each other's differentiated lessons, provide feedback after the observation, and collaborate on future shared lessons (Dixon et al., 2014).

Teacher Efficacy

Teacher efficacy is the culmination of their beliefs about their ability to instruct others and bring about change through their efforts (Bandura, 1977). It has been related to learner engagement and achievement as well as a teacher's motivation and willingness to experiment with new methods of instruction (Tschannen-Moran & Woolfolk Hoy, 2001). Professional learning communities have been shown to positively influence a teacher's sense of efficacy when there is supportive leadership, collective learning, shared practices, and strong relationships (Anderson & Olivier, 2022). An analysis of 18 studies on building collective efficacy in a school also shared the importance of leadership in establishing a culture of trust and collaboration within their building (Salas-Rodriguez & Lara, 2023). This emphasis on collaboration

influencing teacher efficacy mirrors the findings that collaborative discussion is the strongest predictor of a teacher's change in practice (Goddard & Kim, 2018; Tricarico & Yendol-Hoppey, 2012).

When looking at the connection between collaboration through instructional coaching and teacher efficacy, the research is sparse but promising. A study on the effectiveness of virtual instructional coaching on science instruction in middle and high school found that teachers who received instructional coaching following a summer institute PD showed significant differences in their self-efficacy than teachers who did not (Nugent et al., 2018). Another study in a California school district on the benefits of instructional coaching for teacher efficacy with PreK-6 teachers also found that PD was more effective when followed up with direct, intensive support. By embedding professional learning opportunities into the day-to-day work of teachers, instructional coaching was perceived to have more influence on a teacher's sense of efficacy when the focus of the coaching was on the needs a teacher had (Walsh et al., 2020).

Synthesis of Research on Teacher Practice, Achievement, and Collaboration

To gain a comprehensive understanding of differentiated instruction within teacher practice, academic achievement, and collaboration a synthesis of research completed in the past 10 years on the topics can be a useful tool in understanding what is known and where gaps in research exist. Although this synthesis is not a complete picture of every study completed, valuable insight can still be gained as to what has helped drive the conversation in these areas.

Teacher Practice

A synthesis of research on differentiation and practice, as seen in Table 2, shows that although there have been extensive research and literature reviews (Bondie et al., 2019; Graham et al., 2021) completed on the topic of differentiated instructional practices, much of that work

has been focused on what teachers were already doing in their classrooms. It has been research that gives insight into how teachers feel about differentiated instruction and how differentiated instruction is not the norm in classrooms, but only two of the studies (Bondie et al., 2019; Muir et al., 2021) had an explicit focus on measuring how teacher practices changed. The literature review (Bondie et al., 2019) focused on United States studies from 2001 to 2015 asked if changes in teacher practice led to a common definition of differentiated instruction, and while they concluded that Tomlinson's (2001) framework was used most frequently in defining differentiation, it was the use of assessment cycles and decision making through collaboration that resulted in an increased usage of differentiated instructional practices. The second study (Muir et al., 2021), completed in the Netherlands, investigated how teachers made changes in their personalized learning practices in mathematics and found a similar result, where professional learning that focused on collaborative opportunities to explore instructional strategies in the context of their classroom was the most effective in promoting changes in practice.

Table 2

Studies on Differentiated Instructional Practices

Study	Change in Practice	High Ability Learners	Elementary	Mathematics	United States
Hersi & Bal, 2021					X
An & Mindrila, 2020					X
Bondie et al., 2019	X				X
Brigandi et al., 2019		X	X		X
Bishop et al., 2020					X
Goddard et al., 2019			X	X	X
Graham et al., 2021					X
Johnsen et al., 2020		X	X		X
Lee et al., 2022					X
Muir et al., 2021	X		X	X	
Ozdemir & Isiksal Bostan, 2021		X		X	
Ritzema et al., 2016			X	X	
Rubenstein et al., 2015		X	X	X	X
Saclarides & Harbour, 2023			X	X	X
VanTassel-Baska & Johnsen, 2016		X			X
VanTassel-Baska et al., 2020		X			X

Another insight gained from Table 2 is that although there has been research on differentiating instruction for high ability learners, differentiating for learners in elementary

school, and differentiated instructional practices in mathematics, only one of the studies (Rubenstein et al., 2015) incorporated all three aspects. Additionally, although many of the studies that incorporated a look into differentiating for high ability learners took place in a gifted education program (Brigandi et al., 2019; Ozdemir & Isiksal Bostan, 2021; VanTassel-Baska et al., 2020; VanTassel-Baska & Johnsen, 2016) or cluster classroom (Johnsen et al., 2020), the Rubenstein et al. (2015) study was the only one to take place in a general education setting. The goal of this study was to provide a curriculum that promoted academic rigor to all and to demonstrate the value of a pre-differentiated and enriched mathematics curriculum in a general education setting. This gave classroom teachers the ability, time, and desire to differentiate for the high-ability learners in their rooms. Not only did the curriculum help in that regard, but teachers had such positive experiences with the pre-assessments that they were able to more frequently discuss growth with learners and wanted to continue the practice outside of the curriculum provided through the study (Rubenstein et al., 2015).

In looking at the results and future recommendations of the three unique studies mentioned (Bondie et al., 2019; Muir et al., 2021; Rubenstein et al., 2015), valuable insight can be gained into where future research for differentiated practice may be helpful in moving the conversation forward. Bondie et al. (2019) found that teachers differentiate more when decisions are clearly articulated, and they feel support from their principal. It also recommended frameworks for differentiated instruction that include carefully considered routines that have maximum impact on student learning so we can explicitly tie the differentiated instructional practices to learning outcomes. Muir et al. (2021) found that professional growth and changes in practice can be achieved when teachers collaborate and see salient outcomes from their learners and recommended additional research in classroom-based professional learning that provided

access to expert knowledge and support. Rubenstein et al. (2015) found that many teachers can differentiate if provided the appropriate support and materials and recommended a continued look into experiences where teachers are provided pre-differentiated and enriched curriculum to meet the needs of high ability learners in the regular classroom.

Achievement

A synthesis of research connecting differentiated practices with academic achievement, as seen in Table 3, shows that although past studies have focused on achievement gains compared with a control group within the same time frame, there have not been studies comparing the achievement gains to previous achievement trends. It should be noted that studies on mathematics achievement was the intended focus of this synthesis. Bernard et al. (2019) was included as it was a comprehensive literature review of 299 studies from 2000-2017 that looked at how differentiated instruction, specifically individualized learning opportunities, impacted student achievement and did not disaggregate data by content area. The authors found that a combination of teacher-centered and student-centered approaches produced higher achievement but classrooms that offered learners more of a hands-on role in deciding their pacing of instruction produced lower achievement (Bernard et al., 2019).

Table 3

Studies on Differentiated Instruction Affecting Achievement

Study	High Ability Learners	Elementary	Mathematics	United States
Altintas & Özdemir, 2015	X		X	
Bernard et al., 2019				X
Card & Giuliano, 2016	X	X	X	X
Cho et al., 2015	X	X	X	X
Gavin, Casa, Adelson, and Firmender, 2013	X	X	X	X
Gavin, Casa, Firmender, and Carroll, 2013	X	X	X	X
Siegle et al., 2019	X	X	X	X
Smith et al., 2017	X	X	X	X
Trinter et al., 2015	X	X	X	X

When looking into the studies that looked at the mathematics achievement of high ability elementary learners only three studies (Gavin, Casa, Adelson, and Firmender, 2013; Gavin, Casa, Firmender, and Carroll, 2013; Trinter et al., 2015) looked at achievement in a general education setting, while the rest (Card & Giuliano, 2015; Cho et al., 2015; Siegle et al., 2019; Smith et al., 2017) looked at the achievement of learners in gifted programs. However, it should be noted that none of these studies compared their achievement changes to past achievement trends. Card and Giuliano (2016) found that cluster grouping high-achieving fourth graders had a significant positive effect on their reading and math scores. In a study on the effect of an advanced mathematics curriculum with mathematically promising third graders (Cho et al., 2015), findings suggested positive outcomes, but there were varying degrees of effective teaching practices

taking place, so the positive outcomes were limited to classrooms that implemented the curriculum with fidelity and followed their suggested teaching practices.

The studies that focused on achievement within gifted programs (Siegle et al., 2019; Smith et al., 2017) also produced lackluster findings regarding achievement because many gifted programs focus more on critical and creative thinking than accelerated instruction, thus showing minimal effectiveness in terms of having a significant impact on achievement levels and suggesting a need to develop programs and services that will adequately challenge and meet the academic needs of high ability learners.

Although the previous studies mentioned offer insight into gifted programming, looking at achievement within the general setting is important since that is where high ability learners spend much of their time. Trinter et al. (2015) found that incorporating differentiated educational games in a primary setting was more effective than traditional mathematics instruction and Gavin, Casa, Firmender, and Carroll (2013), who implemented advanced geometry and measurement curriculum in a first-grade, general education setting, saw positive effects where the experimental group showed a deeper understanding of those concepts on open-response assessments than the comparison group. Gavin, Casa, Firmender, and Carroll (2013), much like Rubenstein et al. (2015), found positive signs that working with classroom teachers in the general education setting on differentiated practices and instruction that focus on advanced learners and curriculum is beneficial and produces measurable results.

Collaboration

Although the research on differentiating instruction with a component of collaboration or coaching (Table 4) is limited, it can provide a window into how future research can build onto past results and incorporate some of the components found to be effective. For example,

Saclarides and Harbour (2023) found that through one-on-one coaching, much of the discussion on differentiated instruction was focused on learners who were struggling and the content and process aspects of differentiation. Although the sample size of this study was one, it highlights a need for further research on how coaches can effectively support teachers in differentiation. Livers et al. (2018) had a direct focus on high ability learners where teacher candidates worked with their mathematics methods instructor and gifted and talented coordinator at the elementary school to collaborate on providing curriculum compacting as a form of differentiated instruction. This weekly collaboration increased the teachers' confidence in differentiating instruction for high ability learners and suggests the need for additional research on the effect collaboration has on providing differentiated instruction.

Table 4

Studies on Differentiated Instruction Aided by Collaboration or Coaching

Study	Change in Practice	High Ability Learners	Elementary	Mathematics	United States
Goddard & Kim, 2018	X				X
Livers et al., 2018		X	X	X	X
Muir et al., 2021	X		X	X	
Saclarides & Harbour, 2023			X	X	X

Although not focused on high ability learners, Goddard and Kim (2018) looked at the relationship between collaboration, differentiated instruction, and teacher efficacy. They found a link between the three components where teachers who implemented more differentiated practices also had greater amounts of collaboration and self-efficacy (Goddard & Kim, 2018). This cyclical relationship has positive implications for future research, where adding a

collaborative component to a study on differentiated instruction can result in positive changes in teacher practice and achievement. A study completed in the Netherlands (Muir et al., 2021) had similar results, although researchers looked at the relationship between collaboration, differentiated instruction, and change in teacher practice. As teachers were introduced to adaptations to focus on personalized learning in mathematics, they worked collaboratively on developing or adapting pre-assessments and grouping learners according to their performance which led to a sense of shared responsibility for their cohort of learners (Muir et al., 2021). This study focused on fifth- and sixth-grade learners but has positive implications for teachers who want to bring about changes in their mathematics teaching and learning practices through differentiated instruction.

Summary

Although there are criticisms and challenges to differentiated instruction, positive results have been shown when it is based on a solid curricular foundation, flexible grouping occurs, and a collaborative culture is present (Gavin, Casa, Adelson, and Firmender, 2013; Gavin, Casa, Firmender, and Carroll, 2013; Goddard & Kim, 2018; Muir et al., 2021; Rubenstein et al., 2015). Because classrooms present such diverse needs, differentiating instruction may feel lofty, but necessary, especially for high ability learners who need frequent exposure to advanced curriculum to show achievement gains (Card & Giuliano, 2015; Cho et al., 2015; Gavin, Casa, Adelson, and Firmender, 2013; Gavin, Casa, Firmender, and Carroll, 2013; VanTassel-Baska et al., 2008).

Additionally, many studies on which differentiated practices are or are not occurring in classrooms exist, but more research is necessary to develop clearly articulated differentiated frameworks that indicate learning outcomes and teacher change (Muir et al., 2021). Implications

for this research include providing further insight into how coaching and collaboration in classroom-based learning environments can produce salient outcomes in teacher efficacy, learner achievement, and differentiated practices for learners with mathematical promise (Rubenstein et al., 2015).

CHAPTER 3

METHODS

To help fill the research gap in how coaching and collaboration focused on differentiated practices can produce measurable outcomes for a teacher's sense of efficacy and academic growth for advanced learners, this action research study used multiple sources for data analysis. To understand the existing SGP growth trends for first graders in the district, 9 years of district Star Math data was analyzed and sorted by high achieving and low- to mid-achieving learners. Star Math SGP growth trends for the individual teachers was also used. For measuring learner growth during the action research timeline, new data from the Fall 2023 and Winter 2024 Star Math assessments was collected. Due to the small sample sizes, changes in teacher practice and efficacy were measured using descriptive statistics for the mean (*M*) and standard deviation (*SD*) for the CPS-R and TSES, and open response data was collected for a holistic understanding of how the first-grade teachers perceived the coaching experience.

This study followed a mixed-methods, quasi-experimental design where the new sets of data were collected and analyzed in the fall and winter to aid in the overall interpretation of the action research intervention (Creswell & Creswell, 2020). This approach was selected as the learners cannot be randomly assigned, but the data sets can be synthesized to develop a stronger understanding of the coaching. The methods chosen for this study are not meant to validate a differentiation or coaching model, but rather to analyze the effects of coaching classroom teachers on ways to provide differentiated learning experiences for all learners in the general

education setting, with a specific focus on those showing mathematical promise (Rubenstein et al., 2015).

Action Research Questions

1. To what extent does coaching first-grade classroom teachers affect their differentiation practices for mathematically promising learners?
2. If teachers change their differentiation practices, to what extent does the change affect the academic performance of mathematically promising learners?
3. If there is a change in the academic performance of mathematically promising learners, to what extent does the change affect a teacher's sense of efficacy?

Action Research Approach

Description of the Action Research Intervention

The goals of the differentiation coaching included: (a) changing teacher practice as it pertains to increasing their differentiation of mathematics instruction for mathematically promising learners, (b) increasing the achievement growth of mathematically promising learners, and (c) increasing a teacher's sense of efficacy. Although differentiation coaching also occurred during the 2022-2023 school year, this study sought to gain a comprehensive understanding of sustained coaching using multiple measures. This continuation of coaching into a second school year meant the first-grade team and differentiation coach could build off and refine the work put into the 2022-2023 school year where they revised seven mathematics units by consistently following the subsequent steps:

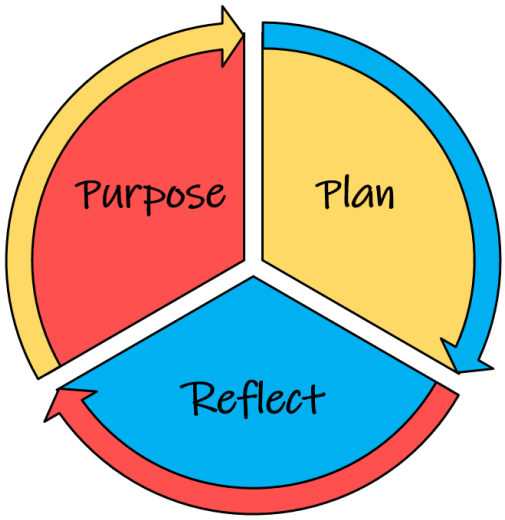
1. Identifying the critical content and standards within the mathematics unit.
2. Clarifying unit expectations as outlined by the district's trimester pacing guide.
3. Reflecting on what was and was not working with previous curriculum modifications.

4. Designing or modifying unit pre-assessments.
5. Focusing instruction to be more inquiry-based and intentional by breaking down the unit objectives into lesson goals.
6. Analyzing learner data.
7. Incorporating additional opportunities for differentiation by creating choice boards that match achievement levels, including learners showing mathematical promise as designated by the unit pre-assessment.

Coaching continued about every other week during the 2023-2024 school year in 30–60-minute increments to continue to reflect and tweak any curriculum changes as the team deemed necessary. Additionally, during this school year the coaching followed the Collaborative Process Model, as represented in Figure 2, where each coaching session focused on setting a purpose, planning, and reflecting (Mofield & Phelps, 2020). All qualitative and quantitative data was collected in the fall and winter as a pre- and post- measure of the coaching intervention, and the analysis process was rooted in action research because it was built around plans of action that may not always follow a linear path due to the complexities that come with teaching (Stringer & Ortiz Aragon, 2020).

Figure 2

Collaborative Process Model for Coaching in Gifted Education



Note. The coaching process is intended to be cyclical yet fluid and overlapping. The overlapping colors and arrows represent the general flow of the process where one aspect of the model can influence the next.

Role of the Researcher

It should be noted that I was both the researcher and the differentiation coach. This meant I took on an active role as I provided support for the classroom teachers as they worked through the curriculum revisions and implementation process. To help mitigate unintended bias, the CPS-R and TSES were selected to collect classroom teacher data as they reflect both reliability and validity in assessing teachers' use of differentiation strategies and their sense of efficacy (Pereira et al., 2021; Tschannen-Moran & Woolfolk Hoy, 2001). Additionally, I controlled for bias by primarily focusing on quantitative data, where the axiological and methodological assumption of quantitative research is that it reflects intellectual honesty and suppresses personal bias when conducted well (Mertens & Wilson, 2019). The open-ended responses were also designed not to sway or persuade the first-grade teachers to answer in a certain way.

Participants

The participants of this action research study included the differentiation coach, the first-grade teachers, and the first-grade learners, with an emphasis on analyzing growth data from those identified as mathematically promising by scoring at or above the 85th percentile on the fall Star Math assessment. The first-grade team was selected as they attended the personalized learning training in the summer of 2022 and expressed interest in continuing the work that had started in developing differentiated math units. All three teachers were female and have taught first grade for at least the past four years. One of the teachers has taught for 6 years and two of the teachers have taught for 4 years.

Data Sources

This action research study used four sources of data for its analysis. Star Math assessments were used for measuring the effect on learner performance, the CPS-R survey was used for measuring the effect on teacher practice, the TSES survey measured the effect on teacher self-efficacy, and open response questions offered additional insight into the coaching intervention and offered data on changes in teacher practice and their sense of efficacy.

Star Math

Star is the district's standardized assessment tool and is given every fall, winter, and spring. The district expectation is a Student Growth Percentile (SGP) of 55 on the Star Math assessment from fall to spring. The assessment has high alignment between the test content and curriculum standards, and the internal reliability for Star is .95 with its test-retest reliability of .91 (Renaissance Learning Inc., 2020). In addition to this, hundreds of studies show Star assessments correlate strongly with other achievement tests with cumulative evidence of

criterion-related validity, convergent and discriminant validity, and demonstrated accuracy of screening and diagnostic classifications (Renaissance Learning Inc., 2020).

The math test is 34 questions long and the fall and winter data were collected and analyzed for achievement growth. The assessments were given in a whole group setting, unless specified otherwise by special education accommodations, on district-provided iPads, where each learner is provided their own device for the school year. Learners wore headphones during the assessment, but questions could be read to the learner, if necessary, to mitigate their reading level masking their mathematics ability, as there are times when the audio simply states, "Choose the best answer," and the learner was not yet an independent reader. Results of the assessment were available for the classroom teacher immediately following the completion of the assessment.

Classroom Practices Survey - Revised

The Classroom Practices Survey – Revised (CPS-R) (Appendix A) is a psychometrically sound self-assessment instrument that assesses a teacher's use of differentiation strategies at the low, average, and high achievement levels. The survey consists of 40 items split into four subscales which include questioning and thinking, providing challenges and choices, reading and writing assignments, and curriculum modifications. For this action research study, the third subscale on reading and writing was removed as it is outside the scope of the research questions since the focus of this study is on differentiation in mathematics, resulting in 32 items between the three remaining subscales. The CPS-R is an up-to-date instrument on collecting information regarding differentiation strategies and has evidence of internal consistency with estimates ranging from .81 to .94 as well as validity and reliability among the different achievement levels and subscales (Pereira et al., 2021).

This self-assessment instrument was selected for a variety of reasons. First, it disaggregates the teacher practice responses by achievement level, making it appropriate for this study which focused on changes in practice for mathematically promising learners. Second, this instrument focuses on differentiation practices on questioning and thinking, providing challenges and choices, and curriculum modifications, which matched the focus of the collaboration between the differentiation coach and first-grade teachers. The questioning and thinking portion matched the team's focus on inquiry-based instruction, the challenges and choice portion matched the focus on developing choice boards for mathematically promising learners, and the curriculum modifications portion matched the focus on making intentional changes to seven mathematics units. The third reason this instrument was selected is because it represented quantitative data, thus helping to mitigate bias within the study.

Teachers' Sense of Efficacy Scale

The Teachers' Sense of Efficacy Scale (TSES) (Appendix B) is a valid and reliable instrument designed for measuring teacher efficacy in student engagement, instructional practices, and classroom management. The long form, which was used in this study, contains 24 items total with eight items in each efficacy subscale. The tool has evidence of construct validity, showing positive correlations with other self-efficacy tools, and the reliabilities for the subscales are 0.87 for student engagement, 0.91 for instructional practices, and 0.90 for classroom management with an overall reliability of 0.94 for assessing efficacy (Tschannen-Moran & Woolfolk Hoy, 2001).

This instrument was selected as it was designed specifically to measure teacher efficacy. The long form was selected over the short form as it contains more questions around differentiation and working with high achieving students, referred to as "very capable," which

was the primary focus of the coaching intervention. The student engagement items reference helping learners with critical thinking and valuing learning, the instructional practice items reference asking good questions, adjusting the level of instruction, and providing appropriate challenges, and the classroom management items reference establishing routines and grouping students. Overall, this instrument offered a quantitative look into teacher efficacy which helped mitigate bias in this study while giving insight into coaching supports affecting efficacy beliefs.

Open-Ended Responses

The open-ended response prompts were intentionally designed to gain a more personalized insight into the coaching intervention since this is the second year of the intervention. Because the seven instructional units were initially revised and piloted during the 2022-2023 school year, the classroom teachers may have experienced growth last year that will not show in the data collection and analysis. This means the growth results in the CPS-R and TSES may have been stifled from higher practice or efficacy levels at the start of the 2023-2024 school year. However, this reality parallels the coaching intervention, which focused on how to engage in practices for those already starting above the average learner. With the three response items, one targeted a response regarding practice, the second targeted efficacy, and the third was left open for additional feedback. This qualitative aspect of the study provided a more holistic understanding of the impacts of differentiation coaching.

Data Collection

The exploratory portion of this mixed-methods, quasi-experimental study included collecting Star data that spanned from the 2013-2014 school year to the 2022-2023 school year to analyze the SGP growth trends from fall to winter for low and mid achieving learners and high achieving learners (Creswell & Creswell, 2020). Although the collection of the historic data did

not contribute to answering the research questions, it helped provide perspective on achievement level growth trends and gave context for the 2023-2024 data. This data was collected from the district's Assessment Analyst in the fall when the action research study began. The data included first grade Star Math data that could be filtered and analyzed by elementary school, and included the fall to winter SGP, winter to spring SGP, and fall percentiles. It did not include student identifiers such as gender, race, or ID number as those were outside the scope of this action research study.

The next step was to collect the fall data from the CPS-R, TSES, open-ended feedback, and the fall Star math assessment. Star assessments were completed in the learners' classroom on their district issued iPad. Learners wore headphones during the 34-question assessment, and it took approximately 30 minutes to complete. Results of the assessment were calculated instantly, and scores were available to the teacher, school, and district on their Star dashboard. The three first-grade teachers participating in revising and implementing the mathematics units also completed the CPS-R, TSES, and open-ended feedback form for the first time at the beginning of October during the 2023-2024 school year. The second set of data was collected in January 2024 with learners taking the winter Star math assessment and teachers completing the CPS-R, TSES, and open-ended feedback form within two weeks of that assessment.

Data Analysis

Analysis of Teacher Practice

CPS-R Analysis. After the CPS-R was completed by the first-grade team, individual responses were recorded. Response averages and standard deviations within each section were calculated. Once the CPS-R was completed for the second time, all individual responses were documented, and response changes were noted and shared using descriptive statistics.

Teacher Practice Open-Ended Responses. To analyze the fall and winter responses from the first-grade teachers, Tesch's (1990) eight-step process was followed:

1. On the first read through, write down your initial thoughts and ideas.
2. On the second read through, write down the considered meaning of the responses.
3. Create a list of topics and cluster similar topics together.
4. Abbreviate topics as codes and write them next to the interview responses.
5. Find the most descriptive wording for the topics and then them into categories, noting any interrelationships.
6. Make a final decision for code abbreviations and alphabetize them.
7. Assemble data for each category.
8. If necessary, recode existing data.

The coding process was followed for each of the three questions. A summary of the results is represented in Tables 5, 6, and 7; the assembled data are shown in Table 8. The responses were also color-coded into categories during Step 4 of the coding process, as seen in Tables 9 and 10.

Table 5

Coding Process for Coaching Influencing Teacher Practice

Steps	Fall	Winter
1 and 2: Initial thoughts and meanings	Teachers want something tangible to implement. It is important to increase the knowledge base and understanding for how to differentiate higher. Lots of mention of increased understanding and tangible things increasing confidence. Evidence of teacher actions changing from coaching.	Coaching influenced practices. The time was valued for discussion and problem solving along with tangibles. The application piece was there. The time was valued for discussion and problem solving along with tangibles. Teachers recognize essential components to differentiate.
3 and 4: Clustered topics and codes	T: Tangible Things, A: Actions, D: Differentiation, U: Understanding, F: Feelings	D: Differentiation practices, A: Actions, I: Instructional components, V: Value added, C: Collaboration
5: Categories	Teacher Tangibles, Teacher Actions, Learner Experiences, Increased Understanding, Teacher Feelings	Teacher actions, Differentiated practice, Instructional components, Collaboration, Value added
6: Interrelationships	Actions for what was done seem to be directly tied to increased actions for differentiation.	Overlap between action words and active implementation of differentiated practices.
7: Alphabetized codes	A: teacher actions, D: learner differentiated experiences, F: teacher feelings, T: teacher tangibles, U: increased understanding	A: teacher actions, C: collaboration, D: differentiated practice, I: instructional components, V: value added

Note. Fall and Winter responses were coded separately to avoid assumptions that codes, topics, or categories would repeat. Because of this, a letter used in the Fall may represent something different than the Winter and vice versa.

Table 6

Coding Process for Coaching Influencing Sense of Efficacy

Steps	Fall	Winter
1 and 2: Initial thoughts and meanings	Coaching went beyond teacher impact – it affected learners. Evidence of understanding there are multiple ways to show proficiency. Sometimes teachers just want/need/appreciate something given as a starting point to feel successful. Supports for learners, when intentionally thought about, provided, or created can advance learning and focus on strengths. Marzano connection with students tracking learning and taking ownership.	Confidence is tied to knowledge and tangibles. There is more than one way to differentiate (essential understanding)
3 and 4: Clustered topics and codes	T: Tangible Things, A: Actions, O: Outcomes	AL: learner actions, AT: teacher actions, C: classroom application, T: tangibles
5: Categories	Teacher Tangibles, Teacher Actions, Learner Actions, Learner Outcomes and Experiences	Learner actions, Teacher actions, Differentiation, Tangibles, Collaboration
6: Interrelationships	Lots of overlap within these categories between tangibles and outcomes and actions and outcomes. Overlaps exist between teacher and learner actions, outcomes, and tangibles. They seem to play off each other.	Overlap between classroom application and learner actions
7: Alphabetized codes	A: Teacher and learner actions, T: Teacher tangibles, O: Learner outcomes and experiences	AL: learner actions, AT: teacher actions, C: collaboration, D: differentiation, T: tangibles

Note. Fall and Winter responses were coded separately to avoid assumptions that codes, topics, or categories would repeat. Because of this, a letter used in the Fall may represent something different than the Winter and vice versa.

Table 7

Coding Process for Additional Comments

Steps	Fall	Winter
1 and 2: Initial thoughts and meanings	The results go beyond raising achievement scores – Growing teachers is just as important as growing learners. Teachers want to learn and are grateful for meaningful learning experiences. Regardless of learner outcomes, a difference was made.	Teacher A values knowledge and essential pieces. Teacher B values collaboration and incorporates feeling words in responses. Teacher C values tangibles and actions. The experience for all was positive and helpful. All teachers found value in different ways and achieved the same outcome. Coaching was a process that took time, but you need to listen to needs and create tangible solutions.
3 and 4: Clustered topics and codes	O: Outcomes, A: Actions, F: Feelings, T: Tangibles, E: Experiences	F: feelings, C: collaborative actions, V: value added, T: tangibles, A: actions
5: Categories	Teacher outcomes, Teacher actions, Teacher feelings, Coaching tangibles, Learner experiences	Collaborative actions, Feelings, Tangibles, Differentiation
6: Interrelationships	Lots of overlap again between tangibles, teacher actions, and learner experiences.	Overlap between coaching action and collaboration as well as learner action and differentiation
7: Alphabetized codes	A: Teacher actions, E: Learner experiences, F: Teacher feelings, O: Teacher outcomes, T: Coaching tangibles	A: teacher actions, C: collaborative actions, D: differentiation, F: feelings, T: tangibles

Note. Fall and Winter responses were coded separately to avoid assumptions that codes, topics, or categories would repeat. Because of this, a letter used in the Fall may represent something different than the Winter and vice versa.

Table 8

Assembled Data for Open-Ended Responses

Coding Categories	Question					
	1 Fall	1 Winter	2 Fall	2 Winter	3 Fall	3 Winter
Teacher and learner actions	Digging deeper, Help, Giving, Providing, Scaffold, Push, Match, Looking, Grouping, Creating	Provide, assess, guide, work, plan, try, make, talk, look, push	Offer, Give, Create, Show, Feel, See, Track	Learned, find, gives, talk, learn, know, helped, Engage them, Work, Push, Grow, Expand	Teaching, Working, Process, Implement, Digging, Looking, Personalizing	Scaffolding, align, break down, help, brainstorm, listening, making, mapping, finding, track, assess
Learner outcomes, Differentiation, Instructional Practices	Match their level, Reaching/teaching where they are, Scaffolding instruction, Match needs, Higher further, Group	Differentiation, Personalized, Instruction, Reach all students, Look deeper, Scaffold, Push students further, Ready, Lessons, Standards	Fluency, Skills, Choices, Proficiency, Support, Advance learning, Ownership, Strengths, Grow	High achieving learners, Areas to work, Where students are at, How and where to, Push, Student opportunities	Personalized learning	Help all students, Opportunity, Opportunities, Learning in other ways
Teacher feelings, Feelings	Confidence, Understanding				Enjoyed, Appreciated	Appreciated, wonderful, ready, enjoyed
Teacher outcomes, Increased Understanding, Value added	Standards x2, Progression of learning, Needs of learners, Best practices, Differentiating progression	Opportunities, appreciate time, opportunity, helpful, talk about, concerns, questions, clarification, helped			Helped teaching other areas, Classroom implementation	
Coaching tangibles and Teacher tangibles	Activities, Opportunities for success, Assessments, Lessons		Activities, Choices, Choice boards, Ideas, Games, Lessons	Variety, materials, more confidence, knowledge	Help, New information, Knowledge, Advice, How to personalize	Units, lessons, standards, new ideas, choice boards
Collaborative actions, Collaboration		Work with, we, have someone, our		With		Talk through, walk through, help us, listening ear, help with confusion, questions

Table 9

Fall Color-Coding for Open-Ended Responses

Question	Teacher		
	A	B	C
1	Providing students with activities to match their level Understanding of the standards and progression of learning	The coaching process has helped me to better understand the needs of all my students and the best practice of teaching them. I feel I have a better understanding of the differentiating progression. I also feel more confident that I'm reaching/teaching students where they are at and giving them opportunities to be successful.	It has helped me to dig deeper into the standards and look at how to scaffold instruction, help those who are lower and push those students who are higher further. It's helped me to group students based on their needs and create assessments and lessons that match what they are needing.
2	Activities for them to grow their fluency and skills rather than busy work Offering choices in ways to show proficiency.	I definitely feel more confident in my ability to differentiate for high achieving learners due to the coaching process. We were given great ideas, games, activities, and lessons to support these learners.	It's helped me to create choice boards where they can advance their learning to a higher level. I'm able to see that students will have strengths in some areas and not others. They are able to track their learning and take ownership.
3	It has helped my teaching in other areas as well.	I have really enjoyed working with/through the differentiation coaching process. I have appreciated the new information and knowledge and advice on how to best implement it in my classroom.	I have enjoyed digging into the standards and looking at how to personalize each students' learning experience.

Note. Each question was coded separately to avoid assumptions that categories would repeat. Because of this, the colors between questions often represent different coding categories. Question 1: Red – tangibles, Orange – actions, Green – differentiation, Blue – understanding, Purple – feelings; Question 2: Red – tangibles, Green – outcomes, Blue – actions; Question 3: Red – outcomes, Orange – actions, Green – feelings, Blue – tangibles, Purple – experiences

Table 10

Winter Color-Coding for Open-Ended Responses

Question	Teacher		
	A	B	C
1	It has gotten me to provide more differentiation for personalized instruction and more opportunities to assess to guide instruction.	Yes - I appreciate the time and opportunity to work with the coach as we plan and try to make our lessons reach all students. It's been helpful to have someone to talk to about concerns or questions/clarification. I'm also able to look at our lessons in a more understanding way.	It has helped me to look deeper at the standards and be able to scaffold. It's also helped me push students further who are ready.
2	I have learned how to find a variety of materials for high achieving learners to engage them in areas they need to work on.	Yes - it gives me more confidence as I'm able to talk through it with the coach and learn from her. I know where students are at, and how and where to push them.	It has helped me to find ways to give H.A. students opportunities to grow and expand their knowledge.
3	I have appreciated the opportunity to talk through the scaffolding of units/lessons, opportunities for differentiation, and how to align lessons to standards.	It's been wonderful having a coach to walk through and help us break down lessons to best help all students. She's been a listening ear and always ready to brainstorm new ideas and help with any questions or confusion.	I have enjoyed making choice boards, mapping out each unit and finding ways to track/assess their learning in other ways.

Note. Each question was coded separately to avoid assumptions that categories would repeat. Because of this, the colors between questions often represent different coding categories. Question 1: Red – differentiation practices, Orange – actions, Green – instructional practices, Blue – value added, Purple – collaboration; Question 2: Red – teacher actions, Orange – learner actions, Green – tangibles, Blue – differentiation; Question 3: Red – feelings, Orange – collaborative actions, Green – tangibles, Blue – teacher actions, Purple – differentiation

Analysis of Academic Performance

Star Scores. To analyze the previous years of fall to winter data, from the 2013-2014 school year to the 2022-2023 school year, the yearly mean and standard deviation were calculated for the SGP growth for high-ability learners and mid to low ability learners from fall to winter, as SGP is the growth indicator used by the school district (Berkman & Reise, 2012). The groups will be those between the 1st and 84th percentile, and those at or above the 85th percentile. Because there were variables such as the COVID-19 pandemic, teacher turnover, and curriculum changes, a 10-year span was selected to have a larger scope to look for trends. The results from this analysis provided perspective on the typical SGP growth for high ability learners within the district in which the action research study took place. Additionally, the average SGP growth for the individual first grade teachers were calculated from the past 4 years to give insight into their typical growth trends with their learners.

Upon completion of the winter Star Math assessments in January 2024, the mean SGP growth was calculated again and compared to the district and individual teacher's trending SGP growth. It should be noted that although the district has a goal of an SGP growth of 55 in mathematics, this pertains to the growth from fall to spring, so the analysis will be helpful in identifying the trending growth from fall to winter, with a specific focus on the trending growth for high ability learners. As with the CPS-R results, descriptive statistics were used to compare the 2023-2024 data to the previous years' data sets. Results were interpreted in terms of how the current scores compared to the district and individual teacher averages.

Analysis of Teachers' Sense of Efficacy

Teachers' Sense of Efficacy Scale. The TSES is meant to be scored by computing the means of each subscale, those being the efficacy in student engagement, efficacy in instructional

strategies, and efficacy in classroom management. Those averages were calculated in the fall and winter and, as with the other data analysis, descriptive statistics were used to analyze the results.

Sense of Efficacy Open-Ended Responses. The second and third open-ended response prompts were meant to provide insight into the first research question. As with the first research question, inductive coding was used following Tesch's (1990) process to build a self-efficacy and teacher change theory based on patterns that emerge from the interview questions (Creswell & Creswell, 2020; Saldaña, 2015. Table 11 provides the data source and data analysis for each action research question.

Table 11
Action Research Methodology

Evaluation Question	Data Sources	Data Analysis
To what extent does coaching first-grade classroom teachers affect their differentiation practices for mathematically promising learners?	CPS-R Open-ended responses	Individual response changes Descriptive statistics Inductive coding
If teachers change their differentiation practices, to what extent does the change affect the academic performance of mathematically promising learners?	Star Math data extraction from the district Fall and winter Star Math	*M* and *SD* Descriptive statistics Comparison to historic district and teacher SGP averages
If there is a change in the academic performance of mathematically promising learners, to what extent does the change affect a teacher's sense of efficacy?	TSES responses Open-ended responses	Individual response changes *M* and *SD* of each subscale Descriptive statistics Inductive coding

Note. CPS-R = Classroom Practices Survey – Revised; TSES =Teachers' Sense of Efficacy Scale; SGP = Student Growth Percentile

Delimitations, Limitations, and Assumptions

Delimitations

This study was inclusive of first-grade teachers and first-grade learners in North Dakota. Additionally, the three classroom teachers worked through the curriculum redesign process with a differentiation coach. Feasibility of time and bandwidth were also considered when determining the data collection period as well as the number of participants. This study was also intentionally designed to incorporate inquiry-based instruction and individualized learning opportunities through choice boards as differentiation strategies. Inferences drawn from this study should not extend beyond this scope, although action research studies with other grade levels, subject areas, or larger sample sizes would be useful extensions.

Limitations

This action research study was limited in its ability to extend its findings beyond the intervention provided and the school in which the study was conducted. The curriculum revisions were also rooted in the math curriculum the district uses. Because the researcher in this study was the differentiation coach and worked closely with the first-grade teachers throughout the revision process, this study could have participant and researcher bias, although intentional steps were taken to mitigate that bias. Additionally, due to the nature of action research and the small sample size, the findings in this study are not meant to be generalized. The small sample size also eliminated the opportunity for the school's achievement data to be broken down by race demographics, as data within a school that has a sample size smaller than 10 cannot be shared. In this case, the sample sizes for each demographic group at or above the 85th percentile on Star Math would need to be greater than 10 or the race would simply be shared as *other*. As a final

note, the goal of the study was to provide clarity on the implications of differentiation coaching that took place in this elementary school and readers should take caution in applying the results to other settings.

Assumptions

The primary assumption for this action research study was that differentiation and instructional coaching is effective. It also assumed the classroom teachers responded honestly during the CPS-R, TSES, and open-response opportunities and the learners gave their best effort during the Star Math assessments. Honesty benefits the participants, researcher, school, and district in future decision-making regarding differentiation options and curriculum redesign. Additionally, it assumed the instruments used for data collection were valid and reliable sources, and that the mathematically promising learners were adequately identified.

Ethical Considerations

Ethical considerations for this action research study included the exclusion of learner, teacher, school, and district names in the action research report. Following the approval of the study proposal, the study was submitted to William & Mary's IRB. Additionally, the researcher obtained consent and approval from the school district's action research representative. Finally, each first-grade teacher was provided with an informed consent form, as seen in Appendix D, which allowed them the opportunity to refuse participation in the study.

Timeline

This action research study occurred during the 2023-2024 school year where the collaboration continued to reflect and tweak any curriculum changes as the team deemed necessary. During this phase, the following data were collected: (a) trending Star Math data; (b) Fall 2023 Star Math, CPS-R, TSES, and open-response data; and (c) Winter 2024 Star Math,

CPS-R, TSES, and open-response data. The analysis of trending data and initial teacher response analysis occurred in the fall with the comparison data analysis occurred after the completion of the winter data collection.

CHAPTER 4

FINDINGS

The results of this action research study will be presented in order of the research questions, timeframe, and data type. For the first research question about the extent the coaching affected teacher practices, the fall responses for the CPS-R and open-ended questions will be analyzed, followed by the winter responses for the CPS-R and open-ended questions, and concluding with a comparison of the responses. The second research question about the extent the change in practice affected the performance of mathematically promising learners will start with the analysis of the historical SGP growth data for the district and the individual teachers, move into the winter results, and conclude with a comparison of the results. The third research question about the extent to which the change in learner performance affected the teachers' self-efficacy will start with the analysis of the fall responses for the TSES and open-ended questions, followed by the analysis of the winter responses for the TSES and open-ended questions, and conclude with a comparison of the responses. Overall, the results show a positive increase in their differentiated instructional practices for their high achieving learners and a positive increase in their self-efficacy about their instructional practices. However, there was not an increase in the achievement growth of their high achieving learners compared to their mid to low achieving peers nor compared to each teacher's trending achievement growth data.

Research Question 1 Teacher Practice Findings

CPS-R

The CPS-R survey results (Table 12) show the mean and standard deviation for how the first-grade teachers responded to the questions regarding their teaching practices within the categories of questioning and thinking, providing challenges and choices, and curriculum modifications among different achievement levels. Because of the sample size, the data cannot be analyzed for statistical significance; however, the data are explained descriptively.

Table 12

Classroom Practices Survey - Revised Results

Category	Level	Teacher A				Teacher B				Teacher C			
		Fall		Winter		Fall		Winter		Fall		Winter	
		M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Questioning and Thinking	Low	3.60	0.52	3.90	0.74	3.30	1.12	3.40	1.17	3.50	1.27	4.10	1.20
	Mid	3.60	0.52	3.90	0.74	3.30	1.16	3.65	1.18	4.10	0.99	4.40	1.27
	High	3.60	0.52	3.90	0.74	3.30	1.16	3.60	1.17	4.20	0.79	4.40	1.27
Providing Challenges and Choices	Low	2.36	1.50	2.55	2.34	0.64	1.29	2.55	1.81	2.09	1.70	1.91	1.76
	Mid	2.36	1.50	2.82	2.09	0.82	1.33	2.68	1.62	1.91	1.70	2.27	1.79
	High	2.36	1.50	3.27	2.05	0.91	1.70	2.73	1.62	2.00	1.67	2.46	1.75
Curriculum Modifications	Low	1.91	1.30	2.91	2.12	3.00	1.10	3.68	0.85	2.64	1.12	2.82	0.98
	Mid	1.91	1.30	3.55	1.51	3.00	1.10	3.68	0.85	2.72	1.10	3.09	0.94
	High	1.91	1.30	4.00	1.34	3.00	1.10	3.68	0.85	2.72	1.10	3.09	0.94

Note. Questioning and Thinking had 10 questions, Providing Challenges and Choices had 11 questions, and Curriculum Modifications had 11 questions.

CPS-R Fall. For all three teachers, their reported implementation of questioning and thinking practices was higher than their reported implementation of providing challenges and choices and their reported use of curriculum modifications, regardless of the learner's achievement level. For Teacher A, their reported implementation for providing challenges and choices was higher than curriculum modifications. Teacher B and C's results show their reported of use of curriculum modifications was higher than providing challenges and choices, however Teacher C's results for those two categories are similar.

When looking at their individual responses, all three teachers used at least half of the 10 given questioning and thinking practices either *a few times a week*, as reported by a 3, *once a day*, as reported by a 4, or *multiple times a day*, as reported by a 5. For Teachers A and B their average for the frequency with which they implemented curriculum modification practices was lowest, but for Teacher C their average for the frequency with which they provided challenges and choices was lowest. Within those two sections, each teacher reported a 0, meaning *never used*, on one of the questions about their curriculum modification practices and on one or more of the questions regarding providing challenges and choices.

CPS-R Winter. The CPS-R winter survey results (Table 12) show how the first-grade teachers responded to questions about their teaching practices about three and a half months after completing the survey in the fall. Again, due to sample size, statistical significance was not calculated, and descriptive language was used to describe the findings.

The winter data shows the averages between the three teachers are similar to each other. For Teachers A and C, their highest reported category was in questioning and thinking, but for Teacher B their highest category was curriculum modifications, although for all three the questioning and thinking category averages were close to their curriculum modification averages.

Within the providing challenges and choices category, although all three teachers had this as their lowest category according to their average, they showed a higher average in their practices for high achieving learners than their mid and low achieving learners.

CPS-R Fall to Winter Comparison. For Teacher A, averages in every CPS-R category went up in every achievement level with the most dramatic increases occurring in the high achievement levels for providing challenges and choices and curriculum modifications. Most notably is their curriculum modifications average for high achieving learners which went from an average of 1.91, meaning they modified the curriculum to address the needs of their high achieving learners *a few times a month*, to an average of 4, meaning they modified the curriculum *daily*. For providing challenges and choices their average went from 2.36, meaning they engaged students in interest-based and readiness-based curriculum choices—including independent studies, advanced content, and interest grouping—*a few times a month*, to an average of 3.27, meaning they provided challenges and choices to high achieving learners *a few times a week*. Additionally, their top average moved from questioning and thinking to curriculum modifications, although their average for questioning and thinking still moved up slightly.

The comparison in Teacher B's fall to winter CPS-R responses also show an increased average in all categories. Providing challenges and choices shows the largest increase, with their average for challenges and choices increasing from 0.91 for high achieving learners, meaning around *once a month or less frequently*, to 2.73, meaning *a few times a week*. As with Teacher A, their highest average also changed with their curriculum modification average surpassing their questioning and thinking average. Their range from their highest to lowest average for high achieving learners also decreased from 0.91–3.3 in the fall to 2.73–3.68 in the winter.

Although Question 1 (“Has the differentiation coaching process influenced your teaching practice? If yes, how would you describe the influence on your teaching practice?”) and the open-ended prompt (“Please share any additional comments regarding your experience with the differentiation coaching process”) were designed to give insight into how coaching affected their differentiation practices, Question 2 (“Has the differentiation coaching process influenced your belief in your ability to differentiate for high achieving learners in your classroom? If yes, how would you describe the influence on your belief?”) also provided insightful data regarding differentiation practices. The comparison in Teacher C’s fall to winter CPS-R response shows an increased average in their questioning and thinking practices as well as their curriculum modification practices. For providing challenges and choices, their average increased for mid and high achieving learners and decreased for low achieving learners, but again the changes were small. The ranking in which their averages occurred with questioning and thinking having the highest average, providing challenges and choices having the lowest average, and curriculum modifications being in the middle also did not change from fall to winter.

Teacher Practice Open-Ended Responses

The summary of the coding process that followed the three open-ended questions (Tables 5, 6, and 7); assembled data (Table 8); and color-coded responses (Tables 9 and 10) followed Tesch’s (1990) process. Both the fall and spring responses provided insight into teacher practices and their sense of efficacy.

Teacher Practice Open-Ended Responses Fall. When tagging words for question one, overlap was found between differentiation and actions, or practices, that teachers were implementing. For example, Teacher A reported it had gotten them to provide students with “activities to match their level.” Teacher B reported they are “reaching/teaching students where

they are at." Teacher C reported it helped them "push those students who are higher further" and to "group students based on their needs." Teacher C also mentioned "creating" "assessments and lessons that match what they are needing." With Question 2, although it focused on self-efficacy and how the differentiation coaching process influenced their belief in their ability to differentiate for their high achieving learners, the coding process gleaned additional insight regarding their instructional practices. After coding the data there were many overlaps between tangible things and outcomes, both for teachers and learners. For example, teacher actions and tangibles such as creating activities, lessons, and choice boards led to Teacher C mentioning their learners "are able to track their learning and take ownership." Question 3, which asked for any additional comments regarding the differentiation coaching process, also gave insight regarding their teaching practices. For example, Teacher A wrote, "It has helped my teaching in other areas as well." The teacher actions that were coded included actions that occurred during the coaching sessions, such as digging and looking, but also in their classroom, such as teaching and personalizing. The learner experiences included personalized learning and the teacher outcomes included the implementation of advice given during the coaching sessions.

The overall takeaway from the fall responses was that the actions the teachers made because of the differentiation coaching process that occurred in the 2022-2023 school year were tied to an increase in their understanding and implementation of differentiated practices in their classrooms. Additionally, the way the teachers felt about receiving both abstract and concrete tangibles led to changes in their teaching practices regarding differentiated experiences for their high achieving learners. Teacher B wrote they "definitely feel more confident in my ability to differentiate for high achieving learners due to the coaching process," and that they "really enjoyed working with/through the differentiation coaching process."

Teacher Practice Open-Ended Responses Winter. When tagging words for Question 1, overlap was found between action words and active implementation of differentiation practices. For example, Teacher A mentioned they "provide more differentiation for personalized instruction," Teacher B referenced making lessons that "reach all students," and Teacher C referenced scaffolding to help "push students further who are ready." There was direct mention of differentiation coaching adding value. For example, Teacher B wrote "It's been helpful to have someone to talk to about concerns or questions/clarification. I'm also able to look at our lessons in a more understanding way." For Question 2, Teacher A mentioned "engaging" high achieving learners with a variety of materials, Teacher B mentioned working with thee coach allowed them to know where their students were at and "how and where to push them," and Teacher C mentioned giving high ability learners opportunities to "grow" and "expand." For Question 3, Teacher A referenced "opportunities for differentiation" through scaffolded units and lessons, Teacher B mentioned breaking down lessons to "help all students," and Teacher C mentioned "making choice boards" and working to "track/assess" learning.

Teacher Practice Open-Ended Responses Fall to Winter Comparison. Overall, the takeaway from the winter responses aligns to what was found in the fall responses where the differentiation coaching process led to an increased understanding and implementation of differentiation practices in their classroom. The responses referenced application of the tangible changes and materials that occurred during the coaching sessions. For example, Teacher C wrote they "enjoyed making choice boards, mapping out each unit, and finding ways to track/assess their learning." Additionally, their teaching practices were changed in areas outside of mathematics as referenced by Teacher A in the fall. The words "opportunity" and "opportunities" were also written frequently between the three teachers in both the fall and

winter, referencing how the coaching process allowed their practice to provide ways in which their mathematically promising learners could continue to grow.

Academic Performance Findings

District Data

The district SGP growth data, as seen in Table 13, was included in the results to give context to the individual teacher data. Although it does not contribute to answering the research questions, it provides perspective into growth norms. In 7 of the last 9 years, the average growth for high achieving learners, as defined by those scoring at or above the 85th percentile in the fall, has been lower than the rest of the first-grade population. The difference was statistically significant ($p < .05$) during the 2020-20221 school year (MedCalc Software Ltd., 2023). This is the year that followed virtual learning during the previous spring and a hybrid between virtual and in-person learning in the fall due to the COVID-19 pandemic. However, the average growth scores of high achieving first-graders has not met pre-pandemic levels. Compared to the 2019-2020 average growth, it was significantly lower in 2020-2021, $t(367) = -2.30$, $p < .05$, and 2022-2023, $t(516) = -3.91$, $p < .001$.

The 2023-2024 fall to winter growth data appears to follow the trend of past data where there is not a significant difference between the growth scores of the high achieving learners compared to the mid and low achieving learners. The 2023-2024 growth averages also do not exceed pre-pandemic growth averages again.

Table 13

District Student Growth Percentiles for First-Grade Learners

Year	Low- and mid-achieving learners			High-achieving learners			*N*
	n	M	SD	*n*	M	SD	*n*
2014-2015	528	57.55	27.37	201	54.16	24.17	729
2015-2016	644	54.38	28.95	174	53.82	29.41	818
2016-2017	645	54.6	27.74	160	53.03	28.15	805
2017-2018	694	56.57	28.00	166	59.75	27.74	860
2018-2019	718	52.76	28.11	204	52.27	28.81	922
2019-2020	693	54.01	29.08	232	54.16	29.13	925
2020-2021	670	50.42*	29.49	137	46.63*	32.34	807
2021-2022	645	51.49	28.86	279	51.1	28.88	924
2022-2023	673	47.07	28.14	286	44.27	28.27	959
2023-2024	778	47.72	29.00	233	48.26	28.71	1,011

*$p < .05$

Teacher Data

When analyzing the growth data for the three first-grade teachers, the data was first sorted by the means, standard deviations, and SGP growth score ranges for of each teacher's low and mid achieving learners. However, because the number of learners that scored as high achieving, which was defined as scoring at or above the 85th percentile on their fall STAR Math assessment, was low, their means and standard deviations were not calculated. Instead, the SGP ranges are listed, and the data is also represented in Box and Whisker plots to give a better visual representation of how the growth of the achieving learners compared to the mid and low achieving learners in each of the three first-grade classrooms.

Teacher A. For Teacher A, Table 14 represents their trending and current SGP growth data and Figure 3 visually represents the large range in SGP growth for all learners. During the 2019-2020 and 2020-2021 school years the high achieving growth was lower than most of the mid and low achieving learners, but slightly higher in the 2021-2022 school year and slightly lower in the 2022-2023 school year. Overall, the data from Teacher A is like the district data where high achieving learners tend to show lower growth than their other peers at various levels of severity. This continued for the 2023-2024 school year where their high achieving learners continued to show less growth than their mid or low achieving peers. However, Teacher A's 2023-2024 STAR Math growth appears lower overall compared to past years.

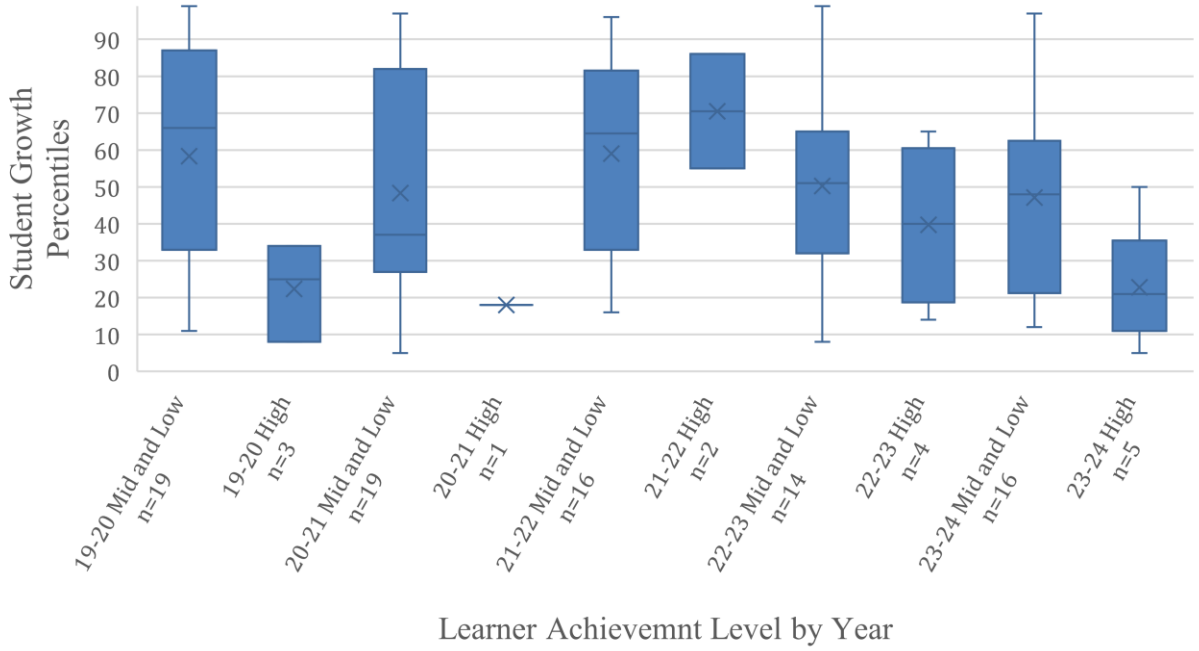
Table 14

Teacher A Student Growth Percentiles for First-Grade Learners

Year	Low and mid achieving learners				High achieving learners	
	n	SGP Range	M	SD	*n*	SGP Range
2019-2020	19	11-99	58.37	28.91	3	8 - 34
2020-2021	16	5 - 97	48.81	33.3	1	18
2021-2022	16	16 - 94	59	26.74	2	55-86
2022-2023	14	8 - 99	50.29	25.62	4	14 - 65
2023-2024	16	12 - 97	47.13	26.12	5	5 - 50

Figure 3

Teacher A STAR Math Student Growth Percentiles



Teacher B. The data for Teacher B, as seen in Table 15, also shows the range of growth between their learners to be large, both with high achieving learners and mid to low achieving learners. Figure 4 showcases just how wide the range of growth is, with no apparent trend occurring. With Teacher B, the high achieving learners are showing similar growth to their peers, despite the wide ranges. This means there are learners of all ability levels in the classroom showing both small and large growth scores. The 2023-2024 data again show their high achieving learners making similar, although slightly less, growth than that of their mid and low achieving peers. However, Teacher B only had one learner score at or above the 85th percentile during the 2023-2024 school year.

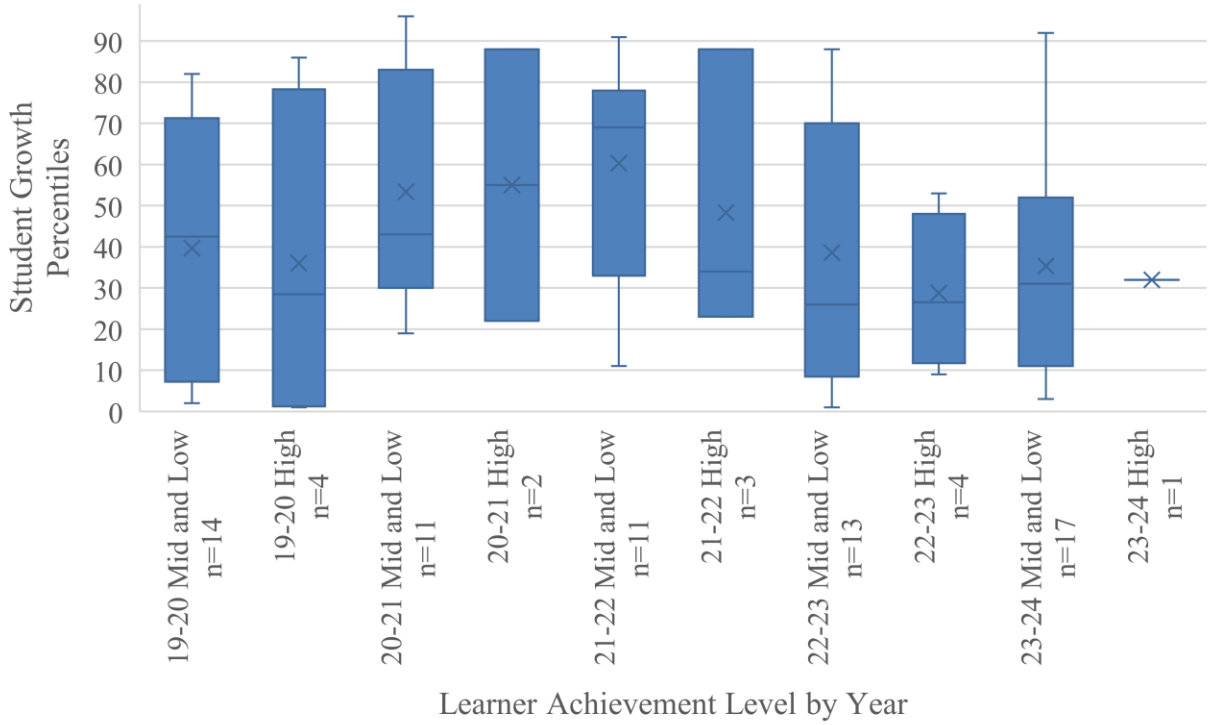
Table 15

Teacher B Student Growth Percentiles for First-Grade Learners

Year	Low and mid achieving learners				High achieving learners	
	n	SGP Range	M	SD	*n*	SGP Range
2019-2020	14	2 – 86	40.24	29.67	4	1 - 86
2020-2021	11	19 - 96	53.36	26.55	2	22 - 88
2021-2022	11	11 - 91	60.27	25.84	3	23 - 88
2022-2023	13	1 - 88	38.62	31.52	4	9 - 53
2023-2024	17	6 - 92	35.35	28.03	1	32

Figure 4

Teacher B STAR Math Student Growth Percentiles



Teacher C. For Teacher C, the data, as shown in Table 16 and Figure 5, again reflects a similarity to the district trends where the growth of high achieving learners appears similar but

often lower than their low and mid achieving peers with an exception in the 2021-2022 school year with their high achieving learner having a growth score well above the low and mid achieving average. However, because that year had a sample of one, this finding is not viewed as a break in the trend. The fall to winter growth data for 2023-2024 again shows a similar trend to their past data. They only have 4 years of data as opposed to 5, but it still shows their high achieving learners making similar growth as their mid to low achieving peers. However, as it was with Teacher B, they only had one learner at or above the 85th percentile at the beginning of the 2023-2024 school year.

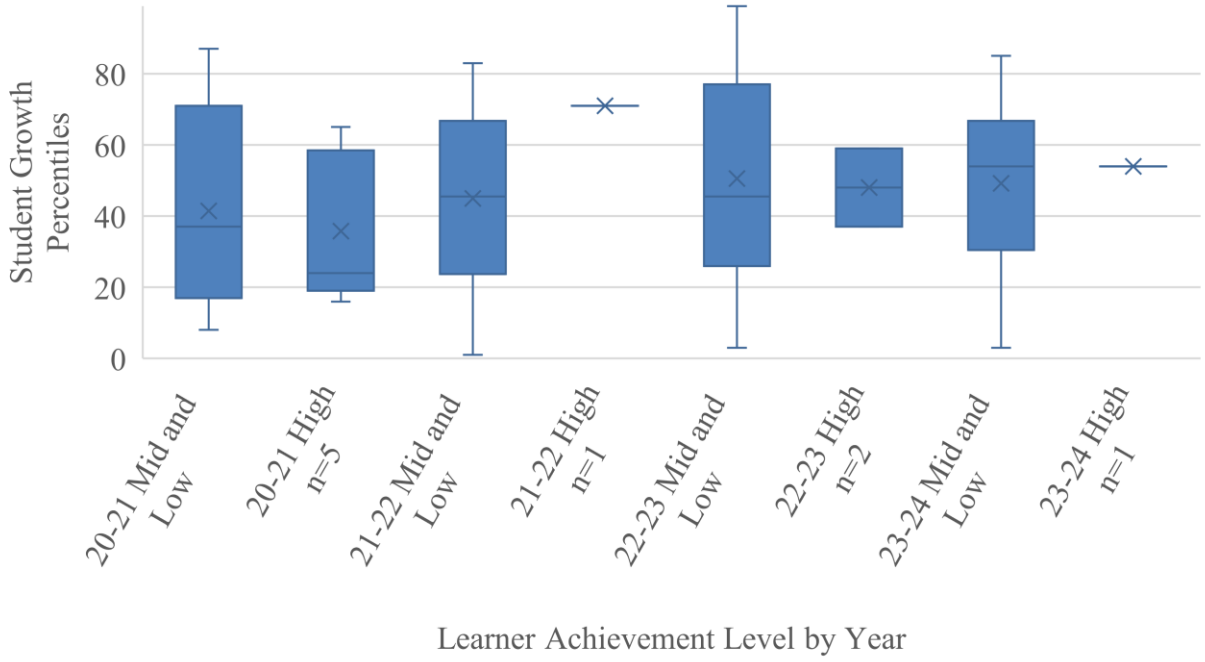
Table 16

Teacher C Student Growth Percentiles for First-Grade Learners

Year	Low and mid achieving learners				High achieving learners	
	n	SGP Range	M	SD	*n*	SGP Range
2019-2020						
2020-2021	15	8 - 87	41.47	26.92	5	16 - 65
2021-2022	16	1 - 83	45	25.11	1	71
2022-2023	14	3 - 99	50.57	31.33	2	37 - 59
2023-2024	21	3 - 85	49.2	22.04	1	54

Figure 5

Teacher C STAR Math Student Growth Percentiles



Sense of Efficacy Findings

TSES

TSES Fall. For the Teachers' Sense of Efficacy Scale responses, as seen in Table 17, there is not a large difference between the teachers' sense of efficacy regarding student engagement, instructional strategies, and classroom management. For all three teachers, their average score for classroom management is highest, but not by much.

TSES Winter. The TSES winter survey results, also shown in Table 17, show how the first-grade teachers responded to questions about their sense of efficacy since completing the survey in the fall. Again, there was not a large difference between the teachers' sense of efficacy regarding student engagement, instructional strategies, and classroom management. Teacher A

shows the largest range between their highest and lowest scoring categories, and Teacher B responded with a 7 for every question this time around, but overall, the scores between the teachers are comparable to each other.

Table 17

Teachers' Sense of Efficacy Scale Survey Results

Self-Efficacy Category	Teacher A				Teacher B				Teacher C			
	Fall		Winter		Fall		Winter		Fall		Winter	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Student Engagement	6.75	1.67	5.88	1.46	6.75	0.71	7.00	0.00	6.25	1.39	6.00	0.76
Instructional Strategies	6.75	0.89	7.38	0.74	6.50	0.76	7.00	0.00	6.63	0.92	7.13	0.64
Classroom Management	7.63	1.41	7.38	1.30	7.00	0.00	7.00	0.00	7.25	0.89	7.00	1.20

TSES Fall to Winter Comparison. The TSES comparison data for Teacher A show there was a decrease in their student engagement and classroom management responses from fall to winter, although there is less than a point difference. Their average for their efficacy in their instructional strategies increased, although by less than a point again. However, this does align with their open responses which often linked language for self-efficacy with language around differentiated instructional practices.

For Teacher B show there is not a large difference between their fall and winter responses. Their classroom management scores stayed the same and their student engagement and instructional strategies averages went up but not by more than 0.50. However, their largest increase was in their instructional strategies score which is what the differentiation coaching was focused on.

For Teacher C there is not a large difference between their fall and winter responses. Their averages for student engagement and classroom management went down and their average for instructional strategies went up but neither were by more than 0.50 in either direction. However, as with Teacher A, the rise in their instructional strategies mean ties with their open-response references to self-efficacy increasing with various differentiated instructional practices.

Sense of Efficacy Open-Ended Responses

Sense of Efficacy Open-Ended Responses Fall. The analysis for the teachers' sense of efficacy was the same as the analysis for classroom practices as it followed Tesch's (1990) eight-step process. The coding process was followed for each of the three open-ended questions and the results are presented in Tables 5 through 10. Although Question 2, "Has the differentiation coaching process influenced your belief in your ability to differentiate for high achieving learners in your classroom? If yes, how would you describe the influence on your belief?" was

designed to give insight into their sense of efficacy, the first question about teacher practice and the third question regarding any additional comments also gleaned some insight into their sense of efficacy.

When tagging words for Question 1, the words “understanding” and “confidence” came up, which were categorized as teacher feelings. The words “understand” or “understanding” were often paired with words directly associated with differentiation such as “progression of learning,” “differentiating progression,” or “needs of learners.” Teacher B alluded to their sense of efficacy when they wrote, “I also feel more confident that I’m reading/teaching students where they are at.” With Question 2, the feelings of confidence, references of help, and examples for how differentiation coaching influenced their ability to differentiate were tied to the creation of tangible items. Teacher A referenced “activities” and “choices,” Teacher B referenced “ideas,” “games,” “activities,” and “lessons.” More specifically, Teacher C mentioned “It’s helped me to create choice boards where they can advance their learning to a higher level.” Additionally, there was an overlap between teacher actions and learner outcomes and experiences. For example, Teacher C used the words “track” and “ownership” for how learners in their classroom are actively involved in their differentiated options. Teacher A also alluded to the quality of the tangible “activities” by mentioning they allowed them “to grow their fluency and skills rather than busy work.” Teacher B mentioned they “definitely feel more confident” in their response and gave a list of tangibles by mentioning “We were given great ideas, games, activities, and lessons” that contributed to their increased confidence. Question 3, which asked for any additional comments regarding the differentiation coaching process, included additional feeling words such as “enjoyed” and “appreciated.” Teacher A referenced implementing the differentiation practices in “other areas” beyond math, which was the focus.

Overall, the takeaway from the fall responses about teacher efficacy is the differentiation coaching process that took place during the 2022-2023 school year was tied to an increase in efficacy around differentiated instructional practices for high ability learners. Additionally, the creation of tangible items appears to influence the increase in efficacy.

Sense of Efficacy Open-Ended Responses Winter. As with the fall data, the winter responses to all three open-ended questions gave some insight into how the coaching process affected their sense of efficacy. Because the growth scores remained either similar to or below the average growth scores of their mid to low achieving peers, yet there is evidence of their self-efficacy increasing in their open-ended responses, the data does not show learner performance affecting a teachers' sense of efficacy.

For Question 1 on coaching influencing their practice, Teacher B shared it had been "helpful to have someone to talk to about concerns or questions/clarifications" and they are now able to plan lessons in a "more understanding way." Teacher C used the word "helped" two different times when they responded with, "It has helped me to look deeper at the standards and be able to scaffold. It's also helped me to push students further who are ready." Teacher A also mentioned they "provide more differentiation" and "opportunities" in their instruction, signaling a change in their efficacy around instructional strategies. For Question 2 on their sense of efficacy, Teacher B uses the words "more confidence" in their response and tied that feeling of confidence to differentiated instructional strategies by knowing "where students are at" and "how and where to push them." Teacher A referenced they "learned how to find a variety of materials for high achieving learners," which alludes to an increase in self-sufficiency and efficacy. Teacher C used the words "helped" and "find" and "give" when responding to question two which, like Teacher A, shows they are implementing more differentiated instructional practices

due to the help they received and knowledge they gained. For Question 3, Teacher A mentioned they "appreciated the opportunity to talk through the scaffolding of units/lessons, opportunities for differentiation, and how to align lessons to standards." Teacher B used the word "wonderful" when describing the coaching process and mentioned receiving "help" with "questions or confusion." Teacher C used the word "enjoyed" when describing the coaching process and referenced the tangible items that were implemented to "track/assess" learning. For all three teachers, the increase in how-to knowledge regarding differentiated instructional practices appears to tie in with their sense of efficacy as their knowledge, confidence, and implementation practices increased.

Sense of Efficacy Open-Ended Responses Fall to Winter Comparison. Both the fall and winter open-ended responses included numerous positive references to the coaching process that led to an increase in their differentiated instructional practices. Words such "confidence," "learned," and "helped," all signal a change in each teacher's self-efficacy.

Summary of Findings

Overall, the results for the extent coaching first-grade classroom teachers affect their differentiation practices for mathematically promising learners were positive and supported by the change in their CPS-R results, their open-ended responses, and the change in their instructional practice results from the TSES. The results for the extent the changes in teacher practice affect the academic performance of mathematically promising learners show the changes did not affect the academic performance of their high ability learners as measured by the SGP growth on their STAR Math assessment. Finally, the results for the extent the changes in learner performance affect a teachers' sense of efficacy remain inconclusive as there was not a change in learner performance. However, there is evidence that the coaching did have a positive

effect on their self-efficacy as measured through their open-ended responses and their instructional practice results from the TSES.

CHAPTER 5

DISCUSSION, CONCLUSIONS, AND RECOMMENDATIONS

The recommendations proposed in this chapter will provide a comprehensive list of ideas that connect with the results of this action research study combined with a bit of Disney wisdom. After the summary of major findings, there will be a section discussing some of the perceived "whys" behind the findings. From there, a section on implications for policy and practice will outline six recommendations for the next steps districts, school leaders, and action researchers can take based on the discussed findings. It will conclude with an overall summary of this action research study.

Summary of Major Findings

Differentiation Practices Summary

When looking at the CPS-R results and the open-ended responses, it appears the differentiation coaching had some effect on the teachers' differentiation practices for their mathematically promising learners. The CPS-R results showed increases in their practices around questioning and thinking, providing challenges and choices, and curriculum modifications. The increases were the most pronounced for providing challenges and choices, followed by increases in curriculum modifications. Questioning and thinking started with higher averages for all three teachers and remained at similar or slightly higher levels as well.

Within their open-ended responses, there is evidence that their differentiation practices changed due to the coaching process as there were mentions of increased understanding in

differentiation practices, scaffolding, progressions of learning, and how to push learners further. Additionally, the implementation of various tangibles that were created or discussed during the coaching process such as choice boards or unit adaptations show evidence of changed teacher practices.

Academic Performance Summary

There does not appear to be evidence that the change in teacher practice affected the academic performance of mathematically promising learners on the STAR Math assessment. The SGP scores from the assessment do not appear to be different from the historic data for the individual teachers nor the district.

Sense of Efficacy Summary

Because there was no evidence of a change in learner performance and the reported changes in the teachers' sense of efficacy were either similar or slightly changed, the answer to this question is inconclusive. However, the open-ended responses give evidence that there was an increase in their sense of efficacy around differentiation. The responses included words such as "more confident" or "helped my teaching in other areas" which suggest it was the change in *their own* performance and practice rather than the learners' performance and practice that led to the increase in efficacy.

Discussion of Findings

Differentiation Practices Discussion

This study was different than most research on differentiation and practice, as seen in Table 4, in that it did not just focus on what teachers were already doing in their classrooms. Instead, the focus was on how changes around differentiated instructional practices could be made. Overall, the results support the Bondie et al. (2019) literature review finding that while

there are different frameworks used in defining differentiation, the use of assessment cycles and decision making through collaboration increases the use of differentiated instructional practices. It also supports the finding in the Rubenstein et al. (2015) study that teachers can differentiate if they are provided with the appropriate support and materials.

More specifically, the change in practice supports the findings of Goddard and Kim (2018) and Muir et al. (2021) that differentiated instruction aided by collaboration or coaching leads to a change in teacher practice. The coaching was based on a solid curricular foundation, learners were grouped based on their performance within each unit pre-test, and the culture between the coach and teachers was collaborative, which mimics the foundational pieces of the Muir et al.'s (2021) Netherlands-based study. Although that study was focused on fifth- and sixth-grade learners in a different country, the focus was still on mathematics and the results of this study show that the findings can be replicated in alternative settings. Additionally, although Goddard and Kim (2018) focused on the relationship between collaboration, differentiated instruction, and teacher efficacy, they found a link between teachers implementing more differentiated practices also having greater amounts of collaboration, which align with the results of this study.

My study also supports the findings of the Livers et al. (2018) study where teacher candidates worked with their mathematics methods instructor and the gifted and talented coordinator at an elementary school to collaborate on differentiated instruction. The results showed that the weekly collaboration increased teacher confidence but suggested additional research on the impact collaboration has on providing differentiated instruction. My study included that extension and supports the finding that regularly scheduled collaboration on

differentiated instruction increases teacher confidence, but also that it increases differentiated instructional practices.

Academic Performance Discussion

This study differed from past research (Table 5) connecting differentiated practices with academic achievement as they focused on achievement gains compared to a control group. While this study compared teacher and district averages, the focus was on analyzing how the mathematically promising learners grew, as measured by the STAR Math assessment, compared to each teacher's past data. It compares to the Gavin, Casa, Adelson, and Firmender (2013), Gavin, Casa, Firmender, and Carroll (2013), and Trinter et al. (2015) studies because it took place in a general education setting, but because this study did not use an advanced mathematics curriculum to guide instruction this study cannot support or refute the findings in those studies. This study also did not include cluster grouping the high-achieving first-graders so it cannot build on the evidence found in the Card and Giuliano (2016) study where cluster grouping high-achieving fourth graders had a significant positive effect on their math scores. Because there were no evident achievement growth gains, it also cannot build on evidence from the Rubenstein et al. (2015) study which found positive signs that working with classroom teachers in the general education setting on differentiated practices for advanced learners produces measurable results.

Some connection can be made, however, with the Siegle et al. (2019) and Smith et al. (2017) research showing that gifted programs have minimal effect on achievement as many focus on critical and creative thinking more than accelerated learning. Although the setting of this study was the general education classroom rather than a gifted program, the differentiation within this study was focused more on choices that can be given to learners that have shown

proficiency rather than accelerated learning or instruction using advanced curriculum. Because the achievement and growth results in this study were lackluster as they were in the Siegle et al. (2019) and Smith et al. (2017) studies, it supports the conclusion that without intentional instruction focused on accelerating learning, significant impact on achievement levels will not occur.

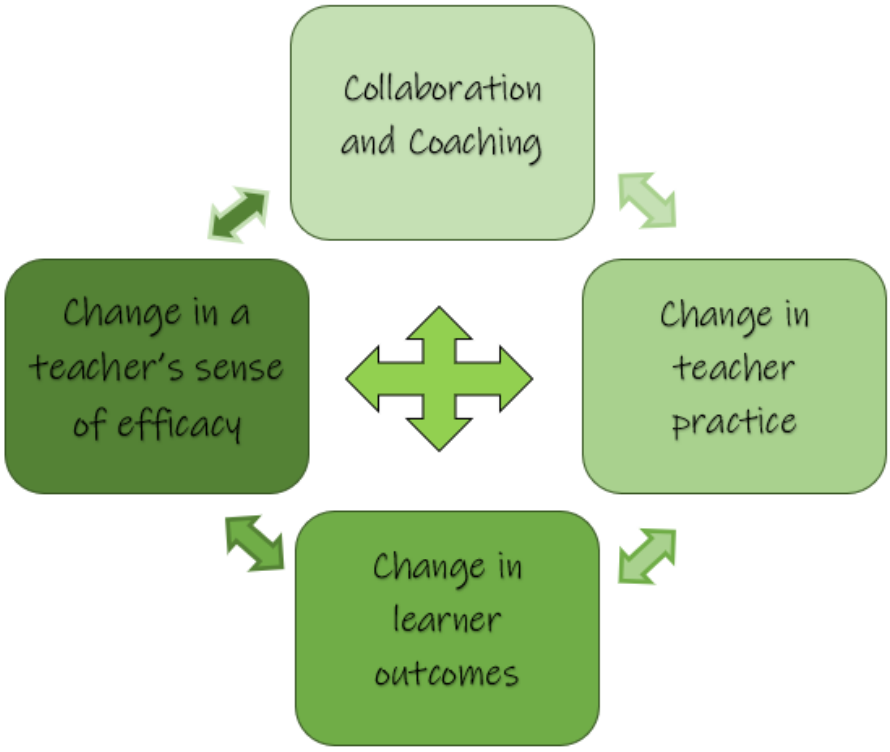
While this action research study began as an investigation by the action researcher into ways mathematically promising learners could show more achievement growth, the study evolved into something different. Because the intervention was instructional coaching, decisions were guided by the needs and desires of the classroom teachers. When the KnowledgeWorks training occurred, the teachers mentioned they wanted to be more comfortable with differentiating for high ability learners, offer more choice to increase student agency, and redesign their mathematics curriculum units to focus on the grade level standards more directly. While they also mentioned the importance of their high ability learners showing growth, that was not the primary focus of the differentiation coaching, and thus may have affected the achievement growth outcome.

Because the growth patterns for learners with mathematical promise did not change, the Sustainable Teacher Change Conceptual Framework (Figure 1) needed to be revised (Figure 6) to reflect the findings of this study. Three of the four major components which include collaboration and coaching, change in teacher practice, and change in teacher self-efficacy remain. However, change in learner performance was changed to change in learner outcomes due to the lack of evidence of change in growth scores as measured by the Star Math assessment. While learner performance may have changed from the unit pre-assessments to post-assessments, that was not measured in this study. The word outcome is also more inclusive to the changes

supported in the findings such as changes in learner agency and learner choice. Additionally, a change was made to the framework to make the pieces more interconnected rather than following a simple cyclical pattern. While the first version was simple, this revised version is more complex and reflects the realities of change where each piece is equally important and can influence the others

Figure 6

Sustainable Teacher Change Conceptual Framework – Revised



Note. The revised conceptual framework reflects a complex change process where each piece is equally important and can influence the others. The arrows represent the general flow of the process, and the overlapping colors represent the connection between the pieces.

Sense of Efficacy Discussion

Because this study took place during the second year of the differentiation coaching process, and because it did not include a control group of teachers, it is difficult to connect the findings of this study with the sparse research that exists on the connection between teacher efficacy and instructional coaching. For example, it does not allow for connections to be made between this study and the Nugent et al. (2018) research that found teachers who received instructional coaching showed a significant difference in their self-efficacy than teachers who did not.

However, because there was some evidence in the open-ended responses from the teachers that the coaching had some effect on their efficacy, it supports findings from Walsh et al. (2020), where embedded professional learning opportunities and instructional coaching that focused on the teacher's needs was perceived to affect their sense of efficacy. It also supports the findings in the Goddard and Kim (2018) and Tricarico and Yendol-Hoppey (2012) studies that collaborative discussion, rather than change in learner performance, is the strongest predictor of a teacher's change in practice. This change in practice supports the idea that a relationship exists between teacher efficacy and their willingness and motivation to experiment with new methods of instruction (Tschannen-Moran & Woolfolk Hoy, 2001).

Implications for Policy and Practice

"The way to get started is to quit talking and begin doing," -Walt Disney (Disney, 2018). Far too often in the field of gifted education the focus is on talking about how to properly identify gifted learners and the repeated echo that there is a lack of differentiation practices used in schools, as outlined in Table 4 (Ezzani et al., 2021; Gubbins et al., 2021). However, it is naïve to believe teachers know how to modify curriculum to meet the needs of high ability learners

because, despite widespread support for differentiated instruction, there are not many examples of systematic, consistent, or robust implementation of it (Peters & Jolly, 2018; Santangelo & Tomlinson, 2012). Additionally, even if teachers were to receive some PD on how to differentiate, traditional, top-down PD does not create sustainable change in teacher practice, or influence student achievement (Muir et al., 2021; Peters & Jolly, 2018).

The primary focus of this action research study was to stop talking about the problems surrounding the achievement of high ability learners and, instead, attempt to do something about it. Something that did not worry about who was labeled as gifted or not gifted. Something that acknowledges that teachers impact student achievement more than any other aspect of schooling and could make teachers feel good about themselves (Johnson, 2016; VanTassel-Baska et al., 2020). Something that gave teachers an opportunity to make progress on something they wanted to see happen, that was integrated and valued in a teacher's busy schedule and not just seen as "something extra" that got added to their plates.

While the focus of this action research study was on differentiated teaching practices for high achieving learners, all implications and practice recommendations will be firmly rooted in a place that respects classroom teachers. They will also do more than talk about the problems, they will suggest concrete, actionable steps. When teachers feel supported, they make changes, which is extremely important when the most difficult expectation from PD seems to be the transfer of learning into classroom implementation (Dixon et al., 2014, Tschannen-Moran & Woolfolk Hoy, 2001). A summary of the findings and recommendations, as seen in Table 18, show that many of the recommendations were a result of more than one finding.

Table 18

Summary of Action Research Findings

Findings	Related Recommendations	Supporting Literature
Differentiation coaching had a positive effect on teacher differentiation practices.	Listen to teachers Invest in direct teacher support Ensure tangibles Increase knowledge base through action steps Do not expect a quick and easy fix	Goddard & Kim, 2018 Nugent et al., 2018 Tricarico & Yendol-Hoppey, 2012
The changes in teacher practice did not influence the academic performance of mathematically promising learners.	Listen to teachers Allow flexibility in instruction Do not expect a quick and easy fix	Altinatas & Özdemir, 2015 Muir et al., 2021 Pierce et al., 2011 Siegle et al., 2019 Smith et al., 2017
The extent a change in learner performance affects a teachers' sense of efficacy is unknown.	Listen to teachers Allow flexibility in instruction Do not expect a quick and easy fix	Peters & Jolly, 2018 Tschannen-Moran & Woolfolk Hoy, 2001
Differentiation coaching and changes in teacher practice had some positive effect on a teachers' sense of efficacy regarding their instructional practices.	Listen to teachers Invest in direct teacher support Ensure tangibles Increase knowledge base through action steps Do not expect a quick and easy fix	Nugent et al., 2018 Tschannen-Moran & Woolfolk Hoy, 2001 Walsh et al., 2020

Listen to Teachers

"A little consideration, a little thought for others, makes all the difference." – Eeyore, *Winnie the Pooh* (Economy, 2020).

This action research study was sparked, unintentionally, by the two-day personalized learning PD opportunity provided by the district in June of 2022. This was the time where the district and KnowledgeWorks team gave the teachers in attendance permission to work toward personalized, competency-based learning in whichever way they felt would support the district's

strategic plan and core beliefs. Wheatley (2006) believes the best way to create ownership is for those responsible for implementing a plan to develop the plan for themselves, and this action research study supports that belief.

The decision by the first-grade teachers to focus on redesigning math units to accommodate for more differentiated instruction had the support of the administrators at the table and aligns with studies that show positive climates exist where expectations are high, but autonomy is allowed encourages experimentation and risk taking (Goddard et al., 2019; Graham et al., 2021). The three teachers wanted to differentiate more in mathematics, the administrators listened, and the teachers dove into unit one and scheduled meetings with the differentiation coach every other week during the 2022-2023 school year to keep working on it. This type of enthusiasm and dedication should be applauded and looked upon as a powerful example of what can happen if teachers are listened to and given the opportunity to work on what they feel needs to be worked on.

Invest in Direct Teacher Support

"Sometimes the right path is not the easiest one." – Grandmother Willow, *Pocahontas* (Economy, 2020).

Because the top-down PD model does not create sustainable change in teacher practice, efforts need to be made to invest in supports that directly work with classroom teachers (Peters & Jolly, 2018). The decision for what this looks like should be made only after following the first implication of listening to teachers. Decisions for how to best support teachers should not be made without their explicit feedback on what type of support they feel would best impact their teaching practices. Because ownership is established when those responsible for implementing a plan are also responsible for developing the plan, this can increase teacher buy-in and help them

feel they are being listened to and increase the chance of providing meaningful PD in a format appropriate to the realities of teaching (Wheatley, 2006).

This may turn into instructional coaching positions, gifted education teachers and classroom teachers collaborating with each other, or something else. District leaders can provide research-based PD options for teachers to choose from so they still have a guiding role in the decision making, but because the responses from the teachers were so positive and differentiated instructional practices were improved in this study, it strongly supports research that suggests that PD options should incorporate a collaborative aspect (Goddard & Kim, 2018; Tricarico & Yendol-Hoppey, 2012).

Ensure Tangibles

"In every job that must be done, there is an element of fun." – Mary Poppins, *Mary Poppins* (Economy, 2020).

While reading the open-ended responses, as seen in Tables 13 and 27, the value the teachers placed on having tangible things to implement became clear. Tangibles such as lesson plans, assessments, progressions of learning, activities, games, choice boards, ideas, and advice were embedded throughout all three question responses and tied to words like "appreciated," "enjoyed," or "confidence." It is not just about giving the teachers something to use, but rather about helping to guide them through the creation of items they feel they need to be successful. And, in the case that they do not know what they need, giving ideas or advice that they can choose from helps build a collaborative culture and rapport with the person coaching or helping the classroom teachers. Evidence from this study supports that sometimes teachers just want, need, or appreciate something given to them as a starting point so they can feel successful. By having an increased understanding of what to implement along with tangible items to implement,

the classroom teachers grew in their confidence and efficacy surrounding differentiation in their classrooms.

Additionally, the development of tangible items created opportunities for the teachers to find success in differentiated learning and teaching. Differentiation does not need to be complicated, but it does require intentional actions with tangible things that lead to matching instruction, activities, and opportunities with the needs of individual or groups of learners. The essential understandings and confidence were built over time throughout various teacher actions, but it was actively doing things and creating things that was vital to the instructional change. Teachers want and need tangible things to help them feel good about what they are doing and can make the difference in positive teacher outcomes and behaviors which can lead to changes in what experiences learners have in their classrooms.

Increase Knowledge Base Throughout Action Steps

"Life's not a spectator sport. If watchin' is all you're gonna do, then you're gonna watch your life go by without ya." – Laverne, *The Hunchback of Notre Dame* (Economy, 2020).

Joe Renzulli often refers to the importance of information coming on an "as needed basis" because it sparks creative productivity and makes for authentic work (Knobel & Shaughnessy, 2002). While this is referenced in the context of teaching children, this study supports this statement and urges against PD that teaches everyone the same thing, at the same time, at the same pace. If school leaders expect classroom teachers to differentiate, then PD should also be differentiated.

The initial thoughts that came from reading the fall responses from question three in the open-ended questionnaire, as seen in Table 11, were that teachers want to learn and are grateful for meaningful learning experiences, that regardless of the academic outcomes differences were

made in teaching practices, and that the study results will go beyond academic achievement because teachers growing is just as important as learners growing. This happens when teachers are engaged in positive learning experiences where they are given new information, knowledge, and advice on how to do something when they need to hear it because it pertains to them. It is worth noting that among all the different teacher actions that were coded in the fall and winter, the word "listening" was never used. The teachers were teaching, working, implementing, digging in, looking, personalizing, supporting, advancing, showing, seeing, tracking, creating, offering, grouping, and more. It was the progression of teacher actions, combined with a coach who was listening and providing enough expertise to assist them, when necessary, that led to positive teacher practice changes. When we help teachers learn and grow through both talk and action, it promotes their sense of efficacy, confidence, and knowledge base for independently finding differentiation opportunities and producing materials that can jumpstart higher achievement growth in mathematically promising learners and beyond.

Allow Flexibility in Instruction

"Venture outside your comfort zone. The rewards are worth it." - Rapunzel, *Tangled* (Economy, 2020).

This recommendation stems from the lack of positive achievement growth gains from each teacher's high achieving learners. Although the focus could turn to different forms of differentiation for advanced learners within the general education classroom, a teacher only has so much bandwidth, and when a classroom may only have one high achieving learner, other instructional models should be considered. Research supports small group instructional settings where groups are flexible and frequently re-evaluated based on pre-assessment data (Rakow, 2012; Rubenstein et al., 2015; Santangelo & Tomlinson, 2012; VanTassel-Baska et al., 2020). To

help teachers do this more effectively, educational practices such as cluster grouping that implements a more advanced curriculum for high ability learners should be supported (Altintas & Özdemir, 2015; Muir et al., 2021; Pierce et al., 2011; Card & Giuliano, 2016; Deringöl & Davasligil, 2020). By encouraging flexible grouping, the clustered groups could be re-arranged at multiple points throughout the year based on unit pre-assessment data. Although some learners may need the advanced curriculum throughout the entire year, some learners may only need the advanced curriculum for a single unit, such as geometry. Learners could move classrooms to fit their instructional needs during their math block with one of the teachers designated as teaching the advanced curriculum to prevent individual teachers from needing to teach from multiple curricula.

Do Not Expect a Quick and Easy Fix

"You control your destiny – you don't need magic to do it. And there are no magical shortcuts to solving your problems." – Merida, *Brave* (Economy, 2020).

Coaching and collaboration is an ongoing process. This action research study took place a year after the collaboration between the gifted education teacher (me) and the first-grade teachers started revising their mathematics curriculum units and discussing ways they could incorporate choice boards in their classrooms. The collaboration is still ongoing and will take on different instructional components as time goes on. When looking at systemic change, nothing can happen overnight, and changing more than one variable at a time can make measuring any amounts of change difficult. This action research project was a process that took time, diligence, dedication, and hard work for all involved and still did not produce all the desired results. Meeting for 30–60 minutes every other week for a year and a half moved the needle on changing instructional practices but there are other pieces to look at. Improving academic growth for mathematically

promising learners is a heavy lift, but one that can be done if the other recommendations are followed. The process will involve trying, clarifying, and looking deeply into the problem of focus, but as long as those involved feel they are dedicating the appropriate amount of time and developing opportunities for action, change can take place.

Summary

When examining the objectives of this action research study, which aimed to (a) change teacher practice as it pertained to increasing their differentiation of mathematics instruction, (b) increase the achievement growth of mathematically promising learners, and (c) increase the efficacy of classroom teachers, there is evidence that the first and third objectives were met, while the second objective fell short in terms of achievement outcomes. However, the change in teacher practice and their sense of efficacy is notable because the study took place during the second year of differentiation coaching and changes in practice could have also occurred during the 2022-2023 school year. To deepen insights into instructional coaching, future action research endeavors should consider evaluating differentiation coaching across various grade levels and subjects. Additionally, exploring alternative differentiation methods such as curriculum compacting or cluster grouping could provide valuable perspectives on enhancing learner achievement.

Overall, this action research study was an extremely positive experience that forged a powerful bond between educators who were striving to make a difference. While the academic progress of mathematically promising learners mirrored that of previous years and teachers didn't report an increased sense of efficacy across all aspects, significant shifts in teacher practice were measured. Additionally, educators' perspectives on differentiated instruction and

unit planning underwent transformative changes, indicating promising strides toward more effective pedagogical approaches for mathematically promising learners.

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APPENDIX A

CLASSROOM PRACTICES SURVEY - REVISED

Classroom Practices Survey-2017R

Use the following scale to describe the frequency with which you use each strategy below:

0	1	2	3	4	5
Never	Once a month, or less frequently	A few times a month	A few times a week	Daily	More than once a day

Category I. Questioning and Thinking (QT) – how teachers provide opportunities for students to engage in activities that promote higher-level questioning, reasoning, and logical thinking

Strategies	Low to Below Average Achieving	Average Achieving	Above Average to High Achieving
QT1. Teach thinking skills in the regular curriculum	0 1 2 3 4 5	0 1 2 3 4 5	0 1 2 3 4 5
QT2. Provide questions that encourage reasoning and logical thinking	0 1 2 3 4 5	0 1 2 3 4 5	0 1 2 3 4 5
QT3. Ask open-ended questions	0 1 2 3 4 5	0 1 2 3 4 5	0 1 2 3 4 5
QT4. Encourage students to ask higher-level questions	0 1 2 3 4 5	0 1 2 3 4 5	0 1 2 3 4 5
QT5. Encourage student participation in discussions	0 1 2 3 4 5	0 1 2 3 4 5	0 1 2 3 4 5
QT6. Use students' questions to provide depth and complexity	0 1 2 3 4 5	0 1 2 3 4 5	0 1 2 3 4 5
QT7. Encourage students to think about thinking (i.e., metacognition)	0 1 2 3 4 5	0 1 2 3 4 5	0 1 2 3 4 5
QT8. Ask follow-up questions to evaluate student thinking	0 1 2 3 4 5	0 1 2 3 4 5	0 1 2 3 4 5
QT9. Provide opportunities for students to develop critical thinking	0 1 2 3 4 5	0 1 2 3 4 5	0 1 2 3 4 5
QT10. Provide opportunities for students to develop creative thinking	0 1 2 3 4 5	0 1 2 3 4 5	0 1 2 3 4 5

Use the following scale to describe the frequency with which you use each strategy below:

0	1	2	3	4	5
Never	Once a month, or less frequently	A few times a month	A few times a week	Daily	More than once a day

Category II. Providing Challenges and Choices (CC) - how teachers engage students in interest-based and readiness-based curriculum choices, including independent studies, advanced content, and interest grouping

CC1. Allow students to work in locations other than class	0 1 2 3 4 5	0 1 2 3 4 5	0 1 2 3 4 5
CC2. Use contracts or management plans for independent study	0 1 2 3 4 5	0 1 2 3 4 5	0 1 2 3 4 5
CC3. Give time for independent study or small group projects	0 1 2 3 4 5	0 1 2 3 4 5	0 1 2 3 4 5
CC4. Work from higher grade text in class	0 1 2 3 4 5	0 1 2 3 4 5	0 1 2 3 4 5
CC5. Use a more advanced curriculum unit	0 1 2 3 4 5	0 1 2 3 4 5	0 1 2 3 4 5
CC6. Group by achievement levels across classrooms	0 1 2 3 4 5	0 1 2 3 4 5	0 1 2 3 4 5
CC7. Send students to higher grade levels for specific content area instruction	0 1 2 3 4 5	0 1 2 3 4 5	0 1 2 3 4 5
CC8. Consider students' interest in planning instruction	0 1 2 3 4 5	0 1 2 3 4 5	0 1 2 3 4 5
CC9. Assign programmed or self-instructional materials	0 1 2 3 4 5	0 1 2 3 4 5	0 1 2 3 4 5
CC10. Provide opportunities for students to develop and pursue their interests	0 1 2 3 4 5	0 1 2 3 4 5	0 1 2 3 4 5
CC11. Offer students opportunities to select ways of presenting what they learned	0 1 2 3 4 5	0 1 2 3 4 5	0 1 2 3 4 5

Use the following scale to describe the frequency with which you use each strategy below:

0	1	2	3	4	5
Never	Once a month, or less frequently	A few times a month	A few times a week	Daily	More than once a day

Category IV. Curriculum Modifications (CM) – how teachers modify the curriculum to address the needs of different students

CM1. Use pretests to determine mastery	0 1 2 3 4 5	0 1 2 3 4 5	0 1 2 3 4 5
CM2. Eliminate curricular material students have already mastered	0 1 2 3 4 5	0 1 2 3 4 5	0 1 2 3 4 5
CM3. Give different assignments for students who have mastered regular material	0 1 2 3 4 5	0 1 2 3 4 5	0 1 2 3 4 5
CM4. Assign different homework based on achievement level	0 1 2 3 4 5	0 1 2 3 4 5	0 1 2 3 4 5
CM5. Use ongoing assessment strategies	0 1 2 3 4 5	0 1 2 3 4 5	0 1 2 3 4 5
CM6. Use a variety of assessment formats	0 1 2 3 4 5	0 1 2 3 4 5	0 1 2 3 4 5
CM7. Use culturally-responsive curricula to engage all students	0 1 2 3 4 5	0 1 2 3 4 5	0 1 2 3 4 5
CM8. Use technology to differentiate instruction	0 1 2 3 4 5	0 1 2 3 4 5	0 1 2 3 4 5
CM9. Use tiered lesson plans	0 1 2 3 4 5	0 1 2 3 4 5	0 1 2 3 4 5
CM10. Allow students to bypass content that they have already mastered	0 1 2 3 4 5	0 1 2 3 4 5	0 1 2 3 4 5
CM11. Use a balanced assessment system	0 1 2 3 4 5	0 1 2 3 4 5	0 1 2 3 4 5

APPENDIX B

TEACHERS' SENSE OF EFFICACY SCALE

Teachers' Sense of Efficacy Scale[1] (long form)

Teacher Beliefs Directions: This questionnaire is designed to help us gain a better understanding of the kinds of things that create difficulties for teachers in their school activities. Please indicate your opinion about each of the statements below. Your answers are confidential.	How much can you do? Nothing		Very Little		Some Influence		Quite A Bit		A Great Deal
1. How much can you do to get through to the most difficult students?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
2. How much can you do to help your students think critically?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
3. How much can you do to control disruptive behavior in the classroom?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
4. How much can you do to motivate students who show low interest in school work?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
5. To what extent can you make your expectations clear about student behavior?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
6. How much can you do to get students to believe they can do well in school work?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
7. How well can you respond to difficult questions from your students ?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
8. How well can you establish routines to keep activities running smoothly?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
9. How much can you do to help your students value learning?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
10. How much can you gauge student comprehension of what you have taught?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
11. To what extent can you craft good questions for your students?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
12. How much can you do to foster student creativity?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
13. How much can you do to get children to follow classroom rules?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
14. How much can you do to improve the understanding of a student who is failing?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
15. How much can you do to calm a student who is disruptive or noisy?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
16. How well can you establish a classroom management system with each group of students?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
17. How much can you do to adjust your lessons to the proper level for individual students?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
18. How much can you use a variety of assessment strategies?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
19. How well can you keep a few problem students form ruining an entire lesson?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
20. To what extent can you provide an alternative explanation or example when students are confused?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
21. How well can you respond to defiant students?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
22. How much can you assist families in helping their children do well in school?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
23. How well can you implement alternative strategies in your classroom?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
24. How well can you provide appropriate challenges for very capable students?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)

APPENDIX C

OPEN ENDED FEEDBACK

1. Has the differentiation coaching process influenced your teaching practice? Yes or No
    a. If yes, how would you describe the influence on your teaching practice?
2. Has the differentiation coaching process influenced your belief in your ability to differentiate for high achieving learners in your classroom? Yes or No
    a. If yes, how would you describe the influence on your belief?
3. Please share any additional comments regarding your experience with the differentiation coaching process.

APPENDIX D

INFORMED CONSENT FORM

Research Participation Informed Consent Form
Educational Policy, Planning, and Leadership
William & Mary

Title: Coaching First-Grade Teachers on Differentiated Instructional Practices for Learners with Mathematical Promise: An Action Research Study

Principal Investigator: Alicia Schroeder-Schock

This is to certify that I, _____, have been given the following information with respect to my participation in this study:

1. **Purpose of the research**: The purpose of this research is to determine how coaching teachers through curriculum revisions that incorporate explicit differentiated instructional methods affects (1) teacher practice, (2) learner achievement, and (3) a teacher's sense of efficacy.
2. **Procedure to be followed**: As a participant in this study, I will be asked to complete the Classroom Practices Survey – Revised (CPS-R), the Teachers' Sense of Efficacy Scale (TSES), and answer some open-ended questions in the fall and winter of the 2023-2024 school year. I also acknowledge that my previous years' Star Mathematics data will be accessed and analyzed for comparison purposes.
3. **Discomfort and risks**: There are no known risks associated with this study.
4. **Potential benefits**. My participation in this research will contribute to the development of our understanding about the effects of differentiation coaching. The results on how the coaching affected my practice, efficacy, and learner achievement will be shared with me.
5. **Statement of confidentiality**: My data will be anonymous. My data will not be associated with my name, nor will it be coded so that my responses may be linked to my name in any way.
6. **Voluntary participation**: Participation in this study is voluntary. I am free to withdraw at any time without penalty or loss of benefits. I may choose to skip any question or activity without impacting the relationship with the researcher.
7. **Incentive for participation**. Participants will not be compensated for their participation.
8. I am aware that I must be at least 18 years of age to participate in this study.
9. I may obtain a copy of the research results by contacting Alicia Schroeder-Schock at akschroedersch@wm.edu.
10. **Termination of participation**: Participation may be terminated by the researcher if it is deemed that the participant is unable to perform the tasks presented.
11. Questions or concerns regarding participation in this research should be directed to: Alicia Schroeder-Schock at 701-446-7718 or at akschroedersch@wm.edu. The dissertation chair for this study is Dr. Tracy Cross who can be reached at tlcross@wm.edu.
12. I am aware that I may report dissatisfactions with any aspect of this study to Dr. Jennifer Stevens, the Chair of the Protection of Human Subjects Committee, by telephone (757-221-3862) or email (jastev@wm.edu).

I agree to participate in this study and have read all the information provided on this form. My signature below confirms that my participation in this project is voluntary and that I have received a copy of this consent form.

_____

Printed Name Date

_____

Signature Date

THIS STUDY WAS APPROVED BY THE COLLEGE OF WILLIAM & MARY STUDENT INSTITUTIONAL REVIEW BOARD COMMITTEE (phone: 757-221-3966) ON 2023-09-25 AND EXPIRES ON 2024-09-25.

VITA

Alicia Schroeder-Schock

April 28, 2024

EDUCATIONAL BACKGROUND

Executive Ed.D. in Educational Policy, Planning and Leadership May 2024
William & Mary, Williamsburg, VA
Concentration: Gifted Administration
Dissertation title: Coaching First-Grade Teachers on Differentiated Instructional Practices for Learners with Mathematical Promise: An Action Research Study
Committee: Jennifer Riedl Cross, Ashley Carpenter, Tracy Cross (Chair)

Master of Education, Educational Psychology May 2020
University of Connecticut, Storrs, CT
Concentration: Giftedness, Creativity, and Talent Development

Bachelor of Science in Education May 2015
Concordia College, Moorhead, MN

PROFESSIONAL EXPERIENCE

Gifted and Talented Teacher	2018-present
Math Interventionist	2021-2024
Elementary Teacher	2015-2018

PUBLICATIONS

2023
Teacher Contributor
William & Mary Center for Gifted Education (2023). *Beyond words: Figurative language* (3rd ed). Kendall Hunt Publishing Company.

Teacher Contributor
William & Mary Center for Gifted Education (2023). *Worldly words: Systems of language* (3rd ed). Kendall Hunt Publishing Company.

MEMBERSHIP IN PROFESSIONAL ORGANIZATIONS

North Dakota Association for Gifted Children	2019-present
National Association for Gifted Children	2018-present
National Council of Teachers of Mathematics	2015-present