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Effect of Cycle Coaching on Middle School Math Achievement

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This is to certify that the doctoral study by

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has been found to be complete and satisfactory in all respects,
and that any and all revisions required by
the review committee have been made.

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Walden University
2025

Abstract

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by

Lauren Kay Wilson

MA, Slippery Rock University, 2007

BS, Grove City College, 2003

Project Study Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Education

Educational Administration and Leadership

Walden University

February 2025

Abstract

The problem addressed in this project study was that 96% of middle school students at the local district did not meet proficient level on the math state assessment (MSA). School leaders implemented coaching cycles grounded in the theory of action for teacher coaching to enhance teacher knowledge and practice and to improve student achievement; however, the effectiveness of this intervention was unknown. The purpose of this quantitative study was to investigate the difference in MSA scores between middle school students whose teachers participated in cycle coaching and students whose teachers did not, while controlling for the previous year's MSA score. For this causal-comparative design, an analysis of covariance with 587 participants was performed. The adjusted MSA means for the group coached was $M = 866.649$, and for those not coached was $M = 866.068$. After controlling for MSA 2022, there was no statistically significant difference in MSA 2023 scores between the coaching and non-coaching groups, $F(1,587) = .017$, $p = .895$, partial $\eta^2 = .0$.Since the coaching cycles have shown effective in other educational settings, it might be that the implementation at the study site was not sufficient. Therefore, a professional development plan was developed specifically to support the implementation. When teachers are trained and supported in the implementation, the coaching might improve MSA scores.

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Dedication

This project study is dedicated to my mother, who taught me that education is the only thing in life that cannot be taken away from you. To my daughter, who inspires me every day. I hope she sees that anything in life can be accomplished if you put your mind to it. To my first mentor, the late Dr. Claudia Balach, who saw something in me and helped me believe in myself. Finally, to Dr. Anne Butler, whose guidance and support have meant more to me than I can ever express.

Acknowledgments

I want to thank my mother, who has been the wind beneath my wings through it all. I also want to thank my daughter, Kaidence, for giving me space, time, and encouragement that I did not know a 9-year-old could possibly give. Finally, a special thanks to my father who has supported me in his own unique way.

Professionally, I have to acknowledge the late Dr. Claudia Balach. She brought me on as an undergrad as her graduate assistant and coordinator through a grant. Her gift of showing me the ropes in educational research was the start of my inspiration to earn this degree. Also, I want to acknowledge Dr. Anne Butler, who taught me grace for others, but mostly myself, through learning the lessons of educational leadership.

Finally, I want to acknowledge Dr. Danette L. Brown, who has supported me throughout this process. She has challenged me to become a better thinker, writer, and researcher. Also, the other professors at Walden University have inspired me throughout this educational journey.

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Section 1: The Problem

According to the 2022 Nation's Report Card, eighth-grade mathematical achievement scores across the United States declined 8 points since the previous assessment, given in 2019 (National Center for Education Statistics, n.d.). Theresults from the annual National Assessment of Educational Progressshowedthat all five percentile groups of students declined in achievement, meaningstudents with different levels of mathematical understanding hadregressedin their knowledge of critical mathematical skills.Researchers have indicated that this decline in middle school mathematical achievement is not a surprise due to COVID-19 pandemic learning loss (Kuhfeld et al., 2022) and decreased motivation (Umarji et al., 2021). In general, the findings support that middle school mathematical achievement in the United States is declining.

More specifically, in Pennsylvania, eighth-grade mathematical achievement scores declined 11 points between 2019 and 2022 (National Center for Education Statistics, n.d.). This was a more significant decrease than the national average. The Commonwealth Foundation (2022), a nonprofit educational advocacy group in Pennsylvania, noted in a press release that only 22% of Pennsylvania eighth-grade students showed mathematical proficiency. Eighth-grade mathematical achievement levels are declining not only nationally, but also in the state of Pennsylvania.

The Local Problem

The problem addressed in this study was that approximately 96% of middle school students did not meet proficiency on the math state assessment (MSA) at

Pennsylvania Online School (POS, a pseudonym) in 2021. The school's leadership team voiced concern about the math scores across the district, as the district had dropped from 23.5% to 6.4% in proficiency compared to the previous state assessment taken in 2019 (Pennsylvania Department of Education, 2023). The chief academic officer (CAO) also expressed concernabout the results of middle school students, which were below the district's average.

It is crucial to ascertain how the COVID-19 pandemic and related disruptions to education have impacted students' acquisition of fundamental academic abilities. Assessments of students' proficiency in mathematics not only demonstrate the learning of critical abilities but also significantly predict their performance in school and future success when entering the workforce (Cohodes et al., 2022). Researchers have found that students' mathematical scores showed anything from half to a full year's worth of learning loss between the state exam period of 2020 and 2021(Donnelly & Patrinos, 2022; Kuhfeld et al., 2022). I examined the effectiveness of the coaching intervention on mathematics that local school leaders implemented to address the learning loss experienced during the pandemic.

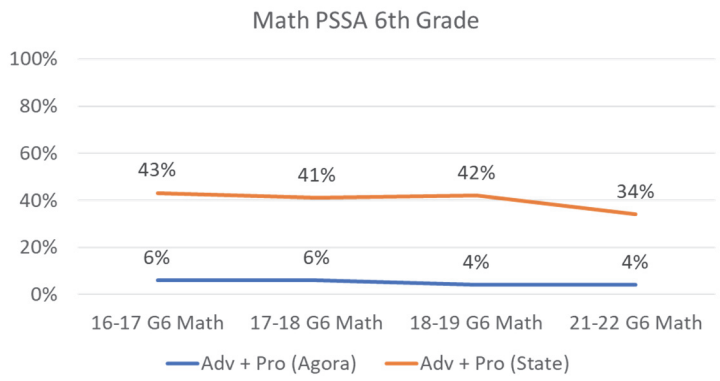
An interview with POS's CAO revealed more about the district's plan to address the decline in middle school students' mathematical achievement. The CAO described a root cause of this drop in achievement, identified by the school's leadership team, as the implementation of the Eureka math curriculum. Although the teachers had the resources to teach this curriculum, they varied intheir implementation of the curriculum, instructional approaches, and assessment practices. In addition, the CAO reported many

teacher misconceptions surrounding effective instructional practices that support Eureka's conceptual approach to understanding mathematics.

In July 2022, the district's data analyst presented longevity results on the MSA since 2017 and compared it to the state's average (see Cragle, 2022). Omitting the years 2020 and 2021 due to the COVID-19 pandemic, average math scores dropped at the state and local levels. Figure 1 shows the sixth-grade decline from 43% proficiency to 34% at the state level and the POS's decline from 6% to 4%. Figure 2 shows similar results in the seventh-grade state-to-local comparison, where the state declined from 41% to 28%, and the local site dropped from 8% to 4%. Eighth-grade scores, displayed in Figure3, also show declining results at the state level, from 35% to 25%, and at the POS, from 4% to 3%. Although mastery of mathematics is a problem at the state level, the disparity between the state's average and the local site's average is concerning for the future success of the students. According to Rehman et al. (2023), math proficiency is one of the most vital indicators of future success.

Figure 1

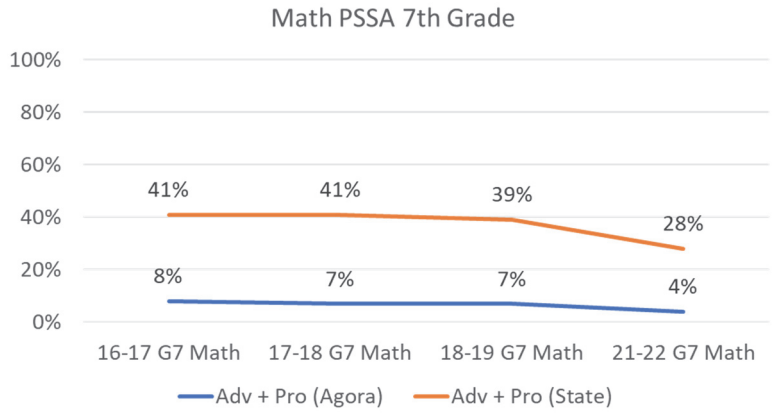
Sixth-Grade Math Proficiency Scores at the Local and State Level



Note. PSSA = Pennsylvania System School Assessment; G6 = Grade 6.

Figure 2

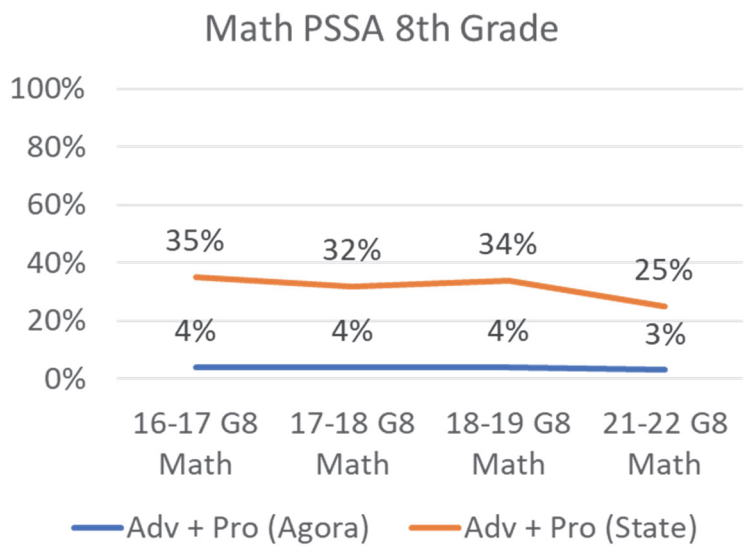
Seventh-Grade Math Proficiency Scores at the Local and State Level



Note. PSSA = Pennsylvania System School Assessment; G7 = Grade 7.

Figure 3

Eighth-Grade Math Proficiency Scores at the Local and State Level



Note. PSSA = Pennsylvania System School Assessment; G8 = Grade 8.

The district's middle school principal provided several insights intothis data and plans she had to address the problem of declining scores. She reiterated that in the 2016–2017 school year, educators introduced the Eureka math curriculum at the middle school to provide students with the opportunity to learn mathematics through a conceptual lens. Many researchers have confirmed that this shift from direct math instruction to a more authentic, conceptual, and problem-based approach better prepares students for future success (Allensworth et al., 2021; Goldberg et al., 2023).Although scores were expected to drop due to this change, the hope was for the scores to recover after the students were exposed to this approach to learning mathematics. The principal identified several factors leading to this decline, including high numbers of students transitioning in and out of the online school, teacher misunderstandings of teaching math conceptually, and the amount

of time in schedules to fully implement the curriculum with fidelity. In response to my question about plans to address the problem, the principal shared that the school's focus was on teacher development so the curriculum could be implemented with fidelity and through teaching strategies that built a more student-centered classroom. Her ideas aligned with the district's plan to implement coaching cycles, and she shifted her instructional coach's focus to instructional support instead of more managerial tasks.

Due to these misaligned understandings, the CAO described the district's plan to use instructional coaching, specifically coaching cycles, to address the teachers' need for professional learning related tomathematics. This led to school leaders' implementing cycle coaching in the 2022–2023 school year to build teachers' understanding of a conceptual approach to teaching mathematics. The CAO noted that implementing these coaching cycles also shifted the current role of instructional coaches, as historically, most of their responsibilities focused on managerial tasks rather than potentially productive coaching activities (PPCAs).

Instructional coaching has been growing in popularity over the past decade, as research indicates it is one of the most highly influential professional development (PD) activities, affecting instructional shifts and student achievement (Hashim, 2020; Kraft et al., 2018). The POS had instructional coaches working at the school level; however, its leaders shifted to a district-level, systematic approach to incorporate and implement effective coaching cycles (J. Knight, 2018) and focus on PPCAs (Woulfin& Rigby, 2017) to utilize instructional coaches in an instructional-focused manner. As reported by the

CAO, it was unknown to the district how this shift in instructional coach practice hadaffectedstudent achievement, specifically in the area of middle school mathematics.

Rationale

According to the National Assessment of Educational Progress, students' mathematics achievement scores declined considerably on the 2022 report card (National Center for Education Statistics, n.d.);eighthgraders' scores declined by 8 points, a proficiency level not seen since 2003. The local setting for this study, in the Northeastern region of the United States, also experienced decreased mathematical achievement, as evidenced by its declining math scores. Examining the problem more specifically, the CAO of this online school stated, "Middle school math is a key priority for improvement, as these grade levels have a lower proficiency level than the other grade bands."

The district's leadership team identified the new math curriculum as a possible root cause for these declining scores. Although the district had provided resources and materials, little time had been spent on teacherPD to increase understanding of instructional practices that support conceptual mathematics instruction. The research aligns with this notion, as notable reforms in mathematics call for a shift in instructional practices (Philip et al., 2019) that require job-embedded PD such as instructional coaching (Kane &Saclarides, 2023; Saclarides&Harbour, 2023). Therefore, examining the outcome of cycle coaching on student achievement may provide district leaders with empirical evidence of how this intervention affectsstudents' mathematical achievement.

Definition of Terms

Instructional coaches: Instructional leaders who collaborate with teachers to grow their instructional practices and ultimately support student learning. They partner with teachers through data-based decision-making, classroom management, content augmentation, and professional learning implementation (J. Knight, 2018).

Online school: A school where instruction is delivered remotely using a variety of technological tools. Students are taught wholly or primarily online or on the internet in an online school, which is also known as a "virtual school,""e-school," or "cyber school" (Allen& Seaman, 2017).

Significance of the Study

This study is significant because it mayyield knowledgeof the effectiveness of an intervention that aims to improve middle school students' mathematical proficiency. Educational leaders in the local setting may have empirical evidence of cycle coaching's effect on MSA scores that may allow them to determine whether to continue the intervention, scale the intervention to other parts of the district, or look to other causes beyond instruction that affect mathematical achievement. According to the National Council of Teachers of Mathematics, members of U.S. society will find it increasingly difficult to understand and critique, let alone challenge, many of the decisions and actions of those in power in political, social, scientific, and economic institutions without mathematics literacy, as well as without a strong mathematics identity and sense of agency (Larson, 2018). This study has the potential to effect positive social change by

highlighting the importance of bolsteringmathematical achievement to prepare future generations better to be productive citizens in the global world.

Research Question and Hypotheses

The following research question (RQ) and hypotheses underpinned this study:

RQ: What is the difference in MSA scores between middle school students whose teachers participated in cycle coaching and students whose teachers did not while controlling for the previous year's MSA score?

H_0: There is no statistically significant difference in MSA scores between middle school students whose teachers participated in cycle coaching and students whose teachers did not while controlling for the previous year's MSA score.

H_1: There is a statistically significant difference in MSA scores between middle school students whose teachers participated in cycle coaching and students whose teachers did not while controlling for the previous year's MSA score.

Review of the Literature

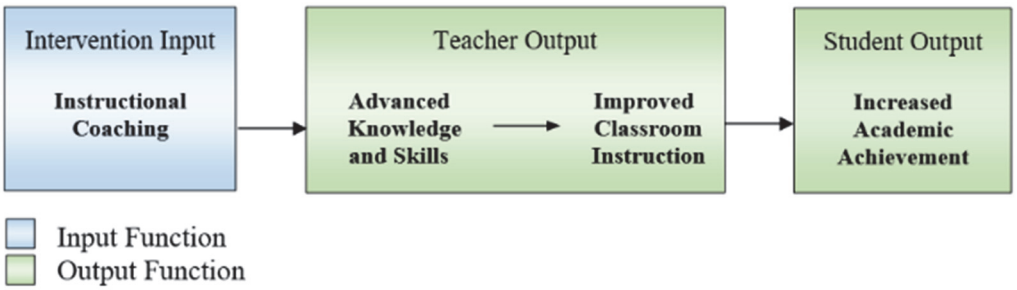
Theoretical Framework

Kraft et al. (2018) developed the theory of action for teacher coaching that served as the theoretical framework for the study. The theory helps explain how the action of coaching (cause/input) leads to changes in teacher practice (effect/output) and student learning (effect/output). Ifcoachestake a specificaction, they can presumably have a specific effect (Kraft et al., 2018). The theory of action links a coach's actions to the learning and achievement of their students, which are the results of those actions (Hopkins & Craig, 2014). Kraft et al. (2018) created the theory of action for teacher

coaching (see Figure 4) based on the first meta-analysis examination of the causal effect of teacher coaching on instruction and achievement.

Figure 4

Theory of Action for Teacher Coaching



Note. Adapted from "The Effect of Teacher Coaching on Instruction and Achievement: A Meta-Analysis of the Causal Evidence," by M. A. Kraft, D. Blazar, and D. Hogan, 2018, *Review of Educational Research*, *88*(4), p. 552 (https://doi.org/10.3102/0034654318759268). Copyright 2018 by Sage Publications.

According to the theory of action for teacher coaching, student achievement will not increase without changes in teacher knowledge or classroom procedures. Large-scale PDtraining provided to all teachers at one time increases teachers' content knowledge; however, this has little effect on changing how they teach. In contrast, coaching, which involves individual and embedded PD, enhances instruction by assisting teachers in putting what they have learned into practice through professional dialogue, one-on-one interaction, and personal observation and evaluation of teaching practices (Brandmo et al., 2021; Kraft et al., 2018). Because advances in teacher knowledge are inextricably linked to improvement in teacher skill, classroom practice evolves, thus leading to

increased student achievement. Figure 4 displays how the relationship between instructional coaching and student achievement flows from coach to teacher to student, which directly relates to the hypotheses for the presentstudy. Therefore, because this job-embedded cycle coaching has a more significant influence on teacher-changed practice in the classroom, students whose teachers engaged in cycle coaching have higher achievement scores than students whose teachers did not receive cycle coaching.

Other researchers have used the theory of action for teacher coaching. For example, Glover et al. (2023) tested the theory using multiple regression analysis to determine if coaching actions correlated with the implementation of new instructional strategies that led to better student achievement. Analyzing the work of 16 coaches, 133 teachers, and 3,649 students, they found that coaching related to changed teacher practices and improved student outcomes. Reddy et al. (2021) also applied the theory of action for teacher coaching. Through a randomized controlled trial,they examined the impact of the classroom strategies coaching model specifically on teacher and student behavior. Results revealed changes in teacher practices that led to better outcomes for students.

Literature Search Strategy

The literature used to inform this review emerged through comprehensive online searches conducted in several stages with the assistance of a Walden University librarian. Although the focus was on current, peer-reviewed scholarly articles, I initially referred to books, older articles, and government documents to obtain contextual and background information and produce leads for search terms and topics relating to instructional

coaching, mathematics, and mathematics instructional coaching. After collecting background and contextual material, I determined the best search strategy and, with the assistance of a Walden University librarian, generated ideas regarding search keywords. Various combinations of the following key terms and phrases proved helpful: *instructional coaching*, *cycle coaching*,*mathematics coaching*,*Common Core mathematics*,*middle school coaching*,and*mathematics education*and*theory of action*.

I used EBSCOhost, ERIC, SAGE, Education Source, and Taylor and Francis Online to search for relevant, current, peer-reviewed journal articles published within the past 5 years. Before generating the search results, I selected the *peer review*feature, ensuring that all sources returned heeded this requirement. I also relied upon Google Scholar to obtain additional full-text, peer-reviewed articles. The bibliographies of critical studies on instructional coaching, mathematics, and mathematics coaching providedseveral additional studies of interest. Finally, I searched international journals to ensure I reviewed all relevant, peer-reviewed studies aboutinstructional coaching, mathematics, and mathematics coaching.

Shifts in Mathematics Education

Mathematics instruction varied in the United States prior to the adoption of Common Core State Standards of Mathematics (CCSSM) in 2010 (Dingman et al., 2022). The push for equitable standards across the United States, coupled with more accountability measures after the 2001 No Child Left Behind Act, led to the creation of the CCSSM to set foundational learning expectations for students in Grades 3–8 (Dingman et al., 2022).Although the CCSSMlaid the foundation for consistency of

mathematical learning across the United States, the implementation of these standards was left up to districts, which still caused disparities in students' mathematical understanding (Desimone et al., 2019).The goal of these consistent standards was to alleviate differences in mathematics instruction and learning. Yet,discrepancies in mathematics education continued to occur due to varying interpretations of how to implement the standards into practice.

Findings from nationally representative studies show that most U.S. math teachers have adapted their teaching materials and instruction styles to promote conceptual understanding, which is in line with the guidelines set by the CCSSM (Edgerton et al., 2020). Teachers have voiced apprehensions over their capacity to execute the requisite instructional changes mandated by these standards, which are aimed at aiding students of diverse abilities who are often underprepared in their prior grades (Edgerton & Desimone, 2018; Edgerton et al., 2020). However, math teachers' use of these standards-aligned practices has tended to vary across different grade levels and student capabilities.

Researchers haveconsistently demonstrated that alignment between teachers' pedagogical views and curriculum reform objectives significantly enhances instruction and student achievement. Such findings legitimize the idea of teachers having the autonomy to interpret and implement curriculum resources according to their pedagogical discretion (Savage et al., 2018). Both demanding and inspiring, the CCSSM poses challenges and expectations that may seem overwhelming for educators. However, this should be seen as an opportunity to elevate teaching standards and learning outcomes for students.

Another driving force behind mathematics reform is the push for science, technology, engineering, and mathematics education. To better prepare students to enter the 21st-century workforce, educators combine these content-specific areas of learning to help students develop critical thinking and problem-solving skills (Widya& Yosi, 2019). Wei et al. (2022) reported that although learning through solving complex problems provides an authentic approach to students mastering these skills, teaching students to think and persevere through these types of problems critically challenges teachers' current methods of instruction and beliefs about how mathematics should be taught. In combining these key content areas, science, technology, engineering, and mathematics education acts as a vehicle that incorporates math into real-world problem-solving situations and builds students' abilities to think critically about the world they live in.

Mathematics and Student Achievement

Overall, the research on the effect of the CCSSM on student achievement is inconclusive. Although some studies have found a slight positive effect on eighth-grade students' achievement, other studies have found no effect or even slightly adverse effects over time (Bleiberg, 2020; Song et al., 2019). One study did find a slightly higher percentage of middle school students scoring proficient on the state achievement test in districts that adopted Common Core-alignedtextbooks but did not consider whether students' course grades improved alongside their test scores (Gao& Lafortune, 2019). Course grades are better predictors of success in high school and beyond (Allensworth & Clark, 2020). Therefore, it is essential to look beyond test scores when evaluating the impact of the CCSSM on student achievement.

Another way to look at math interventions is through thefrequency of the delivery (DeFouw et al., 2023; Duhon et al., 2022). When considering the amount of time spent for the intervention, DeFouw et al. (2023) found that the session length had no impact on student growth, as students receiving 10, 20, and 30 min of intervention time increased with no significant difference between the baseline and the final assessment. However, Duhon et al. (2022) found higher dosages of math intervention to be beneficial. To determine the range of effective doses, they tested 105 fourth-grade students with different dosages of an explicit timing math fluency intervention package. The results show that the lowest dose necessary to produce a detectable treatment effect was one 2-minute intervention per day for 20 days.

Due to the widening gap between high- and low-performingstudents, researchers have examined many student-facing interventions for mathematics (Stephens et al., 2022). When attending to mathematical fluency, using incremental rehearsal has been found more effective than traditional drilling; however, the CCSSM demands more conceptual understanding than basic fact fluency (Burns et al., 2019). Grimaldi et al. (2022) reported that using a computer-based intervention improved overall student mathematical outcomes, including amongsubgroups of race, gender, and economic status; it also improved mathematical outcomes for English language learners. Mellott and Ardoin (2019) used brief experimental analysis, which is a method for identifyingindividual student needsrelated to math deficits in the areas of accuracy and fluency, fluency by itself, or performance-based discrepancies. This allows the intervention to be tailored to each specific student, which is effective.Brief experimental

analysis needs to be reassessed as students move through interventions because their instructional needs can change as they acquire new mathematical knowledge.

Mathematics Professional Development as an Intervention

Beyond student-facing interventions, teachers need to learn to attend to the instructional demands of the CCSSM. PD that encompasses both the content and practice standards of the CCSSM acts as the means of intervention for teacher learning (Kaskens et al., 2023). Effective teacherPD is characterized by active and practice-based learning, group participation, a focus on content and classroom practice, collaboration, duration, and coherence (Heck et al., 2019; Kaskens et al., 2023). Regarding content focus, Copur-Gencturk et al. (2019) found a significant correlation between increases in teachers' mathematical knowledge for teaching and PD that placed a strong emphasis on curricular content knowledge. Because professional learning leads to changes in teachers' practice, and effective PD includes classroom practice and collaboration, instructional coaching acts as the liaison between PD and the effective implementation of classroom practices.

J. Knight (2019) explored how instructional coaches maximized the efforts of large-scale professional learning through a partnership approach, emphasizing that they maximized new learning among coaches who practiced what they learned and improved in the context of daily instruction. In another study, Richardson et al. (2019) examined the difference between student achievement when teachers received only large-scale PD and when teachers were supported by job-embedded coaching. Students whose teachers received the coaching intervention achieved significantly higher scores than the students whose teachers only attended the large-scale PD.Because mathematics PD leads to

changes in teachers' knowledge and instructional practices, it acts as a teacher-facing intervention to improve students' mathematical achievement.

History of Instructional Coaching

Although large-scale PD provides teachers with new knowledge and skills, transferring this learning into the classroom is a missing piece in the overall teacher change in practice. In the early 1980s, Joyce and Showers (1981, 1982) started a conversation related to teacher coaching. The popularity of coaching practices in schools grew in the 1990s as federal funding was made available (Denton & Hasbrouck, 2009). This job-embedded, differentiated, and application-based approach to teacher development was found to be an effective method to bridge the gap between traditionalPDand classroom change.

In 2001, U.S. lawmakers enacted the No Child Left Behind Actwith the goal of ensuringthat all students in the country advance in their educational journey. The Reading First Initiative was also created to support this goal, providing funds to help teachers strengthen their current skills and learn new ones,specifically in reading. The legislation proposed the use of coaches in elementary schools to provide sustained and effective PD support to teachers. Thousands of coaches were put in place to provide support to teachers in areas such as instructional practices, data analysis, and classroom management; coaches were also responsible for holding teachers accountable for the implementation of evidence-based practices in their classrooms (Denton & Hasbrouck, 2009). These laws led to the closure ofachievement gaps in disadvantaged regions of the

country, with instructional coaching as a driving force behind the success of the programs.

Throughout the next decade, the 2010s, researchers continued to study the influence of instructional coaching. Authors of a pivotal study (D. Knight et al., 2018) found that instructional coaching improves teachers' instructional practices and student classroom engagement. Over a semester, teachers showed a significant change in their instructional practices after collaborating with an instructional coach. Similarly, student classroom engagement increased dramatically, as measured by students' time-on-task during classroom observations. In addition to supporting the overall theory of change for teacher coaching, this was the first study that proposed using the results from classroom coaching to inform teacher training and large-scale PD.

The Every Student Succeeds Act (2015) was a landmark piece of legislation that placed an increased emphasis on the needs of students and the responsibility of state education departments for practical educator evaluation and PD. As a result, state officials took the necessary steps to create and implement PD plans that can improve classroom instruction and student achievement. This included providing teachers with professional learning communities, mentoring and coaching opportunities, and access to research-based best practices and strategies. By providing teachers with the right type of PD, state leaders can ensure that their educators have the knowledge and skills necessary to help their students succeed and reach their full potential; additionally, officials can also use PD to ensure that their schools are providing the highest level of education and resources to their students (Reddy et al., 2019). In short, the implementation of the

EveryStudent Succeeds Act has renewed emphasis on the importance of effective PD for educators and paved the way for funding of instructional coaching as an evidence-based method to provide effective PD.

According to Desimone and Garet (2015), the five key factors of PD include content focus, active learning, coherence, sustained duration, and collective participation. Because instructional coaching encompasses these features, its popularity continued to grow throughout the next decade; however, coaching expanded beyond literacy and into other areas of education in a variety of contexts (Raley et al., 2022). While the underlying current of instructional coaching rested on transformational change and improved student outcomes, approaches to coaching varied between districts. As educational leaders continue to face the challenge of managing increasingly complex school systems, the need for reflective, collaborative leadership becomes more pronounced. Educational leadership coaching is a tool that can be used to develop school and teacher leaders into reflective practitioners who are more aware of their thoughts and feelings. This type of coaching works to improve a leader's cognitive abilities, emotional intelligence, and skills. With these improved skills, educational leaders can seek innovative solutions to school issues that take into account the complexity of the school system while aiming to achieve positive student outcomes, foster positive relationships, and increase teacher efficacy (Miller et al., 2019). By embracing coaching as a critical leadership tool, school systems will be better equipped to tackle the challenges of school leadership and to build teacher leader capacity.

Instructional Coaching

Essentially, instructional coaching acts as the liaison between large-scale teacher PD and turning the learning into instructional practices. Because it is an individualized, job-embedded approach to change instruction, instructional coaching has been proven to influence both instructor and student achievement (Glover et al., 2023; Kraft et al., 2018; Reddy et al., 2021). Researchers have examined instructional coaching to understand better the practices that lead to positive changes in education. In general, coaching is done in a cycle that involves a meeting to establish the current reality of instruction and learning, an observation of instruction, and a debriefing discussion (Kho et al., 2020). These debriefing sessions are estimated to be between 45 and 60 min, with coaching support lasting over about 2 months, depending on the goals and needs of the teachers (Kho et al., 2020; Nugent et al., 2023). In summary, instructional coaching bridges large-scale PD and classroom implementation of learning through individualized support.

Gibbons and Cobb (2017), who quantified coaching actions that led to changes in teacher practice, introduced PPCAs. Gibbons and Cobb identified discussing content, analyzing student work, examining recordings of lessons, and engaging in lesson studies as PPCAs that changed instructional practices when working with groups of teachers. Modeling and coteaching were identified as the PPCAs for one-on-one work with teachers. Kane and Rosenquist (2019) specifically studied these characteristics of instructional coaching, comparing coaches working as either school- or district-hired coaches. In their study, there was an inequitable time distribution in PPCAs between school-hired and district-hired coaches. School-hired coaches, who were often the most

knowledgeable about the teachers in the building and had more robust relationships, could not provide the same level of support to teachers as their district-hired counterparts. Moreover, school-hired coaches faced the additional challenge of balancing their PPCA work with other duties mandated by the school or district. As such, they could not dedicate as much time and energy to engaging teachers in PPCAs, resulting in poorer instruction for students. While school-hired coaches did not need to travel to multiple schools and had consistent schedules and caseloads, district-hired coaches resulted in better outcomes related to improved instruction.

Glover et al. (2023) contributed to the growing body of research on the effectiveness of coaching models in improving teacher and student outcomes. The research team hypothesized that three coaching actions—modeling, practice, and feedback—would predict teachers' intervention implementation fidelity, use of evidence-based classroom strategies, and student achievement. Additionally, they sought to explore whether intervention implementation fidelity mediated the relationship between coaching actions and evidence-based classroom strategies. The research team collected data from teachers, coaches, and administrators in a large urban school district to test these hypotheses. They found that the potential of coaching models positively impacts teacher and student outcomes. The results showed that the three mentioned coaching actions were significantly associated with teachers' intervention implementation fidelity, use of evidence-based classroom strategies, and student achievement. Furthermore, the researcher found that intervention implementation fidelity did mediate the relationship between coaching actions and evidence-based classroom strategies. The research team

concluded that coaching models could effectively improve teacher and student outcomes and that the three individual coaching actions of modeling, practice, and feedback were essential components of a coaching model.

Beyond identifying parts of a coaching cycle, researchershave studied the interactions between teachers and instructional coaches that lead to effective change (Haneda et al., 2019; Monroe & Marvin, 2020; Richardson et al., 2019). Using a case study approach, Haneda et al. (2019) conducted a comparative analysis of a novice and veteran coach working with a teacher to identify coaching behaviors that effectively changed instructional practice.Table1 represents the key features that differentiate these coaching approaches.

Table 1

Coaching Behaviors of Veteran vs. Novice Instructional Coaches

Coaching behavior	Veteran coach	Novice coach
Thinking	Reflective	Action-oriented
Goals	Long-term	Short-term
Student focus	Individual students	Groups ofstudents

Note. The data in the table are from Haneda et al. (2019).

Findings from this study revealed that the veteran coach's approach led to a more meaningful change in teacher practice. Reflective thinking changed how the teacher thought about lesson planning and approaches to instruction, whereas action-oriented thinking led to minor changes with less effect (Haneda et al., 2019). Setting long-term goals pushed the teacher to think about developing practices, while short-term goals led to getting materials for the immediate need. Focusing on individual student needs sets the

tone for the teacher to see what is being learned from the students' perspectives; however, focusing on the group's needs kept the focus on planning instead of learning.

Monroe and Marvin (2020) explored the differences in coach and teacher relationships, comparing their interactions in high- or low-performing schools. Like the study by Haneda et al. (2019), the coaching approach that developed reflective thinking and teachers' practices led to sustainable teacher change. Monroe and Marvin (2020) also emphasized the importance of teacher buy-in and trust in the coaching process. Richardson et al. (2019) examined the interactionsbetween preservice teachers and instructional coaches compared to theirmentor classroom teacher. Again, Richardson et al. (2019) noted theimportance that the coaching relationship played in the development of the preservice teacher, as the results indicated that the coaching relationship led to better development of reflective thinking and focus on student learning. In contrast, the mentor teacher and preservice teacher interactions were more focused on the planning process. Therefore, coach and teacher interactions can lead to effective change in instructional practice, as there is a focus on student learning and reflection.

The Impact Cycle

The specific type of cycle coaching examined in this study was the impact cycle. J. Knight (2009) introduced instructional coaching via a partnership approach. Coaches and teachers work together to implement research-based effective practices. As a result of this trusting relationship, teachers and coaches create action plans and work toward shared goals focused on student learning. Later, J. Knight (2019) formalized this approach. Coaches and teachers engage in a three-phase cycle: identify, learn, and

improve. During the *Identify* phase, a recorded lesson is analyzed and debriefed between the coach and teacher to get an objective view of how students respond to classroom instruction. Lesson plans, observation notes, and student data are used to identify a problem of practice and set goals for future instruction. Next is the *Learning* phase, where the teacher and coach use playbooks, checklists, and strategies as tools to evolve instruction. Coaches can model or coteach in the teacher's classroom to demonstrate the instructional strategy, or the teacher could visit another classroom to see a teacher already using this strategy.

After this is complete, the coach and teacher would debrief to determine whether the teacher prefers to try the new strategy and be observed or if additional support is needed before the teacher attempts the newly learned instructional approach. Finally, the *Improve* stage is where the coach and teacher evaluate whether the instructional goal was met. If so, another cycle can begin, or the teacher can continue using the new instructional practice. If the goal is not met, the coach and teacher come to a consensus about changing the goal, revisiting how the strategy was taught, choosing a new strategy, or changing the way the goal was measured.

Math Instructional Coaching

Additional research that extends the work of PPCAs includes the one-on-one coaching practice of rehearsals. Kochmanski (2022) discussed three critical components that lead to impactful changes in instruction. First comes framing the instructional situation so the teacher understands the context for the rehearsal. This can be considered the planning phase, in which the coach sets the tone for the rehearsal activity. The next

stepinvolves working out possible strategies for the students to solve the problem. This prepares the teacher to engage in conversation and become more aware of where students might struggle or lead the conversation. Finally, the coach and teacher reflect on the actual instruction, and they analyze instructional decisions made during the lesson. This type of rehearsal can help change instructional practices and how teachers engage their students in learning.

Coteaching has been identified as one of the most influential PPCAs that has led to changes in instructional practice (Gibbons & Cobb, 2017). Saclarides (2022) examined coteaching more in-depth, identifying the relationships between teachers and instructional coaches. The seven themes that emerged from this research were building relationships, discussing content and pedagogy, joint teaching, logistics, performative praise and discipline, negotiating coach-teacher roles, and noticing and responding to student thinking. Further research in mathematics education suggested that coteaching lends itself to differentiate instruction to meet the diverse needs of students better becausemore than one person delivers the instruction, so students could learn the concepts in more than one way (Gardesten, 2023).In contrast, Christopher et al.'s (2023) mixed methods study found no significant change in instruction or student achievement when coteaching was employed during a coaching cycle. However, the qualitative results from Christopher et al. (2023)revealed thatpositive relationships between the coach and teacher during planning and implementing a coteaching approach.

The shift to Common Core standards and a more student-centered approach to learning mathematics led to teachers needing to plan for instruction differently. Stein et

al. (2022) specifically examined the coaching approach of coplanning for several reasons. First, with the shift to focusing on multiple ways to solve a problem, teachers had to plan to assess student learning differently. Next, teachers had to prepare to teach students how to collaborate and solve problems and step back from the role of simply providing information to students. Finally, coaches who embed themselves in the work with teachers have been shown to have more significant impacts. With the emphasis on planning for this type of student-centered instruction, coaches leveraged more significant instructional shifts while supporting teachers. Through these in-depth planning cycles, coaches were able to grow teachers' capacity for how they taught and thought about mathematics instruction. Teachers' questioning techniques became more complex, and student work revealed their increased ability to solve problems in multiple ways. Another essential piece of information to note is that these changes did not occur during one coaching cycle, but somewhat over the course of continued coplanning sessions where the coach and teacher went deeper with their conversations about how they attend to student learning.

Recent research has focused on a practical approach to mathematics coaching that includes annotations, based on the theory of professional noticings (Amador et al., 2021; Dindyal et al., 2021; Konig et al., 2022; Mason, 2021). From a sociocultural perspective, noticing is driven by professional vision. Experts can pick up on definite events or phenomena in their profession-specific context that novices may miss. In the case of coaching, a coach may see opportunities to engage students that a novice teacher may not. This type of noticing can be an invaluable tool for teachers to grow their craft, as it

allows them to identify and focus on important cues that can inform their decisions (Konig et al., 2022). According to Mason (2021), direct learning from a coach to build more awareness of students' mathematical thinking resulted in both instructional change and greater student achievement. Amador et al. (2023) explored how both teacher and coach annotations changed over time during coaching cycles. Teachers' annotations shifted from general to more specific, with the focus shifting from the instructional practices to how students responded to the lesson. It was also noted that as the teachers continued with this work, their annotations began to mimic the coaches' notes, helping them become more evaluative of the learning happening in the classroom. As the teacher's noticings evolved, the coaches' notes also went from reflective to more questioning, enabling the teachers to reflect on their instruction more openly. Therefore, this coaching practice of professional noticings has also been shown to be influential in growing instructional practices.

Implications

The purpose of this quantitative project study was to investigate the difference in MSA scores between middle school students whose teachers participated in cycle coaching and students whose teachers did not, while controlling for the previous year's MSA scores. Because math state test results are so low in this school district, coaching was the proposed intervention to increase achievement scores. This analysis provided insight to district and school leaders on the effectiveness of this intervention on student achievement. Leaders can then make data-based decisions to expand coaching, identify strengths and weaknesses of the current coaching model, or investigate other options for

mathematical interventions. Because this analysis gave evidentiary insight and has the potential to positively influence students' mathematical achievement, it can lead to positively affecting students' ability to become successful members of the global society.

Summary

Since the shift to CCSSM, students' mathematical achievement has declined. While research points to several factors, the key to solving this problem is finding ways to support students' understanding of math. As shared in the literature, instructional coaching has been shown to affect teacher development, leading to better student outcomes. When looking at content coaching in mathematics, several approaches have shown positive results for influencing teacher development. The purpose of this study was to examine the effect of cycle coaching on students' mathematical achievement to determine if the coaching intervention does improve student outcomes specifically in POS.

Section 2: The Methodology

The purpose of this quantitative study wasto investigate the difference in MSA scores between middle school students whose teachers participated in cycle coaching and students whose teachers did not while controlling for the previous year's MSA scores. The study's results revealed the effectiveness of the coaching intervention's impact on students' mathematical achievement. An objective was to determine whether cycle coaching has a greater effect on students' mathematical achievement scores as measured by the state assessment.

Research Design and Approach

A causal-comparative research design was used to conduct this study. According to Schenker and Rumrill (2004), causal–comparative designs examine differences between pre-existing groups on an outcome or dependent variable. Because the problem to be addressed through this study is that approximately 96% of middle school students did not meet proficiency on the MSA at POS in 2021, the school implemented cycle coaching as an intervention to address the students' mathematical achievement during the 2022–2023 school year. Only a few teachers can engage in cycle coaching, creating an environment for only some students to be included in this research-based intervention. The independent variable in this study was whether a student's teacher engaged in a coaching cycle, with the dependent variable being the students' MSA scores. A causal-comparative design was appropriate for this study because the groups comprising the independent variable were pre-existing and not assigned by the researcher. An analysis of covariance (ANCOVA) was conducted as one independent variable was categorical

(either received the coaching intervention or did not receive the coaching intervention), with the dependent variable being continuous (score on the MSA).

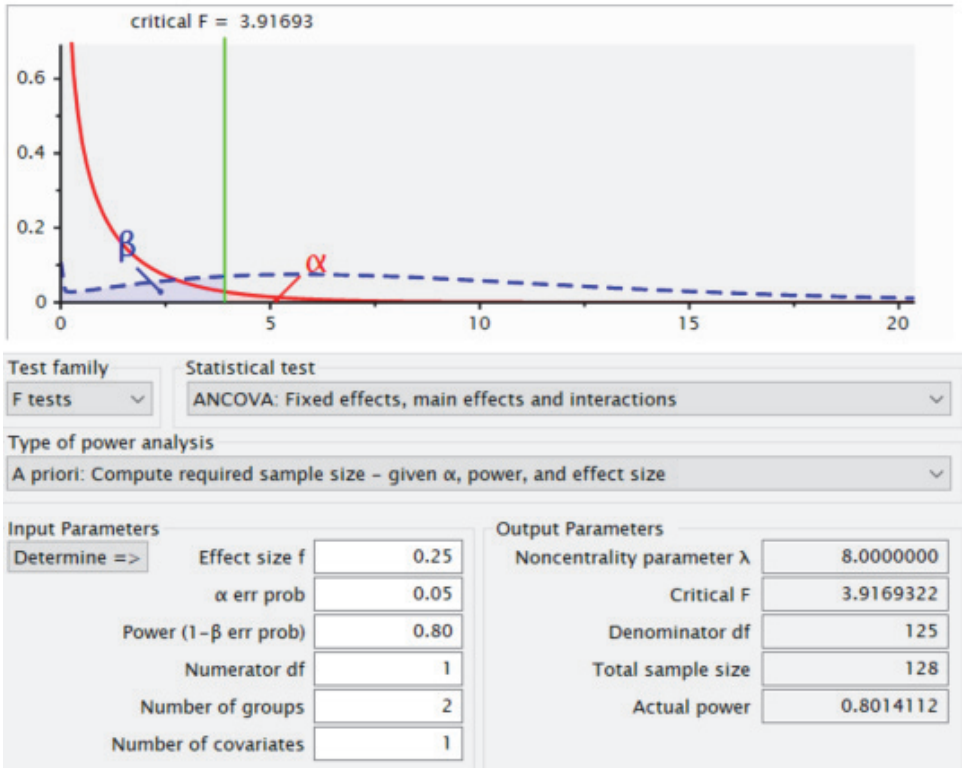
Setting and Sample

Students from an online middle school in the northeastern United States constituted the study's population. This charter school serves the state's suburban, rural, and urban inhabitants. At the time of the study, approximately 4,800 children wereenrolled, with 20% attending the middle grades. About half of the student body were minorities, and 43% were classified as economically challenged. Inclusion criteria for this study specified that a student be in Grades 6–8and either be categorized as part of a class where the math teacher received cycle coaching or not.

The minimum sample size needed to be reasonably probable to detect an impact of a particular size was determined using a power analysis. Power analysis enhances research design when applied appropriately by supplying a sample size that yields a more accurate estimate (Nakagawa et al., 2024). A sample size calculation was performed using G*Power software for an ANCOVA with the following parameters: a medium effect size ($f = 0.25$), alpha level of .05, power level of .80, two comparison groups (received the coaching intervention or did not receive the coaching intervention), and one covariate (previous year MSA score). The calculation results showed that a total sample size of 128 students (64 in each group) was needed for the analysis (see Figure 5).

Figure 5

*G*Power Sample Size Calculation*



Instrumentation and Materials

The standardized test data in this study came from the MSA created by Data Recognition Corporation. This test was used to fulfill state requirements in the No Child Left Behind Act regulations. The test is given over 2 days at local test sites across the state. It consists of 40 multiple-choice items and three open-ended responses. The four mathematical categories on the test include numbers and operations, geometry, algebraic concepts, and data analysis and probability.

Each school year, students are assigned to teachers based on benchmark and state testing data. Teachers can either volunteer to be included in a coaching cycle or be

selected at random by the middle school leadership team. Studentswere identified using a unique numerical identifier for the data pull. Teacher names were attached to the students using this identifier; then the teacher names were changed to “yes” for those who engaged in a coaching cycle or “no” for those who did not. This allowed teachers to remain anonymous but provide categorical data points to conduct the ANCOVA.

The specific coaching intervention was a partnership approach to coaching known as the impact cycle (J. Knight, 2018). The coach and teacher work together through three phases: identify, learn, and improve. Together, they analyze instruction to identify a problem of practice. Next, they collaborate incoplanning, coteaching, or the coach models a desired instructional practice. During the improve stage, the coach collects student data to share with the teacher to see if the initial goal was met. The purpose of this intervention is to keep the focus on student learning and how the students respond to instruction.

Data Collection and Analysis

Both the MSA score (dependent variable) and the prior year MSA score (covariate) are interval levels of measurement. The independent variable is nominal with two groups: the student’s teacher received the coaching intervention, or the student’s teacher did not receive the coaching intervention. Using a unique numerical identifier for each student, I merged teachers’ names onto the spreadsheet and then changed the entry to “yes” if the teacher was part of a coaching cycle or “no” if the teacher did not receive the coaching intervention. The data for all variables were compiled into a single electronic spreadsheet file and imported into a statistical analysis software package (i.e..,

SPSS). I reported descriptive statistics (including the mean, standard deviation, and range) for both the intervention and nonintervention groups. An ANCOVA was performed to address the following RQ and hypotheses:

RQ: What is the difference in MSA scores between middle school students whose teachers participated in cycle coaching and students whose teachers did not while controlling for the previous year's MSA score?

H_0: There is no statistically significant difference in MSA scores between middle school students whose teachers participated in cycle coaching and students whose teachers did not while controlling for previous year while controlling the previous year's MSA score.

H_1: There is a statistically significant difference in MSA scores between middle school students whose teachers participated in cycle coaching and students whose teachers did not while controlling for previous year while controlling the previous year's MSA score.

According to Field (2017), an ANCOVA is appropriate to perform when the research involves testing for differences between groups on a continuous dependent variable while controlling for one or more other continuous variables (i.e., covariates). In this analysis, the dependent variable was the MSA score, the independent variable was the intervention, and the covariate was the previous year's MSA score. The ANCOVA was performed to determine if there was a statistically significant difference in MSA scores between the intervention and nonintervention groups while controlling for the previous year's MSA scores.

Prior to the analysis, I tested the statistical assumptions of ANCOVA. First, normality was tested by examining a quantile–quantile plot of the ANCOVA model residuals. The assumption was met because the points on the plot followed a straight diagonal line. Second, the homogeneity of variance was tested using Levene's test. If the *p*-value for Levene's test was greater than .05, the variances between groups would be statistically equal, and the assumption would be met. Third, independence between the independent variable and covariate were tested using a *t*test to compare the intervention and nonintervention groups on their previous year's MSA scores. If the *p*-value for the *t*test was greater than .05, there was no statistical dependency between the independent variable and the covariate, and the assumption was met. Finally, the homogeneity of regression slopes was tested by computing the ANCOVA with an interaction term between the group and the previous year's MSA scores. A nonsignificant interaction between the independent variable and covariate (i.e., $p > .05$) would indicate that the assumption was met. If the assumptions of the ANCOVA were violated, an alternative nonparametric test (i.e., Quade nonparametric ANCOVA) would have been performed.

The ANCOVA included an *F*-test to measure the effect of the intervention on MSA scores while controlling for the previous year's MSA scores. If the *p*-value for the *F*-test was less than .05, the null hypothesis would be rejected, and it may be concluded that there was a statistically significant difference in MSA scores between the groups. The partial eta-squared (η^2), which is the proportion of variance in the dependent variable that the independent variable explains, was reported as a measure of effect size.

Assumptions, Limitations, Scope, and Delimitations

I assumed that the students who take the MSA test do so to the best of their abilities and that no extraneous factors would cause a student to intentionally perform below their ability (Pennsylvania Department of Education, n.d.). It was also assumed that the students who take the MSA test follow standards of academic honesty and integrity necessary for valid assessment. Additionally, it was assumed that students who required special accommodations for learning and test-taking wereprovided with the necessary accommodations. Another assumption of the study was that the intervention (coaching) delivery was consistent and that no teacher received a better or worse form of coaching than any other teacher.

A limitation of this study was that it did not follow a true experimental design, meaning that the students were not randomly assigned to receive (or not receive) the intervention. Without random assignment, the equivalency of the groups on extraneous factors cannot be ensured (Shadish et al., 2002). Therefore, conclusions about the causal impact of the intervention were more limited in this study compared to a true experiment.

The scope of this study was limited to MSA scores and the impact that cycle coaching may have on these scores. Because 96% of middle school students at POS failed, the school employed cycle coaching as a research-based intervention that has the potential to affect student mathematical achievement (Glover et al., 2023; Kraft et al., 2018; Reddy et al., 2021). The study was delimited to the middle schools in an online school in the northeastern United States.

Protection of Participants Rights

I submitted the proposed study procedures to the Walden Institutional Review Board, which reviewed and approved the study procedures before any data collection or analyses occurred. All necessary permissions to access and analyze the data were obtained from the study site. The data were deidentified to ensure confidentiality, and no data or statistics that could be used to identify an individual student will be published in any report. Additionally, the data were securely stored during the study (e.g., using encryption or password protection). The data were securely destroyed after the study was completed to prevent unauthorized access to the data. As the data proposed for this study were pre-existing, informed consent procedures were not required.

Data Analysis Results

The initial dataset consisted of records from 1,437 students. There were 850 students in the dataset who were missing at least one of the two MSA scores necessary to perform the analysis. After removing the students with missing scores, data from a final total of 587 students remained and were included in the analysis. Table2 presents the demographic characteristics of the sample. The sample consisted of 39.0% eighth graders, 34.6% seventh graders, and 26.4% sixth graders. There was an approximately even split between female and male students. The largest proportion of students were White (45.3%), and approximately one third of the students were Black (32.9%). Approximately 28.8% of the students in the sample were in special education, and 40.7% of the students in the sample were considered economically disadvantaged.

Table 2

Demographic Characteristics of the Sample (N = 587)

Variable	*f*	%
Grade		
6	155	26.4
7	203	34.6
8	229	39.0
Gender		
Female	296	50.4
Male	291	49.6
Ethnicity		
American Indian/Alaskan Native	2	0.3
Asian	5	0.9
Black/African American	193	32.9
Hispanic	97	16.5
Native Hawaiian/Pacific Islander	4	0.7
White	266	45.3
Multiracial	20	3.4
Special education	169	28.8
Economically disadvantaged	239	40.7

Descriptive statistics for the 2022 and 2023 MSA scores for students with teachers who did and did not receive coaching are presented in Table 3. For teachers who did not receive coaching, the average MSA score of their students in 2022 was 879.44 (*SD* = 69.34), and the average was 871.16 (*SD* = 78.30) in 2023. For teachers who did receive coaching, the average MSA score of their students in 2022 was 865.16 (*SD* = 70.68), and in 2023 the average was 860.76 (*SD* = 72.04).

Table 3

Math State Assessment Scores for 2022 and 2023 by Teacher Coaching (N = 587)

Year	Math state assessment scalescore							
	Not coached (n = 315)				Coached (n = 272)			
	M	*SD*	Min	Max	*M*	*SD*	Min	Max
2022	879.44	69.34	684	1148	865.16	70.68	684	1111
2023	871.16	78.30	717	1181	860.76	72.04	734	1181

I performed an ANCOVA to address the following RQ and hypotheses:

RQ: What is the difference in MSA scores between middle school students whose teachers participated in cycle coaching and students whose teachers did not while controlling for the previous year's MSA score?

H_0: There is no statistically significant difference in MSA scores between middle school students whose teachers participated in cycle coaching and students whose teachers did not while controlling for previous year while controlling the previous year's MSA score.

H_1: There is a statistically significant difference in MSA scores between middle school students whose teachers participated in cycle coaching and students whose teachers did not while controlling for previous year while controlling the previous year's MSA score.

In this analysis, the dependent variable was the 2023 MSA score, the independent variable was the intervention (teacher not coached vs. coached), and the covariate was the 2022 MSA score. Prior to the analysis, the statistical assumptions of ANCOVA were tested as follows:

Assumption 1: Dependent variable Scale (MSA 2023)

Assumption 2: Independent variable nominal groups (coached not coached)

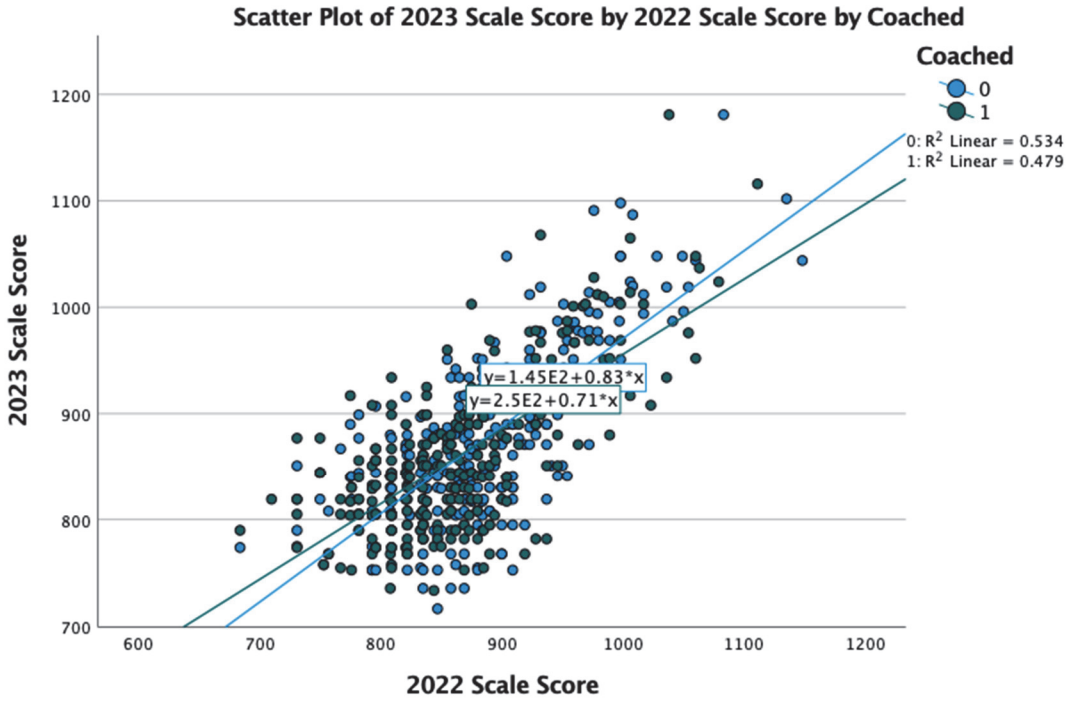
Assumption 3: One covariate scale (MSA 2022)

Assumption 4: Independence of observations. The same person is not in both groups.

Assumption 5: Is there a linear relationship between the covariate, pre, and the dependent variable, post, for each level of the independent variable, group?

Figure 6

Scatter Plot of 2023 Scale Score by 2022 Scale Score by Coached



There is a linear relationship between pre- and post-intervention Test score for each intervention type (coached or not coached), as assessed by visual inspection of a scatterplot.

Assumption 6: There is no interaction between the covariate, pre, and the independent variable, group.

Table 4

Tests of Between-Subject Effects

Dependent Variable: 2023 Scale Score

Source	Type III Sum of Squares	*df*	Mean Square	*F*	Sig
Corrected Model	1718459.54[a]	3	572819.847	205.017	<.001
Intercept	145916.281	1	145916.281	52.225	<.001
Coached	10265.496	1	10265.496	3.674	.056
@2022 Scale Score	1673129.763	1	1673129.763	598.828	<.001
Coached* @2022 Scale Score	10218.234	1	10218.234	3.657	.056
Error	1628905.673	583	2794.006		
Total	443914540	587			
Corrected Total	3347365.213	586			

a. *R* Squared = .513 (Adjusted *R* Squared = .551)

There was homogeneity of regression slopes as the interaction term was not statistically significant, $F(1, 587) = 3.657$, $p = .056$.

Assumption 7: Your dependent variable (MSA 2023) should be approximately normally distributed for each group of the independent variable (coached,1 and not coached, 0). If the Shapiro Wilkes *p*-value is greater than05, the data are normally distributed.

Table 5

Tests of Normality

		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Coached	Statistic	*df*	Sig.	Statistic	*df*	Sig.
Standardized Residual for @2023 Scale Score	0	.031	315	.200	.997	315	.779
	1	.042	272	.200	.992	272	.184

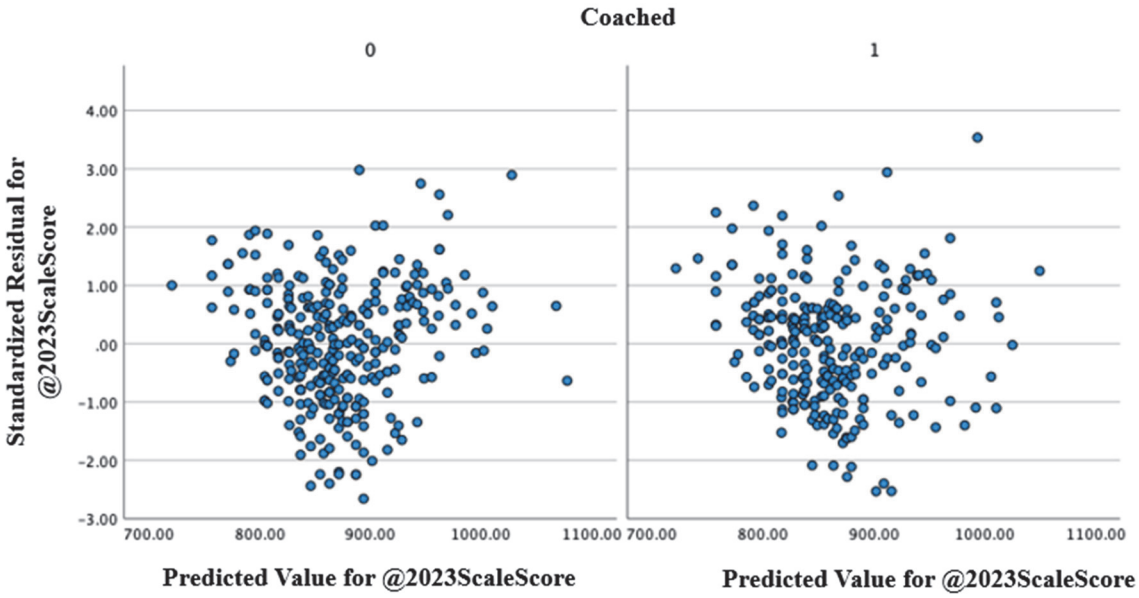
*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

Assumption 8 There should be homoscedasticity

Figure 7

Scatter Plot of Standardized Residual for @2023 Scale Score by Predicted Value for @2023 Scale Score by Coached



The points of each of the scatterplots exhibit no pattern and the spread of points are similar in the y-axis for both categories of the independent variable. Therefore, there was

homoscedasticity, as assessed by visual inspection of the standardized residuals plotted against the predicted values.

Assumption 9: There was homogeneity of variances, as assessed by Levene's test of homogeneity of variance (p = .592).

Assumption 10: There was one outlier in the data, as assessed by one case with standardized residuals greater than +3 standard deviations (3.54). The data point will stay. Since there were no violations of the assumptions, the ANCOVA results will be displayed.

Table 6

Unadjusted Means

Descriptive Statistics

Dependent Variable: 2023 Scale Score

Coached	Mean	Std. Deviation	*N*
0	871.16	78.302	315
1	866.34	72.039	272
Total	866.34	75.579	587

These are unadjusted means for the two groups. 0 is not coached, 1 is coached.

The following are the adjusted means for the covariate.

Table7

Adjusted Means

Dependent Variable: 2023 Scale Score

			95% Confidence Interval	
Coached	Mean	Std. Error	Lower Bound	Upper Bound
0	866.068[a]	2.992	860.192	871.945
1	866.649[a]	3.221	860.322	872.975

a. Covariates appearing in the model are evaluated at the following values: 2022 Scale Score = 872.82.

After adjustment for pre-test 2022, there wasn't a statistically significant difference in post-test 2023 between the coaching and non-coaching groups, $F(1,587) = .017$, $p = .895$., partial $\eta^2 = .0$. Normality was tested by examining a quantile–quantile plot of the ANCOVA model residuals which is presented in Figure 8. The points on the plot follow a straight diagonal line, so normality may be assumed.

Section 3: The Project

The purpose of this PD project was toprovide resources to the instructional coaches to strengthen the approach to coaching cycles. While the average mathematical achievement scores dropped for both groups of students in this study, those students whose teacher received the coaching intervention and those students whose teacher did not receive the coaching intervention, the average scores of the students whose teachers received coaching decreased less than the average scores of those students whose teachers did not receive coaching. To determine if this was a trend or coincidence, the context of POS's use of coaching cycles was considered. Based on implementation research (Bauer&Kirchner,2020; Cohen& McCabe, 2021), meaningful change occurs over several years, not the 1st year of implementation. Because this was the 1st year of POS implementing cycle coaching, it is worth continuing to grow coaching practices and continuing to examine the trend over the course of several school years. Therefore, I designed this project to further instructionalcoaching practices through a series of professional learning with the intention to examine student outcome data over the course of several school years.

The learning outcomes of this PD series are designed to enhance instructional coaches' knowledge and approach to how they cycle coach. First, coaches will be reintroduced to how coaching plays a role in the overall professional learning of a school. Next, a more robust approach to coaching that includes the use of an instructional playbook and video analysis will be introduced to the coaches. Finally, coaches will apply this learning to their current practice and analyze coaching videos to continue to

build their practice while supporting teachers' instructional practices. Through this PD approach, coaches will align more with current research-based practices of instructional coaching that improve teachers' practice.

Rationale

The data showed no significant difference between students whose teachers received cycle coaching and those whose teachers did not. While student achievement dropped for both groups of students, those students whose teachers received the coaching intervention dropped less than those whose teachers did not receive cycle coaching. With this glimpse of the positive influence on student mathematical achievement, this project focuses on a PD plan created to strengthen cycle coaching related to mathematics instruction.

Review of the Literature

Instructional coaching lives under the umbrella of PD; it acts as a critical link between professional learning and implementation. This literature review aims to provide the research base behind coaching as an effective PD approach to enhance teaching practice and ultimately improve student achievement. Through this discussion of the literature, it becomes apparent how using best practices associated with this type of PD can lead to improved teacher practice and better student outcomes.

Professional Development Through the Lens of Instructional Coaching

Instructional coaching has been a proven vehicle for improving classroom engagement (Blinkoff et al., 2024; Gallagher & Grierson, 2024; Reisman & Jay, 2024). According to Blinkoff et al. (2024), coaching leads to increased classroom engagement,

which in turn leads to more communication among students and increased time spent on learning. Gallagher and Grierson (2024) examined a technology-driven approach to coaching. They found that applying coaching principles and techniques through a partnership approach with teachers led to changed instructional practices again proving that cycle coaching had positive influence on teachers' instructional practices. Reisman and Jay (2024) examined content-specific instructional coaching as an embedded form of PD. Findings showed a shift toward higher-level student inquiry and grew teachers' pedagogical toolkits with strategies emphasizing student discourse. Through the coaching process, teachers built their capacity to increase student engagement in learning and go deeper with the content.

Coaching can be a key component when districts seekPD experiences that bring meaningful change to instructional practices and is especially meaningful to change in charter schools like the POS in this study (Woulfin, 2020). PD paired with expertise from a champion of change, who can bring ambition, emotional intelligence, and humility, will ultimately lead to transformational change (Knight, 2024). Saclarides (2024) noted that when district leaders emphasize the importance of professional learning through coaching, more meaningful change can occur due to the support from upper leadership. Finally, coaching conversations within cycle coaching promote a safe space for teachers to have nonevaluative discussions with the coach serving as a sounding board and expert to grow instructional practices that influence positive student experiences in the classroom (Rutledge et al., 2023). Using instructional coaching as a form of PD allows

meaningful changes to occur within school districts that are sustainable and progressive over time.

Another vital role instructional coaching can play when considering overall PD needs is the need to support new teachers (Rice et al., 2023; Rivera et al., 2023). Rivera et al. (2023) acknowledged that providing support to new teachers is a challenge for educational systems around the country. However, coaching acts as a liaison between PD and classroom implementation of both engagement and instructional strategies, helping new teachers work through the challenges of the profession. Rice et al. (2023) showed that coaches must address instructors' needs for social and emotional support in addition to assisting new teachers with their teaching techniques. Through the creation of group-oriented coaching experiences, new teachers expanded their toolkits by working together with coaches and other educators to enhance the overall effectiveness of the teaching team.

Frequency of Coaching

Findings from this study reveal that cycle coaching positively influenced student achievement. Therefore, it is recommended that all mathematics teachers at POS engage in cycle coaching. Research shows that the frequency of coaching can vary between different coaching models (Kavanaugh et al., 2024; Lekwa et al., 2020); however, results from these studies demonstrate common outcomes such as improved student engagement in learning and increased achievement scores.

As a continuous PD process led by a coach who is an expert in the field and works with teachers to learn, instructional coaching offers a perfect setting for formative

assessment because it involves regular skill performance observation and feedback. Coaching may be significantly impacted by how responsive these metrics are to individual teachers' practice modifications. Initially, if individual goals seem to have been reached, coaches should use these data overtime to assess the effectiveness of their support for specific teachers (Lekwa et al., 2020;Woulfin&Spirtzer, 2024). Walsh et al. (2023) found that coaches who consistently use open-ended questions during coaching cycles change how teachers think about their instruction; therefore, the change in thinking surrounding instructional design leads to more conceptual learning opportunities for the students. Also, when the coach tracks these types of shifts to more conceptual learning, it allows the coach to use the data collected and determine the needs and length of the coaching cycle. Based on this research, judgments can be made regarding whether to continue coaching, adjust tactics, or stop coaching altogether.

Coaching cycles are continuous, and for sustained changes in instructional practices, more than one cycle should occur. However, the frequency of coaching varies among teachers based on particular need (Amador et al., 2023; Chung, 2023). Amador et al. (2023) assertedthat teachers who took part in several coaching cycles gradually centered their instructional annotations on students and linked elements of instructional practice more frequently with the ideas that students were thinking about. Coaches asked more inquiries and shifted their attention from providing interpretations to concentrating on instructional practice goals during the coaching cycles. Chung (2023) looked at how coaches interacted with various instructors over a 2-year period in order to find resources that would help coaches create a healthy coaching dynamic with teachers. The coaches

visited with instructors at varying frequencies, but they did not modify their coaching approaches specifically for them. Coaches met more frequently with teachers who had greater relationships with them, as opposed to basing their frequency of coaching on the instructional skills of the teachers. Findings concluded that basing the frequency of coaching on teachers' individual needs proved to be more effective with lasting change.

Creation of a System for Sustainable Instructional Change

Districts have worked to improve or expand their instructional guiding infrastructures in response to the challenging objectives for instructional change outlined in the revised standards for mathematical practice. There is a growing consensus in education that solely implementing a new curriculum accompanied by a large-scale professional learning experience does not lead to sustainable change. According to Russell et al. (2020), this is the favored approach taken by school districts to improve student achievement; however, research shows this method is not practical. Instructors' ability to maintain the cognitive demands of high-level mathematical problems improved when coaches had in-depth and focused interactions with them about lesson planning, paying attention to content, pedagogy, and student learning.

The addition of content-specific instructional coaches to this project is a comforting step toward promoting instructional adjustments that will increase student achievement and advance instruction(Harbour et al., 2021; Kho et al., 2019).Harbour et al. (2021) examined mathematics coaching approaches at the individual and group levels, and both proved to positively impact student achievement. Also, taking a nonauthoritarian, or partnership, approach to coaching led to more positive results that

led to changed teacher practice (Kho et al., 2019). Therefore, content-based coaching that is provided in a manner suitable for content-specific instruction that employs a partnership approach leads to effective and sustainable change.

Use of Video Analysis

A PD method known as video coaching involves teachers or coaches filming instructional episodes and doing ongoing, video-based one-on-one or group conversations (van der Linden& McKenney, 2020). As part of a coaching cycle that includes observations, feedback, and analysis, video examination is a key component that can drive instructional change (van der Linden et al., 2022).Kavanaugh et al. (2024) also noted a correlation between changed instruction when instructional coaches included video analysis as part of their coaching cycles with teachers. Video analysis allows teachers to examine, reflect on, and improve their own practice. It also allows them to share best practices and strategies with other teachers. Overall, video analysis accelerated PD in the school system (Rekoi Kilcullen &Tabelusal, 2024). Because of the online environment of POS, all synchronous lessons are recorded, lending itself to engage in the process of video analysis during coaching cycles.

Use of an Instructional Playbook

A playbook is a collection of actions used to react to circumstances with a predetermined outcome in mind. The suggested instructional playbook for the study's school will embody the set of instructional techniques required to expedite the implementation of research-based teaching practices (Schaefer et al., 2019). The purpose of a playbook is to assist educators in strategic planning and thinking through ways to

maximize the opportunities that the online world offers in both their virtual and in-person learning environments. This guide helps teachers positively influence student learning by merging design and teaching principles, especially for students who are socioeconomically disadvantaged, female, or of a minority race (Online Learning Consortium, 2021). Rachel et al. (2024) examined the use of a playbook specifically in the online learning environment, examining both academic and engagement outcomes of students. The findings indicated that students in schools that implemented a playbook achieved significantly more than those who did not use a playbook, specifically in the content areas of mathematics and science.

A few examples of long-term success exist when teaching and learning are systematically improved. If meaningful changes in practice are to be made, the traditions of teacher autonomy and seclusion must give way to a system that values cooperation, shared practice and resources, and improvement advice (Meyers & Darwin, 2019). The missing piece that connects practice and research is reasoned to be an instructional playbook (Knight et al., 2020). In essence, a playbook supports the coaching process by listing research-based strategies for coaches and teachers, including checklists. These checklists act as a guide and lay the foundation for productive conversation around instructional practices. As teachers learn, implement, and refine instruction, the playbook acts as a guide to help them navigate toward improved learning outcomes for their students. Through this compilation of strategies that are carefully chosen, highly effective teaching techniques, instructional coaches will have a thorough understanding of these techniques, the supporting data, and the procedures involved in putting them into

practice(McKibben, 2021). Then, as coaches work with teachers to assist them in achieving student learning objectives, they can refer to this tool throughout the *impact cycle*.

In closing, instructional coaching has advanced over the years to link large-scale professional learning to translate into effective implementation within classrooms. Through the lens of PD, coaching has evolved, and research has identified effective techniques to be used by instructional coaches that have led to improved student outcomes (Galey-Horn, 2020; Woulfin&Spirtzer, 2024). Woulfin and Spirtzer (2024) conducted a long-term study where coaching evolved from teacher support to implementing a district-level framework to support the work of coaches to then using coaching to drive school improvement initiatives that led to better student achievement. It has been discovered that coaching results in intranet systems, group knowledge, and cooperative problem-solving—all essential elements to propel change while modifying conventional classroom mathematics techniques (Galey-Horn, 2020). Therefore, continuing to develop the coaching approach used in POS, knowing that it has led to better student outcomes, has the potential to better student achievement scores in mathematics.

Project Description

This project (see Appendix) will deliver a PD series to instructional coaches. This learning series aims to strengthen the approach and resources used to coach middle school mathematics teachers in hopes of improving student achievement. This approach combines research-based approaches to instructional coaching (Knight et al., 2020;

Russell et al., 2020; Schaefer et al., 2019; van der Linden & McKenney, 2020) to ultimately improve coaching practices that influence teacher development and student outcomes.

Several resources will be needed to prepare for this learning. Currently, the instructional coaches are required to use the book *Visible Learning for Mathematics* (Hattie et al., 2017). Using an appendix from this text, entitled "Eight Effective Mathematics Teaching Practices," the coaches will create an instructional observation checklist using the teaching practices, purpose, and actions of the teachers and students. This will develop the playbook used across the middle school to provide consistency toward the evolution of teachers' instructional practices and align with the effective approach taken by (Russell et al., 2020). The playbook will be built as a website and accessed through the school's secure platform that houses supplemental resources, making it accessible to coaches, teachers, and leaders to grow instructional practices as a team. Previously recorded lessons will be used during the video analysis training. Because the school is online, these recordings are easily accessible for training purposes.

There are several foreseeable barriers to this learning; however, building in systems of support to this work as vehicles to drive the learning should ensure learning outcomes are met. Middle school mathematics teachers are implementing a new curriculum this year. If teachers see the curriculum work separately from the development of instructional practices, a negative perception could develop surrounding this learning. However, a partnership between the coaching team and curriculum team to build a common understanding of how curriculum and instructional work can be

developed together will provide clear communication across departments and support teachers through these changes. Also, middle school leaders will be involved with the learning surrounding feedback related to the playbook; hence, feedback from leaders and coaches will be consistent and clear.

Project Evaluation Plan

The project will be evaluated by various pieces included in the PD series. First, instructional coaches will complete surveys at the end of each PD session that capture their perception of the learning experience and evaluate if the learning outcomes were met. Next, the data collected from the checklists the coaches use during the coaching cycles will show before and after data and reveal if instructional changes occurred after the coaching cycle. Finally, the next year's MSA scores will be used to determine if student achievement increased.ThePD project can be assessed using several data collection methods. Perception data will be used between sessions to inform the presenter how to steer the next meeting. The data from the checklists will guide the coaches' learning as they develop their coaching cycles. Finally, student assessment data will provide insight into whether coaching had a greater impact on student learning than in previous years.

Project Implications

The National Council of Teachers of Mathematics stated that without mathematics literacy, as well as without a strong mathematics identity and sense of agency, people will find it more and more difficult to comprehend, critique, let alone challenge many of the decisions and actions of those in power in political, social,

scientific, and economic institutions (Larson, 2018). Based on the data from this study, coaching cycles had a positive effect on student outcomes. Because the goal of this project is to improve coaching cycles, it can ultimately improve students' mathematical understanding and better prepare them to achieve post-secondary success in life. This will eventually positively impact society, producing better thinkers, problem solvers, and contributing members of society.

Section 4: Reflections and Conclusions

Project Strengths and Limitations

The creation and implementation of this instructional playbook aimed to improve the coaching cycle, which will positively affect students' mathematical achievement. The data from this study revealed that no significant difference existed between students whose teachers received the coaching intervention and those students whose teachers did not engage in the coaching cycle. However, this was the 1st year of implementing coaching cycles. Therefore, improving the coaching cycle should evolve teacher instruction and student mathematical achievement. Based on the research, an instructional playbook has several strengths. According to Rachel et al. (2024), students who used instructional playbooks performed noticeably better than those who did not, especially in mathematics. A playbook is a compendium of research-based tactics and checklists for teachers and coaches that aid in the coaching process, creating consistency in strategy implementation across a school (Knight et al., 2020).Woulfin (2020) noted that when districts are looking for PD opportunities that will significantly alter their teaching methods, coaching can be crucial as it bridges large-scale PD to implementation within classrooms. In this project, the large-scale learning is the Eight Effective Mathematics Teaching Practices. Using the student and teacher actions to create a checklist and cycle coaching will take this more extensive learning and scaffold the learning into practice.

The inclusion of video analysis strengthens coaching cycles. Researchers showed a relationship between how instruction improved when instructional coaches incorporated video analysis into their teacher-coaching cycles (Kavanaugh et al., 2024). Through video

analysis, teachers can assess, consider, and refine their own methods. They can also exchange methods and best practices with other educators (Rekoi-Kilcullen &Tabelusal, 2024). In general, video analysis expedited the advancement of professionals within the educational system.

While the instructional playbook and video analysis are proven methods to increase the effectiveness of cycle coaching, their success could be limited. Because the instructional coaches are adapting the teacher and student actions to the online learning environment, personal bias could play a role in creating the checklists. Also, developing the playbook with checklists, vetting the materials, and implementing itwithin coaching cycles that include video analysis may take longer than just a single school year. Anticipated results of improved student mathematical achievement may not be seen in the 1st year of implementation.

Recommendations for Alternative Approaches

This study addressed the problem that approximately 96% of middle school students did not meet proficiency on theMSAatPOSin 2021. Cycle coaching was the identified intervention used by the school and examined in this study to address the problem. Based on the quantitative analysis conducted, cycle coaching proved to be effective. However, there are alternate ways to address student mathematical achievement. Multitieredsystems of support consist of numerous levels of prevention and intervention across various domains. *Multitiered systems of support* is sometimes used as a catch-all term for a multitiered, proactive, school-wide behavior program and academic support for reading, writing, and math (Santiago et al., 2024). Integrating behavior and

academic support systems can become complicated, necessitating a lot of planning and work to implement in schools; however, POS has an established system. Because multitiered systems of support involve the systematic measurement ofmath achievement at three tiered levels of instruction, a deeper examination of how students respond to core and intervention instruction could be an alternate approach to looking at the mathematical achievement of middle school students at POS.

Scholarship, Project Development and Evaluation, and Leadership and Change

The scholarship is conducting in-depth research and producing original knowledge that enhances a field of study. It entails a detailed literature review, critically evaluating data, interpreting findings, and actively contributing new ideas via research to the body of knowledge already known in an area. Through this research study, I have grown as a scholar and become more knowledgeable about the research process and instructional coaching.

Becoming a scholar has been a journey through personal and PD. Engaging in this in-depth research process has made me more confident in my knowledge and decision-making in instructional coaching. The literature review expanded my knowledge base surrounding mathematics instruction and learning and how cycle coaching can act as an intervention to develop teachers and support student achievement. By conducting a quantitative data analysis, I have learned how to use and interpret numerical data to draw conclusions about a particular problem. With this information, I could synthesize current research and create a plan to continue moving the work forward in a positive direction. This project has challenged me to grow in scholarship both personally and professionally.

Because I developed a project study for a local school district, the meaning behind this project was personal, as it allowed me to develop a plan to continue helping the school increase student achievement. It was fascinating to start with a theory, synthesize the current research associated with instructional coaching, conduct data analysis, and pave the way to create a PD plan for this school. With the PD plan and evaluation, I plan to continue this scholarly cycle to determine the effectiveness of this approach for stakeholders across a school.

Education constantly evolves with new theories, practices, and ways to support student learning to prepare them for future success. At its core, leadership plays a critical role in helping a school community. Through this research, I have grown as a leader and supported incremental changes in the school I partnered with. This study allowed the school to see the positive impacts of its decision to use cycle coaching as an intervention, and I look forward to leading change in the district with this project.

Reflection on the Importance of the Work

Schools play a vital role in developing the next generation to be responsible citizens of this global world. At the heart of this study is a focus on student learning, specifically in mathematics. Mathematics is essential in education, cultivating critical thinking and problem-solving skills. This work is crucial as it adds to the knowledge base regarding instructional coaching and its role as an intervention to grow student achievement in math. The PDplanincluded in this project studymay ultimately create a way for this district to continue growing teachers and students.

Overall, this project aims to provide POS with a rigorous professional learning series to develop leadership capacity among the instructional coaching team. Because cycle coaching showed promise in growing students' mathematical achievement, evolving coaching practices to strengthen the intervention could lead to increased mathematical understanding of the students. This work is critical to providing sustainable PDby encompassing both coach and leader learning. In building this partnership and laying the foundation to align to current best practices of instructional coaching, this model can be used to continuously enhance teachers' instructional practices and support student learning.

Implications, Applications, and Directions for Future Research

This study has the potential to positively impact social change, as it aims to grow student achievement. Education plays a critical role in social change by giving people the knowledge, awareness, and critical thinking abilities to actively address social injustices, advance human rights, combat poverty, and build a more just and sustainable society. In other words, education prepares people to become change agents in their local communities. While this study examined a specific school, the results showed that coaching has the potential to impact teachersand student learningpositively and can be applied specifically in the online learning environment.

There are several recommendations for future research. The first step would be replicating this current study in other online districts to examine how coaching influences teacher and student change across different schools. Because the growth of a coaching system within a school cannot operate without coaches partnering with other leaders

within the district, it would be beneficial to examine organizational structures that allow coaching to sustain instructional improvement (Woulfin& Spitzer, 2024). Because the PD plan relates to coach education, research to provide a uniform, consistent construct description of coaching presence that identifies its cognitive, emotional, behavioral, and spiritual components would be more groundbreaking and transformative (Grissom& Gordon, 2024). If the presence construct were adequately defined, all aspects of coaching presence, such as curriculum, growth techniques, and a legitimate, trustworthy indicator of coaching presence, would have a common language and basis.

Conclusion

In conclusion, increasing student mathematical understanding is vital to our global community. This study examined the effects of cycle coaching on student achievement based on the theory of action for teacher coaching. Results indicated that cycle coaching positively impacted students' mathematical achievement. Because cycle coaching showed promise, a PD plan for instructional coaches was developed based on research that included coaching methods to enhance current coaching practices. It is the hope of this plan to grow coaching practices with the intent to evolve instruction and increase student achievement.

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Appendix: The Project

Overview

Mathematics is essential to learning as it encourages analytical thinking, builds problem-solving skills, and develops critical thinking. However, the most recent National Assessment of Educational Progress shows a significant drop in mathematical achievement scores, with only 26% of eighth graders in the United States demonstrating proficiency in math (National Center for Education Statistics, n.d.).

Instructional coaching is a research-based approach to improving mathematical proficiency through individualized professional learning (Knight et al., 2020; Russell et al., 2020; Schaefer et al., 2019; van der Linden & McKenney, 2020). POS serves as a catalyst to promote academic and personal growth for their students. The project stems from a research project showing that students at POS respond positively to the instructional coaching intervention; therefore, strengthening the coaching approach should increase students' mathematical achievement. Additionally, the project ensures that POS can build its capacity to create scalable and sustainable high-quality professional learning experiences for its teachers. Participating educators gain expertise as they participate in a gradual release model, which ensures implementation fidelity and sustainability of the professional learning experiences.

Instructional Coaching Professional Learning

The instructional coaches at POS employ cycle coaching to grow teachers' instructional practices and students' achievement in mathematics. Cycle coaching showed promise in increasing students' mathematical knowledgeandstrengthening the coaching

practices, which aims to continue student learning on this trajectory. Through this professional learning series, coaches will gain an increased knowledge base regarding the National Council of Teachers of Mathematics (NCTM) effective mathematics teaching practices, build an instructional playbook to use during coaching cycles that attend to the online learning environment, and use video-based instructional analysis to grow instructional practices continuously.

Participating instructional coaches will engage in eight weeks of virtual professional learning. The professional learning will focus on the following topics:

Day 1 (Full Day):

- **Topic 1: What is an instructional playbook?**
  - Purpose of using an instructional playbook
  - Example templates
  - Video analysis of using a playbook during coaching cycles
- **Topic 2: Eight Effective Mathematics Teaching Practices (NCTM)**
  - Identifying key elements of the eight effective mathematics teaching practices
  - Teacher and student observable behaviors during instruction
  - Building the playbook for use in an online learning environment

Outcome: Instructional coaches will create eight playbook pages to be used in the online learning environment to observe lessons and grow instructional practices.

Day 2 (Half Day):

- **Topic 3: Video-Based Instructional Analysis**
  - Level-setting using recorded lessons and the playbook pages
  - Debrief the data to identify current instructional trends
  - Preparation to implement with teachers

Outcome: Instructional coaches have practiced with one another to level-set instructional feedback. Each coach will leave with a plan to implement with teachers and start cycle coaching using the checklists. The consultant will push in with coaches during cycles and support their development with instructional analysis during virtual support sessions.

Day 3 (Half Day):

- **Topic 4: Debriefing Coaching**
    - Coaches will bring their coaching notes and debrief with one another their experiences working with teachers
    - Any updates will be made to the playbook based on the coaching experiences
    - Prepare to share with other leaders at the school to ensure consistency in feedback

Outcome: Completed and finalized playbook to drive instructional development and change that will be shared with other leaders to provide consistent feedback and sustainable change.

Day 4 (Full Day):

- **Topic 5: Leadership Learning**
    - Instructional coaches will share the playbook with other leaders at POS
    - Coaches will lead a level-setting meeting using recordings
    - Coaches and other leaders will conduct walkthroughs using the playbook pages and give feedback to teachers
    - Coaches will collaborate with other leaders to create plans for continuous instructional improvement

Outcome: Systematic approach to providing feedback using the playbook that drives instructional change. Coaches will develop instructional improvement plans with the support of other leaders at the school with the goal of consistency across all levels of leadership.

Embedded Throughout the Professional Learning:

- Interactive Activities and Opportunities for Practice
- Opportunities to Contextualize the Learning
- Strategic Connections to School Curricula, Programs, and Data Sources

Deliverables and Timelines

Instructional Coaching Professional Learning			
Audience	**Major Deliverable**	**Description**	**Timeline**
Instructional Coaches	Mathematics Playbooks	Participants will create an online playbook to use during coaching cycles using the Eight Effective Mathematics Teaching Practices.	Week 1
	Video-based instructional analysis training	Using recorded lessons from POS, the consultant will model using the playbook pages and instruct coaches through video-based analysis. Coaches will practice and level-set under the consultant's guidance. The consultant will work with coaches during cycle coaching to evolve coaching practices. Coaches will implement this during coaching cycles and return the data to the consultant for analysis and debriefing.	Weeks 2-6
School Leaders	Leadership Learning	To ensure consistency with feedback and instructional growth, the coaches will train other POS leaders to provide feedback aligned with the playbook under the guidance of the consultant.	Week 7
Instructional Coaches	Ongoing Professional Learning	Based on the session outcomes, POS leaders will determine their learning needs and/or additional training topics, which the consultant will prepare and deliver.	Week 8

Ongoing Professional Learning

Instructional coaches will participate in virtual professional development sessions to deepen their knowledge and skills as they begin implementing cycle coaching that includes video analysis and playbook use. Session topics are determined based on

observations and the needs communicated by the participants. During the sessions, educators have the opportunity to ask questions and collaborate with colleagues.

Virtual Implementation Support

Instructional coaches receive job-embedded support during virtual support sessions. Demonstrationcoaching sessions, coaching debriefs, and observation feedback are utilized to provide job-embedded support. This professional learning will equip coaches with the knowledge and skills to implement video-based analysis using the playbook during coaching cycles.

Communication and Evaluation

The consultant will meet with the POS leaders periodically to ensure collaboration, communication, and continuous improvement and share progress toward the timely completion of each specified deliverable.

Continuous evaluation facilitates planning and improves decision-making in a proactive, formative manner. The consultant will provide POS with a final evaluation report that will include the following data points:

- Analysis of growth in coach content knowledge
- Coach participation in professional learning
- Session evaluations
- Analysis of student outcomes in mathematics

A strategic plan for communication and evaluation will be followed, consisting of the major deliverables outlined below.

Communication and Evaluation			
Audience	**Major Deliverable**	**Description**	**Timeline**
School Leaders	Once a Month Meetings	The consultant will meet with school leaders periodically to ensure collaboration for continuous improvement. Progress towards the completion of applicable deliverables will be shared during each meeting.	Prior to Week 1, During Week 4, After Week 8
	Final Evaluation Report	A Final Evaluation Report will include: o Educator PD Attendance o Session Reflections o Observation Data o Student Outcomes	Next cycle of MSA