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ADDRESSING MATH LEARNING LOSS IN LOW-INCOME MIDDLE SCHOOLS: A QUALITATIVE STUDY OF DATA-INFORMED LEADERSHIP

A DISSERTATION APPROVED FOR THE
DEPARTMENT OF EDUCATIONAL
LEADERSHIP AND POLICY STUDIES

BY THE COMMITTEE CONSISTING OF

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Dedication

This research is dedicated to educators who stayed through the pandemic, and those who stepped in to fill the vacancies afterward. Your resilience and dedication to our children continue to inspire us all. Ultimately, I hope this research encourages us to see data not as a burden, but as a tool for hope – helping us meet each student exactly where they are, so they can learn, recover, and flourish in the wake of unfinished learning.

Acknowledgments

"When you want something, all the universe conspires in helping you achieve it."

-Paulo Coehlo, *The Alchemist*

This research stands on the shoulder of giants. My husband, Branden, did almost two years of my half of household duties, and never questioned the financial commitment to this process, my locking myself in an office for days at a time or traveling for weeks away to interview. My mom, Angel, always reminded me of my strength as a first-generation college student, and my purpose. My dissertation chair, Dr. Tim Ford, met me in coffee shops, accepted a barrage of texts and email communications, and offered feedback to ensure I was learning throughout this process. Dr. Dan Hamlin read and re-read my prospectus, and his encouragement helped me to continue this work and see myself as someone who could finish a dissertation. Dr. Liz Zumpe provided opportunities to grow through feedback and presentations, offering kind words of encouragement along the way.

There are also many researchers, practitioners, and colleagues over the years who have allowed me to come to these understandings. Paul Bambrick-Santoyo and Jesse Rector, who first showed me what data-informed practices could look like in action. Datnow and Park, though we have never met, have shaped my understanding of data-informed leadership. Morgan Wood, my peer, who sparred on dissertation topics, and gave me encouragement and feedback. Finally, I express deep gratitude for the 25 instructional leaders who gave me precious time to learn from their work.

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Abstract

Following the COVID-19 pandemic, middle school students of low-income backgrounds exhibited particularly significant learning losses in mathematics. Empirical research indicates that data-informed leadership practices can have an important role in accelerating mathematics achievement among low-achieving students, but there is limited research exploring how instructional leaders seek to use data-informed approaches to counteract post-pandemic learning loss. This study investigates current data-informed leadership practices by performing semi-structured interviews with (n=25-30) instructional leaders in low-income middle schools. To interpret and communicate the findings, Datnow and Park's 4 P's framework - People, Policies, Practices, and Patterns - is used to assess data-informed instructional leadership practices. Findings from this study indicate that math instructional leaders view data-informed practices as central to improving student outcomes, with effectiveness shaped by teacher capacity, collaborative trust, and adaptive responses to post-pandemic challenges such as staffing instability, student engagement, and widening learning gaps.

Chapter 1: Introduction

Instructional leaders in low-income schools face the challenge of addressing widening COVID-related achievement gaps between their students and those in more affluent schools (Bryant et al., 2023; Dorn et al., 2021). The disruptions to schooling caused by the COVID-19 pandemic have had a strong negative impact on student achievement, shaping what is now referred to as the post-pandemic education environment. For this dissertation, post-pandemic education is defined as the educational experiences students received after the initial school closures in 2020 due to COVID-19. Post-pandemic education results indicate significantly widened learning gaps, particularly for students from low-income backgrounds (Garcia & Weiss, 2021; Kuhfeld et al., 2020, Lewis & Kuhfeld, 2024; Pier et al., 2021). Even though in-person learning resumed for many schools in 2021, pandemic-related learning loss has persisted in state and national achievement data (Bryant et al., 2023; Dorn et al., 2021).

Across the United States, the gap between pre-COVID and COVID test scores widened in 2023-2024 (Lewis & Kuhfeld, 2024). Among these trends, eighth-grade math has emerged as a particularly significant concern, highlighted in NAEP and NWEA assessments (Bryant et al., 2023; Lewis & Kuhfeld, 2024). Learning loss has been most pronounced in eighth-grade math as some scholars found that the 2024 cohort of eighth math students need an additional 9.3 months of learning to catch up to pre-pandemic levels, the largest gap of any grade level or content area third through eighth (Lewis & Kuhfeld, 2024). The gaps present in eighth-grade math do not begin in eighth-grade math, given that standards in mathematics build upon each other year over year (National Research Council, 2009), but the data suggest this is the grade level where the learning loss is most pronounced. According to the 2022 National Assessment of Educational

Progress (NAEP), eighth-grade math saw the largest decline in student performance since 1990 and the largest drop overall in student achievement out of any other grade or subject assessed post-pandemic (*Methodology Studies - State Standards | NAEP*, n.d.).

Eighth-grade math is pivotal for students' academic trajectory as it forms the foundation for algebra and higher-level mathematics and critical thinking skills needed for high school and post-secondary education (Boaler, 2022; *National Mathematics Advisory Panel*, 2008). Mastery of algebra is considered a gateway to success in STEM fields and is correlated with higher graduation rates and college readiness (Hein et al., 2013), completing Algebra I in eighth-grade dramatically increases a student's chance at higher mathematics in high school (Clotfelter et al., 2015). While race and socioeconomic status are factors for students and college completion, advanced mathematics instruction in high school has an independent effect on college outcomes (Adelman, 2006).

To support schools with the challenges caused by COVID-19, the federal government provided the Elementary and Secondary School Emergency Relief (ESSER) funds of 122 billion dollars from 2021 until September 2024. ESSER funds were provided to schools to support the challenges posed by the pandemic with ninety percent of funds required to go directly to school districts, yet only twenty percent of the funds needed to be used to support student learning (US Department of Education, 2021). Little guidance was provided on how best to use funds to recover learning loss caused by the pandemic (US Department of Education, 2021). As a result, schools have had lackluster and inconsistent success in mitigating learning loss nationally (Bryant et al., 2023; Dorn et al., 2021; Lewis & Kuhfeld, 2024; Pier et al., 2021).

Beyond addressing funding challenges, school leaders have had to reevaluate their practices to adapt to broader systemic issues exacerbated by the pandemic (Dorn et al., 2020a;

Kuhfeld et al., 2020). Teachers and school administration are tasked with addressing immediate learning gaps and rethinking long-term strategies to ensure equitable learning opportunities for all students (Garcia & Weiss, 2020), all while facing recruitment and retention challenges created or exacerbated by the pandemic (Hamlin et al., 2024) and student absenteeism challenges (Darling-Hamond et al., 2023; Dorn et al., 2021). Some public districts are also experiencing additional funding gaps caused by a decrease in student enrollment (Dee, 2023).

While there is growing interest in developing strategies to mitigate COVID-19 learning loss, many interventions proposed by scholars may be cost-prohibitive and difficult to sustain. Prominent high-leverage strategies, such as high-dosage tutoring and additional time for learning acceleration in the summer, are estimated to cost over 100 billion dollars depending on the treatment size and may be missing students with need as they can be opt-in programs (Dorn et al., 2020b). Some scholars advocate for professional development for teachers to address COVID-19 learning loss (Darling-Hammond & Hyler, 2020; Hamlin et al., 2024), and enhanced support for technology integration in classrooms (Rapanta et al., 2021), but the literature does not address those who will be leading the professional development for teachers. This oversight can create a challenge with sustainability, which can lead to greater costs and less effective practices.

Funding challenges and persisting COVID-19 learning loss suggest a need for low-cost solutions. Since the 1980s, data-informed practices have been described as a low-cost strategy for responding to student achievement gaps (Popham, 1987). Empirical research describes data-informed practices as the systematic collection and analysis of student data to guide instructional actions at the classroom, school, or district level (Carlson et al., 2011; Datnow & Park, 2014; Mandinach et al., 2006; Marsh et al., 2006). Under the right conditions, evidence suggests that

data-informed practices improve student achievement, particularly in math and for low-income students (Carlson et al., 2011; Van Geel et al., 2016). In math, when students are transitioning from arithmetic to more abstract concepts like algebra, data-driven practices can prevent small gaps from widening and help students catch up to grade-level material.

Research demonstrates that data-informed practices are cost-effective (Popham, 1987), and have the potential to significantly improve student achievement, particularly in math and for low-income students (Carlson et al., 2011; Hattie, 2009; Hattie, 2023; Lai et al., 2016; Poortman & Schildkamp, 2016; Van Geel et al., 2016). Key components of data-informed practices, such as formative assessment, feedback, and intervention, are correlated with improved student outcomes (Hattie, 2009; Hattie, 2023). Studies also highlight that while teachers have access to an abundance of data, meaningful analysis, and effective instructional planning often depend on support from colleagues and leadership (Means et al., 2011). Moreover, instructional leadership is identified as crucial in fostering a culture of data use within a school (Hubbard & Park, 2016).

Despite these findings, there is a notable gap in understanding how instructional leaders apply data-informed practices in response to the unique challenges of the post-pandemic educational landscape. While much of the literature emphasizes re-imagining schools, integrating technology, high-dosage tutoring, learning acceleration, and professional development (Dorn et al., 2020b; Leithwood, 2020), limited attention focuses on specific leadership actions required to address pandemic-related student learning loss. Although some researchers advocate for distributed leadership as a response to COVID-19 disruptions (Harris, 2020; Leithwood et al., 2020), comprehensive studies on instructional leadership and data-informed practices remain scarce. This gap underscores the need for research exploring the role of data-informed leadership

in mitigating learning loss, as this could inform practice and policies within school systems (Honig & Rainey, 2014).

Purpose of the Study

The purpose of this study is to understand how math instructional leaders (coaches, teacher leaders, principals), who self-identify as using data-informed practices describe their use in the post-pandemic education system. Data-informed practices could play a critical role in addressing COVID-related learning loss by tailoring instruction to meet student needs (Bambrick-Santoyo, 2010; Carlson et al., 2011; Datnow & Park, 2014; Mandinach et al., 2006; Marsh et al., 2006). The pandemic disproportionately affected students' learning progress, particularly in foundational subjects like mathematics, where cumulative knowledge is essential (*Methodology Studies - State Standards | NAEP*, n.d.). By leveraging data from formative assessments, diagnostic tests, and performance metrics, educators may be able to identify and teach knowledge and skill gaps in students' understanding (Datnow & Park, 2014). The following research question will frame the study:

1. How do math instructional leaders (i.e. coaches, teacher leaders, principals) describe the use of data-informed practices in their schools following the COVID-19 pandemic?

Overview of Research Design

The research question will be addressed through the research design, anchored in Datnow and Park's 4 P's framework: People, Policies, Practices, and Patterns. This framework provides a comprehensive lens for analyzing data-informed instructional leadership and allows for some nuanced understanding of how various elements within the educational system interact and influence the implementation of data-driven strategies (Datnow & Park, 2014). By applying this

framework, the dissertation seeks to assess the extent to which instructional leaders have been able to adapt and innovate in response to the learning loss challenges posed by the pandemic in math classrooms at low-income schools.

This dissertation employs a qualitative approach because constructivist learning theories suggest that individuals actively construct knowledge and that learning is an interactive process situated within specific social contexts (Gronn, 2003). Semi-structured interviews with instructional leaders (coaches, teacher leaders, and principals) are performed to examine how instructional leaders describe data-informed practices pre and post-pandemic. The researcher utilized network connections to generate a list of self-identified math instructional leaders working in Title I public schools (n = 25-30) representing three states and six school districts. Self-identification was used to avoid the assumption that all schools use data-informed practices and because a state-wide identification system does not exist. The interviews are conducted with 16 coaches, (seven school-based coaches and nine district-based coaches), one teacher leader, and eight principals or assistant principals.

Study Limitations and Contributions

The limitations of this dissertation include that there is intentional rather than random sampling. By sampling in three different states, there is an attempt to mitigate sampling bias by widening the geographical location. Participants recall regarding their data systems and practices before COVID-19 is also another potential limitation. Limitations also include the possibility that data-informed practices are not used as the literature describes them (Patton, 2014); however, self-identification of participants using data practices will attempt to mitigate this risk. As this is the researcher's first dissertation project, the researcher's experience is also a limitation of this dissertation.

The significance of this dissertation lies in the potential to contribute to theory and practice in the field of education leadership. This dissertation may offer insights for policymakers, educators, and scholars by addressing the gap in the literature on data-informed instructional leadership in the post-pandemic context. The findings may identify people, policies, practices, and patterns of data-informed practices that are unique to a post-pandemic context of education, potentially contributing to the broader goal of improving student outcomes in the aftermath of pandemic-related learning loss. The potential for data meetings to uncover student understanding could support practitioners in knowing what students are still missing in their learning. Targeted interventions could then be built from student understanding, enabling teachers to provide "just-in-time" instruction while focusing on grade-level content and remediate essential skills that students need to grasp the grade-level content taught (Dorn et al., 2020b; Lynch & Hill, 2020; TNTP, 2021).

Organization of the Dissertation

This dissertation is organized into five chapters. Chapter One introduces the study, including the background, problem statement, purpose, research question, framework, significance, and an overview of the methodology. Chapter Two presents a review of the relevant literature, focusing on COVID-19 learning loss with an emphasis on mathematics, data-informed practices, and data-informed instructional leadership. Chapter Three details the framework, while Chapter Four describes research design and methodology, including data collection and analysis procedures.

Chapter 2: Literature Review

This literature review begins by examining research on the impact of the COVID-19 pandemic on student math learning loss, as commonly used strategies such as remediation efforts including high-dosage tutoring and summer learning. This context provides insight into how schools may currently be experiencing and approaching learning loss challenges based on current research.

COVID-19 and Learning Loss

Research suggests that the pandemic has exacerbated inequities in student achievement, widening achievement gaps and lowering overall student achievement scores by the greatest margin in decades. A quantitative study reviewing hundreds of thousands of interim assessment data points in California found that the COVID-19 pandemic has changed student learning outcomes, including higher rates of learning loss for primary students, students with low-income families, and multilingual learning students (Pier et al., 2021). Researchers also used data from millions of students participating in the Northwest Evaluation Association (NWEA) to conduct quantitative projections and growth modeling. One projection indicated that low-income students could be one year behind in learning (Dorn et al., 2020b). Another researcher also using five million students' NWEA data found disparities among low-income students and their more affluent peers (Kuhfeld et al., 2020). This same study found that math growth declined by 50% in a typical year while reading declines were less substantial (Kuhfeld et al., 2020). When this study was revisited one year later with an additional two million points of NWEA data, students had not yet returned to pre-pandemic levels of learning (Kuhfeld et al., 2022).

The pandemic exacerbated existing inequities in student achievement as some sub-groups of more affluent students experienced academic gains (Pier et al., 2021). Researchers

hypothesize that students from low-income families had less access to technology, faced greater challenges in engaging in remote education, and had less access to live instruction (Dorn et al., 2020b). The isolation and uncertainty brought by the pandemic have led to increased levels of anxiety and stress among students, further hindering their ability to focus on learning and engage in learning activities. In a survey of 1,000 students in the U.S., researchers used regression models to compare the quality of electronic communication during the pandemic to levels of loneliness, feelings of emotional support, and coping efficacy (Juvonen et al., 2021). Some adolescents struggled to maintain meaningful connections and reported higher levels of loneliness and less stress management capacity (Juvonen et al., 2021). A review of existing literature focusing on adolescents in India suggests increased feelings of loneliness, anxiety, stress, and worsening mental health due to the pandemic, particularly children from low-income households (Ghosh et al., 2020). These compounded COVID-19 challenges not only widened the achievement gap but also underscored the link between socioeconomic status and a student's academic achievement.

COVID-related learning loss has had a ripple effect, raising concerns about the broader impact of the education experiences of students on democracy, social mobility, and the economy. The purpose of education is threefold: preparing students to be active members of a democratic society, to contribute to the needs of the labor market, and to advance personally (Labaree, 1997). A quantitative global analysis of historical academic achievement and economic trends indicates that early learning deficits can accumulate over time, leading to wider achievement gaps and reduced opportunities for academic and economic success (Hanushek & Woessmann, 2020). This study projects a 10 trillion-dollar global loss over the century without significant intervention (Hanushek & Woessman, 2020). Learning loss experienced during the pandemic

could result in lower social efficiency: diminishing graduation rates, college readiness, and career prospects. The National Center for Education Statistics found that college matriculation rates dropped 3% from 2019 to 2022 (2024). Some growth models using millions of historical data points for student achievement suggest that students' lifetime earnings could decrease by $61,000 to $82,000 due to learning loss, resulting in significant economic consequences (Dorn et al., 2020a).

Math Instruction and Learning Loss

One of the strongest indicators of student success in college is advanced mathematics in high school (Adelman, 2006) and taking Algebra I in eighth-grade math dramatically increases a student's chance at higher mathematics in high school (Clotfelter et al., 2015). Adelman completed a quantitative analysis of thousands of students across multiple years in the U.S. and found that taking advanced math, Algebra II or higher, in high school, is a strong predictor of completion of a bachelor's degree. The findings also concluded that while race and socioeconomic status are factors, mathematics instruction in high school has an independent effect on college outcomes.

Pandemic-related learning loss is most prominent in eighth-grade math, as evidenced by the National Assessment of Educational Progress (NAEP) and state test data. In 2022, NAEP scores for eighth-grade math showed the largest decline in 30 years, with the average score dropping by 8 points compared to pre-pandemic levels, (Methodology Studies - State Standards NAEP, n.d.). State-level assessments mirrored these findings, with some states reporting up to a 15% decline in math proficiency among eighth-grade students (Dorn et al., 2021).

Researchers attribute this pronounced gap to the complexity of eighth-grade math, which introduces foundational concepts such as algebra and linear equations, requiring more structured

instruction, something that was difficult to achieve through remote learning. Eighth-grade math also requires an accumulation of math standards taught in elementary and middle school to allow for mathematical fluency and to manage cognitive overload while engaging in complex thinking. Some students entering eighth grade are missing foundational understandings from prior grades where learning occurred with remote instruction and increased anxiety and stress during COVID-19. Moreover, eighth-grade math is a critical academic milestone; proficiency at this stage of math instruction is a strong predictor of future success in high school math courses, such as Algebra II and Calculus, which in turn influence college readiness and career paths in STEM fields (Adelman, 2006; Spielhagen, 2006).

A study was conducted on 2,634 seniors in the 2004 graduating class of a single large school district in the Southeastern United States (Spielhagen, 2006). A comparative analysis of these students' seventh-grade math scores was also compared to their math section scores on the SAT as well as the student's opportunity to take Algebra I in eighth grade. Initial findings for eighth-grade Algebra I found that, when controlling for variables, race was an insignificant factor in Algebra I enrollment, that gender was significant with more females than males selected for Algebra I, and that socioeconomic status had a negative relationship with Algebra I enrollment. Researchers found that there was a positive relationship between Algebra I enrollment and continued success in advanced mathematics, including attending college in greater numbers than students who took an eighth-grade math course.

The widening of these learning gaps could create a deeper sense of urgency for targeted interventions to prevent long-term academic setbacks. While enrolling students in Algebra I, despite learning loss gaps may seem tempting, some research indicates that this is detrimental for students. A quasi-experimental study in a large urban North Carolina school district including

20,000 students found that there were long-term negative effects for students weaker in mathematics being pushed into advanced mathematics prematurely, resulting in lower test scores in subsequent math courses (Clotfelter et al., 2015). This study made an argument for adequately preparing students for Algebra I as a policy for school districts to adopt, and in the context of COVID-19, could suggest that preparing students for Algebra I is a priority for future educational outcomes.

Remediation Efforts

Researchers have suggested effective strategies for addressing COVID-19 learning loss by leveraging methods used before the pandemic as well as new data collected during the pandemic. High-dosage tutoring stands out as an effective strategy to mitigate pandemic-created learning loss, with research demonstrating significant gains in student achievement through intensive, individualized instruction (Kraft & Falken, 2021; Nickow et al., 2020). A meta-analysis of 96 experiments that included 26,000 PK-12 students found that tutoring programs yield a pooled effect size estimate of 0.37 SD, yielding a substantial positive impact on learning outcomes (Nickow et al., 2020). A tutoring intervention for a sample of 800 kindergarteners in a large Southeastern district in the U.S. indicates that students receiving consistent, high-dosage tutoring can make up to five months of progress in math and reading over an academic year (Robinson et al., 2021). Given that some students are more than five months behind in some subjects and that individualized tutoring can be structurally challenging and cost-prohibitive. One study used modeling to estimate that tutoring for all K-8 Title I students costs between five and 16 billion dollars (Kraft & Falken, 2021). Some scholars estimated $2,500 - $3,800 per pupil with a two-to-one pupil-to-tutor ratio, the cost variation dependent on structure, scale, and intensity of tutoring (Kraft & Falken, 2021).

High-dosage tutoring is not the only solution for addressing pandemic-related learning loss. When returning from the pandemic, some scholars recommended beginning with a grade-level curriculum in the fall and identifying students who needed targeted support (Lynch & Hill, 2020). Increasing learning time through summer programming is another recommendation from scholars (Borman, 2020). This strategy's recommendation is rooted in a strategy to prevent student learning loss over a typical summer in pre-pandemic times. Researchers also reviewed seven summer learning programs at urban districts 15 years ago to estimate that summer learning provided by a district-led program costs between $1,109 and $2,801 per pupil for a five-week six hours a day summer learning program (McCombs et al., 2011). Adjusted for inflation with a federal inflation calculator, $1,109 in 2024 is just over $1,500. Researchers found that there is a suggested relationship between summer programs and student achievement, particularly for low-income students in reading and math, and researchers identified cumulative effects for students participating in multiple summers of programming (McCombs et al., 2011). What is still missing from the literature is how schools determine what topics to remediate with tutoring and extra time.

Data-Informed Practices

While remediation strategies such as tutoring and extended learning time are discussed as interventions for COVID-related learning loss, research suggests that these interventions are most effective when guided by data-informed practices (Halverson et al., 2007; Marsh et al., 2006). Scholars found that using data systematically enables schools to identify specific student learning gaps, allowing leaders and teachers to design targeted remediation strategies that address the precise needs of students (Halverson et al., Marsh et al., 2006, Means et al., 2011). Furthermore, scholars emphasized that leaders can empower educators to adjust and refine

remediation efforts in real-time, ensuring that interventions remain responsive to student progress (Datnow & Park, 2014).

The focus on data use is not new for the United States. The use of data in schools was introduced in 1948 with a theoretical discussion of management practices, such as statistical analysis training for teachers, and how these theories could be applied to the improvement of education outcomes for students (Scates & Deming, 1948). Competency-based testing added to the conversation of data regarding student learning in the 1970s and 1980s (Popham et al., 1985). Researchers initially discussed data-informed practices beginning in the 1980s, referring to them as measurement-driven instruction (Popham et al., 1985). The 1983 report *Nation at Risk* emphasized accountability and the need for evidence-based decision-making. One researcher claimed that these types of practices were the most cost-effective way of improving student learning (Popham, 1987).

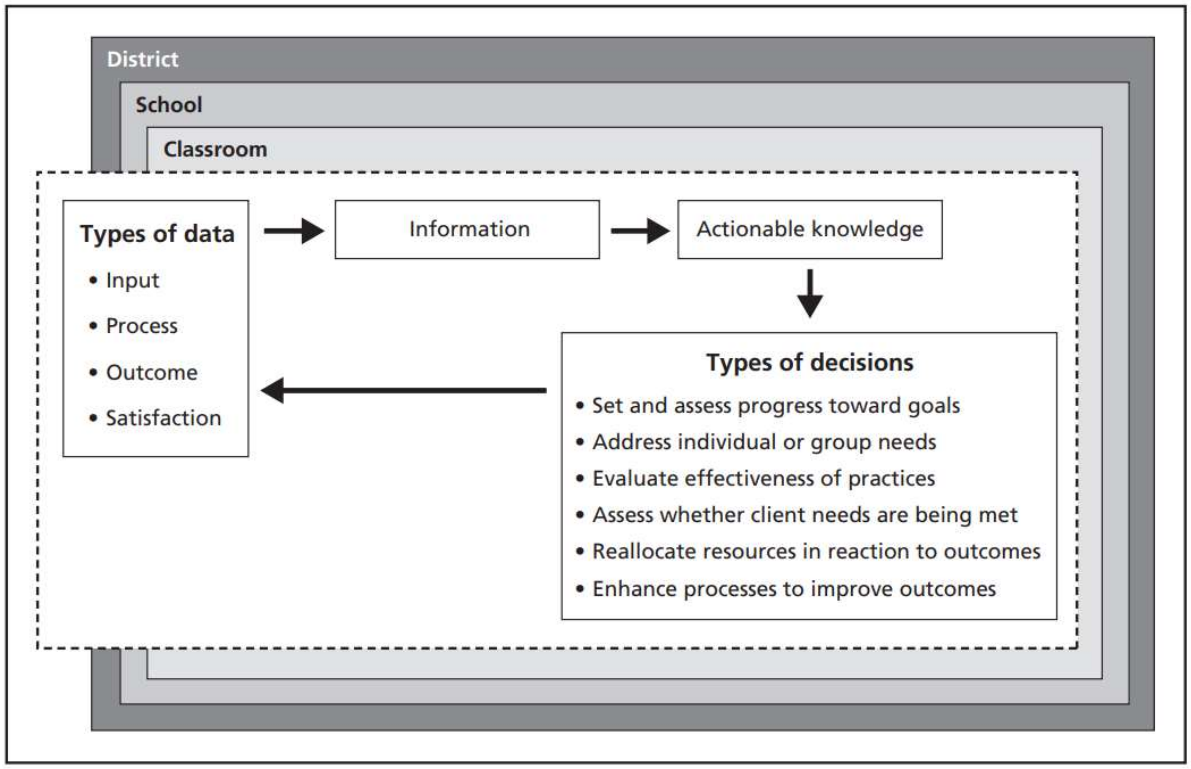
Federal reports and laws continued to drive a national conversation about the role of student data in education. The No Child Left Behind Act (2001), institutionalized the use of data to assess student performance and school effectiveness and made popular the term data-driven decision-making. The national conversation continued in 2015 with the Every Student Succeeds Act, which added additional measures of student data and an emphasis on student growth. With the emphasis on data use in federal education laws, researchers have continued to define elements of data-informed practices as well as explore possible relationships between data-informed practices and student achievement.

Empirical research describes data-informed practices as the systematic collection and analysis of student data to guide instructional actions at the classroom, school, or district level (Carlson et al, 2011; Datnow & Park, 2014; Mandinach et al., 2006; Marsh et al., 2006).

Different types of data are collected, distilled into information, and analyzed to identify actionable knowledge, and various types of decisions are then made from actionable knowledge. Figure 1 shows the elements of data-informed practices (types of data, information, actionable knowledge, and types of decisions), the cyclical nature of data practices, and illustrates how these practices can occur at the classroom, school, and district level (Marsh et al., 2006). Literature reviews and qualitative analyses have found that these decisions are ways to respond to the data, and include actions such as setting and assessing progress towards goals, addressing individual or group needs, evaluating the effectiveness of practices, assessing if individual needs are met, reallocation of resources, and enhancing processes to improve outcomes (Coburn & Turner, 2011; Datnow & Park, 2014; Marsh et al., 2006).

Figure 1

Data-Driven Decision-Making Conceptual Framework. Reprinted from Marsh et al. (2006)



When isolated, elements of data-informed practices show a relationship with increases in student learning. Feedback and assessment are core components of data-informed practices (Halverson et al., 2007; Hamilton et al., 2009). A synthesis of over 800 meta-analyses identified a correlation of 0.70 between feedback and improved student outcomes (Hattie, 2009). An effect size of 0.68 was also observed between formative assessments and improved student outcomes (Hattie, 2009). The same study, when reviewed 14 years later, identified an effect size of 0.73 in response to intervention on student academic achievement (Hattie, 2023). Response to intervention is described as the careful monitoring of class progress and additional or differentiated instruction for whole class, small groups, or individual students, and includes data tracking to make learning visible and allow for appropriate responses based on student need (Hattie, 2023). This same research found that data practices can promote a culture of continuous improvement when educators collaboratively analyze data to identify strengths and weaknesses (Hattie, 2023). The literature indicates a correlation between positive student achievement outcomes and data-informed practices, particularly when feedback, formative assessments, and responses to intervention are integral components of a school's data practices.

Under the right conditions, evidence suggests that data-informed practices as a system improve student achievement (Carlson et al., 2011; Hattie, 2009; Lai et al., 2016; Poortman & Schildkamp, 2016; Van Geel et al., 2016; Zumpe et al., 2025). In a cluster randomized control trial with 500 schools across seven U.S. states, there was a statistically significant positive relationship between data-informed practices and student math achievement (Carlson et al., 2011). A quasi-experimental design research was used in 53 New Zealand urban and rural schools over eight years to test for a relationship between data-informed practices in professional development and student literacy achievement for 7,800 students (Lai et al., 2016). The data-use

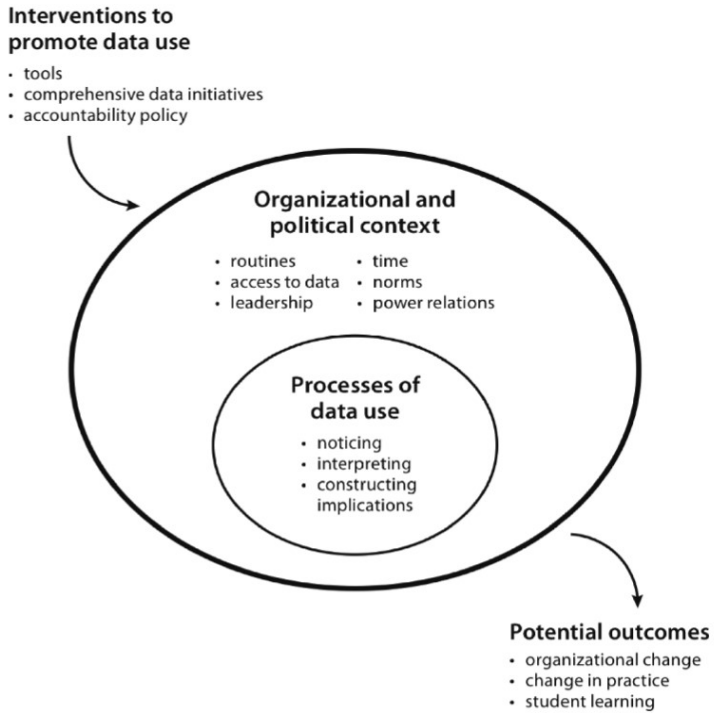
professional development included collaborative data analysis to identify achievement gaps, testing the causes of problems, and co-creating solutions. This intervention was found to positively correlate with high school qualifications, writing, and reading comprehension.

Two additional studies out of the Netherlands also identified a positive correlation between data-informed practices and student achievement. One study found that five out of nine school teams improved student achievement when supported when teachers and school leaders were supported in using data (Poortman & Schildkamp, 2016). Using linear mixed models, a second study based in the Netherlands collected two years of student data before a data-use intervention, and two years during the intervention for 53 schools (Van Geel et al., 2016). The findings suggest that data-use intervention had the highest improved achievement for low-income students. Case studies of one to six schools, while limiting in terms of lack of control and being descriptive rather than predictive, have also observed positive relationships between student achievement and data-informed practices (Bambrick-Santoyo, 2010; Copland, 2003; Feldman and Tung, 2001; Schmoker & Wilson, 1995).

The effectiveness of data-driven interventions is contingent on how these processes interact within the specific educational environments where they are implemented (Coburn & Turner, 2011). A literature review of 161 articles, books, book chapters, and reports identified that organizational and political contexts shape data use, and the process of data use is socially situated and influenced by the beliefs, motivations, and capacities of educators as well. Figure 2 delineates the components of data-informed practices and highlights which aspects are directly shaped by organizational and political contexts. The figure illustrates that routines, data access, leadership, time, norms, and power relations can shape the way teachers and instructional leaders are able to use data-informed practices.

Figure 2

Framework for Data Use. Reprinted from Corburn & Turner (2011)



A teacher's ability to analyze data and then make an instructional decision based on that analysis is a crucial component of data-informed practices (Mandinach et al., 2006; Marsh et al., 2006). A national study including 230 teachers from 19 elementary schools and 11 middle schools conducted interviews and data-analysis tasks to determine teachers' ability to analyze data for instructional use (Means et al., 2011). This study asked teachers to analyze a data task and create an instructional plan either individually or in small groups and found that 33% of those interviewed created instructional plans that were irrelevant to the data goals (Means et al., 2011).

Despite data literacy challenges, some researchers found various types of usefulness in certain types of student data. A qualitative analysis was conducted to understand how educators perceived the uses of different forms of data (Farrell & Marsh, 2016). The study interviewed 13 district leaders, 73 school administrators, coaches, and case study teachers, as well as 24 non-

case study teachers, and conducted 20 observations and resource reviews. Certain types of data, such as state exam data, were less likely to promote teachers reteaching standards or changing their pedagogical approaches. Classroom assessment and student work were described as most useful for changing instructional delivery, and assessments like state tests were less helpful in changing teaching practices.

Multiple studies have identified elements of data-informed practices and identified relationships between data-informed practices and student achievement. The literature suggests a stronger relationship between data-informed practices and student learning in the context of math, and for low-income students. Models of data-informed practices, called different names, identify critical components of data-informed practices: from data collection, analysis, action, and re-assessment to measure student learning.

Research suggests the role of eighth-grade math, particularly Algebra I, is a gateway to advanced high school math and college readiness (Aldeman, 2006; Clotfelter et al., 2015; Speilhagen, 2006). However, the COVID-19 Pandemic has exacerbated learning gaps across subjects, and most particularly in 8th grade math (Dorn et al., 2021; Methodology Studies, State Standards NAEP, n.d.). Despite the depth of research on the relationships between math achievement and long-term student outcomes, there is limited understanding of how data-informed practices are perceived in supporting math instruction specifically in a post-pandemic setting.

School Leadership and Student Achievement

Data-informed leadership emphasizes the systematic use of data to inform and guide instructional decisions, ensuring that educational practices are responsive to student needs and grounded in evidence (Blase & Blase, 1999; Datnow & Park, 2014; Hallinger, 2011; Halverson

et al. 2007; Horng & Loeb, 2010; Leithwood et al., 2009). Because there are both formal and informal leaders of data-informed practices (Datnow & Park, 2014; Neumerski, 2013; Spillane et al., 2004), data-informed leadership is described as shared data-informed leadership. One case-study analysis suggests the need for content expertise to support data practices (Stein & Nelson, 2003), and other scholars have found that principals do not spend a significant amount of time engaged in instructional leadership (Grissom et al., 2013; Huang et al., 2020). Neumerski (2013), in a comprehensive review of the instructional leadership literature, suggests the importance of examining the roles of principals, teachers, and coaches collectively, rather than in isolation, to understand how instructional leadership can support teaching and learning. This description aligns with the emphasis on shared data-informed leadership in schools and highlights the need for coherence among leaders engaging in instructional improvement efforts. To ensure those leading data practices are prioritized, this dissertation defines shared instructional leaders as teacher leaders, coaches, assistant principals, or principals who lead data practices.

For decades, scholars have tried to estimate the relationship between school leadership and student achievement and have tended to find a mostly moderate to low association between school leaders and positive changes in student learning (Hallinger, 2011; Leithwood et al., 2008; Marks & Printy, 2003; Robinson et al., 2008). When school leadership's influence on student achievement is present, it is often indirect and mediated through other actors, making it challenging to quantify (Hallinger, 2011). A review of recent literature, encompassing 43 journal articles, 11 books, and six reports, highlights the critical role of school leaders in supporting or hindering data-informed practices (Datnow & Hubbard, 2016). While teacher beliefs and collaboration are essential for effective data analysis and use, instructional leadership plays a key role in fostering an environment conducive to meaningful data utilization (Datnow & Hubbard,

2016).

One multi-year study including 96 principals, 2,764 teachers, and three years of language and math student achievement data was analyzed using a path analytics technique to identify causal linkages between school leadership and student achievement (Leithwood et al., 2008). The study found a modest but statistically significant effect of school leader collective and self-efficacy on student proficiency on state exams.

A separate study examining types of school leadership and their relationship to student learning was able to make correlational findings to student achievement (Robinson et al., 2008). Scholars quantitatively synthesized findings from an analysis of 27 empirical studies to examine three types of leadership and leadership actions. Leaders who focus on teaching and learning were identified as having a more significant impact on student achievement (instructional leadership) than those who emphasize administrative tasks (transactional leadership) or inspiration and motivation (transformational leadership). Practices such as establishing goals, engaging in direct involvement with curriculum and teaching planning and evaluation, and involvement with teacher professional development were associated with an average effect size of 0.42, 0.42, and 0.84 respectively on student achievement.

Another study conducted a survey of 1,779 teachers in 81 Texas elementary schools to identify 13 variables of school leadership and compare them to student achievement (Leithwood et al., 2020). Results indicated that "rational path leadership," which includes effectively managing instructional time, had the strongest correlation with student outcomes. Instructional time, influenced by leadership, correlated with teaching efficiency and pace and, ultimately, student achievement.

A meta-analysis covering 40 years of research investigated the relationship between

principals and student achievement (Hallinger, 2011). Researchers found that effective principals generally succeeded through collaborative efforts with staff and found the appropriate time and methods for using shared or distributed leadership. This research connects to research that identifies instructional leadership as the type of leadership with the largest effect size, (Robinson et al., 2008); as well as research that indicates principals have limited time dedicated to instructional leadership (Grissom et al., 2013; Huang et al., 2020).

Some scholars have found that principals do not spend a significant amount of time engaged in instructional leadership (Grissom et al., 2013; Huang et al., 2020). One mixed-methods study collected data by observing 100 principals for full days over the course of three years in urban schools, coupled with two surveys of almost 300 school leaders three years apart. On average, principals spent 12.7% of their time on instructional leadership tasks. Another study on American middle schools conducted a secondary analysis of the Trends in International Mathematics and Science Study data, the largest cross-national study of educational achievement (Huang et al., 2020). 501 randomly selected US private and public school participants in the study (in 2011), and 430 of those schools described the principal's use of time. Researchers found that principals' time was often fragmented and dominated by administrative tasks. Principals in higher-poverty schools were observed as more responsive and less focused on instructional goals.

While some researchers encourage teacher training programs to support teacher data-literacy development, (Mandinach & Gummer, 2016), effective instructional leadership has also been identified from qualitative studies as an important component of data-informed practices. Studies suggest that school leaders can support or hinder data-informed practices (Park & Datnow, 2009). Using qualitative data from a case study of four school districts, researchers

found that district leadership played a crucial role in setting policies and expectations for data use in schools. The interviews suggested that distributed leadership was most effective in promoting a culture of data in schools. Similar to other bodies of research, the importance of collaboration and the limitations of the data analysis capacity of educators were also present themes. Means, Chen, DeBarger, and Padilla's (2011) research found that when comparing small groups of teachers to individual teachers, small groups more frequently arrived at sound data interpretations and also appeared to enjoy the data process more, reinforcing the importance of collaboration.

Further studies highlight the positive impact of leader engagement in data-informed practices on teacher development and decision-making (Datnow & Park, 2014; Jimerson, 2014; Means et al., 2011). A mixed-methods study in a small district in Texas surveyed 338 teachers and leaders, as well as interviewed 16 teachers and leaders, revealed that modeling by leaders, formal training, and collaborative practices positively influenced teachers' data-driven decisions (Jimerson, 2014). Although geographically limited, these findings add to the literature by describing how leader engagement can shape teachers' data-informed practices.

Instructional Leadership

Instructional leadership extends beyond the actions of a single principal, encompassing a network of formal and informal leaders who shape instructional improvement within schools (Neumerski, 2013; Spillane et al., 2004). Distributed leadership, which engages staff in shared leadership roles, has been consistently identified as critical for fostering instructional improvement and sustaining professional learning communities within schools (Datnow & Park, 2014; Hallinger, 2011, Louis et al., 2010). The approach of instructional leaders extending beyond a sole principal emphasizes the collective practices of leaders, teachers, and coaches in

co-constructing instructional capacity, aligning with Neumerski's (2013) argument that studying principals, teachers, and coaches together is essential to understanding the enactment of instructional leadership.

A key element of effective instructional leadership involves content expertise (Stein & Nelson, 2003). In a case study analysis, researchers argue that leaders' subject-matter knowledge enhances their credibility, decision-making, and effectiveness in supporting teacher learning, contributing to instructional coherence and improved student outcomes. Distributed instructional leadership can facilitate aligning leaders with relevant areas of content expertise, reinforcing instructional improvement efforts across school systems.

Recent scholarship also emphasizes the role of instructional leadership within systems of accountability. Mintrop (2020) highlights the tension between accountability pressure and authentic instructional improvement, arguing that instructional leaders play a pivotal role in mediating external accountability demands while fostering internal professional accountability oriented toward instructional quality. This perspective frames instructional leadership as not only guiding teaching and learning but also navigating policy environments to support meaningful instructional practices.

Instructional leadership practices that promote collaborative inquiry and data use are particularly relevant in the current education context. Coburn and Turner (2012) argue that social interpretation of data within collaborative settings is crucial for driving instructional change, positioning leaders as facilitators of dialogue and joint sense-making around data. This aligns with findings that instructional leaders can positively influence teachers' data practices by modeling data-informed decision-making, providing structures for collaborative data analysis, and fostering a culture that values inquiry (Datnow & Hubbard, 2016; Jimerson, 2014; Means et

al., 2011).

While the direct correlation between instructional leadership and student achievement is often modest (Leithwood et al., 2008; Robinson et al., 2008), the indirect influence of instructional leadership through teacher learning, collaborative practices, and data-informed decision-making has been documented (Lai et al., 2016; Poortman & Schildkamp, 2016; Van Geel et al., 2016). Studies suggest that instructional leaders who facilitate meaningful engagement with data can support targeted instructional adjustments, leading to improvements in student outcomes, particularly for specific subjects and student subgroups (Carlson et al., 2011; Schildkamp et al., 2014).

Research suggests that instructional leaders are both formal and informal leaders within a school (Datnow & Park, 2014; Hallinger, 2011; Louis et al., 2010). While there is limited research identifying the correlation between effective school leadership and student achievement, there is some research that identifies a relationship between data-informed practices and improvements in student achievement, particularly for certain subjects and sub-groups of students (Carlson et al., 2011; Lai et al., 2016; Poortman & Schildkamp, 2016; Van Geel et al., 2016). There is also research that suggests that instructional leaders can positively influence teachers' data-informed practices by supporting data analysis, modeling data mindsets and practices, and fostering a collaborative environment (Datnow & Hubbard, 2016; Datnow & Park, 2014; Jimerson, 2014; Means et al., 2011).

Instructional leadership, when distributed, content-informed, and situated within collaborative and data-informed practices, may play a critical role in fostering instructional improvement within schools (Coburn & Turner, 2012; Datnow & Park, 2014; Mintrop, 2016; Stein & Nelson, 2003). There is limited empirical research exploring how instructional

leadership specifically functions when data-informed practices are shared among principals, coaches, and teacher leaders. Much of the existing literature focuses on principal-centered instructional leadership or generalized distributed leadership, leaving a gap in understanding the perceptions and experiences of multiple actors as they engage in data use for instructional improvement. There is insufficient exploration of how leaders' content knowledge intersects with their use of data to guide instructional practices, particularly in math or other areas relevant to pandemic learning recovery.

Perceptions of Data-Informed Leadership

School leaders' perceptions of data-informed practices and policies have been examined empirically for the last two decades. Using case studies, interviews, document analysis, and literature review, scholars found that instructional leaders generally see data practices as an essential and effective strategy for improving instructional quality and student achievement (Datnow & Park, 2014; Schildkamp et al., 2014). Some leaders shared with researchers that they see data-informed practices as a strategy to identify trends, make decisions, and support teacher development. They shared that some constraints include limited teacher data literacy, time, and resources. Leaders can also describe data-informed practices as a collaborative effort and recognize that their mindsets about data-informed practices can influence the school.

Additional research suggests that leaders perceive data use as an important strategy to improve student outcomes (Day et al., 2016). Scholars conducted a three-year mixed-methods study to explore the relationship between principals and student outcomes in England, including data from national student exams, a national principal survey, and case studies of 20 schools that were identified as effective or improving in student achievement. Leaders identified that improving teacher practice and promoting stronger academic emphasis were important for

changing academic achievement, and both primary and secondary school leaders cited encouraging data use as the first or second priority for supporting these initiatives.

Halverson et al. (2007) conducted a study with four elementary and middle schools in a Midwestern state that had shown improvement in student achievement, and that had school principals with a reputation for using data practices to explore data-informed practices and leadership. 52 interviews and 53 observations were coded and analyzed in NVivo to identify six main themes that describe the interactions between the actors in a data system and the data artifacts. The key findings concluded that data leadership and well-designed artifacts were crucial to successful data systems and that teachers and leaders must use professional judgment to determine appropriate actions to take from data artifacts.

Leithwood et al.'s research (2008) that identified school leader collective efficacy and self-efficacy correlating with student proficiency on state exams aligns with Earl and Katz' (2002) findings. Earl and Katz noted that school leaders involved in data use often consider themselves as "in charge of their own destiny," a concept related to self-efficacy - the belief in one's ability to change an outcome (Leithwood et al., 2008). Earl and Katz describe effective school leaders as capable of gathering and applying information to guide school improvement efforts. The scholars also highlight the importance of creating a culture of collaboration, shared goals, and distributed leadership, concepts that Leithwood et al. (2008) connect to collective efficacy.

Some empirical research suggests there may be additional benefits to creating a culture of collaboration in a post-pandemic context (Blair et al., 2023). Researchers analyzed 185 surveys and 27 interviews across the United States and observed a positive relationship between teacher to administrator relationships and teachers' sense of well-being in a post-pandemic context. The

researchers recommend that opportunities for deep collaboration to strengthen relationships and trust, which might allow for better problem-solving.

One qualitative study aimed at understanding how school leaders' beliefs and practices shape teachers' sense-making of policies (Coburn, 2005). Focusing on two urban elementary schools in California, the researcher conducted 150 hours of observation of teacher and leader interactions and conducted 93 interviews, seven interviews conducted with two school leaders. 210 hours were also spent observing classrooms. The researcher used inductive coding and the NUD*IST qualitative data analysis software. Given that only two principals were interviewed, the findings could not be generalized, and on many points of discussion, the two principals perceived things differently. Both principals had different approaches to reading instruction, teacher learning, and instructional approaches. The main finding of this work is that school leaders influence teachers' sense-making regarding external policies and internal policies.

Using field notes and prior research, one scholar proposes a framework for data analysis based on theoretical insights (Spillane, 2012). While not strictly empirical research, the researcher uses organizational routines and situated cognition to discuss urban schools and the influence of policies like No Child Left Behind. The scholar drew on observations in urban schools to identify that leaders' perceptions of policy and their sense-making influenced their data response plans. School leaders were found to design and implement organizational routines as a part of promoting data use in their schools.

Some researchers have sought to understand leader perceptions, including their perceptions of their role in relationship to data-informed practices (Coburn, 2005; Day et al., 2016; Datnow & Park, 2014; Earl & Katz, 2002; Halverson et al., 2007; Leithwood et al., 2008). Many researchers include a substantial number of teacher interviews in relationship to the

number of leaders included in the study. Substantial numbers of researchers focus on elementary schools, or a wider K-12 system, and rarely focus on just middle schools. There is an opportunity to add to the literature by narrowing the focus on instructional leaders in middle schools.

Some researchers have observed teacher and leader perceptions of schools post COVID-19. Woo et al. surveyed over 1,400 teachers and over 1,400 leaders PK-12 across the United States from the fall of 2021 to the spring of 2022 (2022). The findings suggest that the politicization of education is a major source of pressure for educators. 40% of teachers and 48% of leaders named that the political climate around education, including topics related to COVID-19, was a major source of job-related stress.

The focus on student achievement and data-informed practices is widely discussed in the literature; however, the context of COVID-19 has not yet been thoroughly integrated into the conversation regarding these practices. Datnow and Park (2014) emphasize that context is critical for effective data-informed leadership, particularly as COVID-19 has reshaped the educational landscape, influencing student achievement (Dorn et al., 2020a; Kuhfeld et al., 2020; Pier et al., 2021). Scholars have described successful instructional leaders as leveraging data to make informed decisions about resource allocation and supporting instructional strategies and student interventions (Datnow et al., 2007). They have also been described as creating data-informed cultures and supporting teacher data analysis and instructional planning (Datnow & Park, 2014; Leithwood & Jantzi, 2008; Bambrick-Santoyo, 2010). Despite the potential benefits of data-informed leadership (Datnow & Park, 2016), research remains limited on how these practices have evolved post-COVID to address the significant learning loss experienced by low-income students in math.

Moreover, there is a scarcity of research focusing solely on instructional leaders' perceptions regarding data-informed practices in this new context. Understanding these perceptions can offer insights into perceived changes and adaptations resulting from contextual shifts in education. This gap in the literature underscores the need for further investigation into how instructional leaders articulate their data practices in a post-pandemic environment.

Chapter 3: Theoretical Framework

Scholars have applied various theories and frameworks to better understand data-informed practices and data-informed leadership. Researchers have drawn upon sensemaking to describe how educators choose data, interpret data, and make decisions based on data interpretations (Farrell & Marsh, 2016; Jimerson, 2014; Spillane, 2012). Researchers have also used the data-based decision-making framework to describe the process outlined by sensemaking theory (Hamilton et al., 2009; Van Geel et al., 2016; Wayman et al., 2017). Data literacy is a framework used by some scholars to describe teacher skills, knowledge, and dispositions as they relate to data use (Mandinach & Gummer, 2016), while some researchers use the entire data-use cycle to describe data processes, similar to data-based decision-making framework (Farrell & Marsh, 2016; Mandinach et al, 2006; Marsh et al., 2006; Poortman & Schildkamp, 2016).

School leadership, as it relates to data use, is described with theories and frameworks that add to the discussion of data-informed leadership. One researcher uses inquiry-based leadership to describe how leaders support data-informed practices in their schools in California (Copland, 2003). Another uses organizational theory and distributed leadership theory to design a data-driven instructional systems framework to describe how school leaders build data-informed internal accountability systems (Halverson et al., 2007). Data-informed leadership is also described as a component of instructional leadership for some researchers who use an instructional leadership framework (Datnow & Park, 2014; Halverson et al., 2007; Marks & Printy, 2003; Robinson et al., 2008). Activity theory, goal setting theory, and constructivist learning theory have provided lenses to review data-based decision-making and school leadership by some scholars as well (Gronn, 2003; Van Geel et al., 2016).

This dissertation primarily draws on concepts from Datnow and Park's 4 P's framework to inform the qualitative analysis (2014). The 4 P's - People, Policies, Practices, and Patterns - serve as key dimensions in understanding how instructional leadership perceives data-informed practices. Designed to aid educators and researchers in understanding how various elements within a school contribute to data-informed practices, this framework builds upon the research of Hargreaves, Honig, Leithwood, Spillane, and Coburn. Datnow and Park used qualitative methods to examine three schools that successfully implemented data-driven decision-making, as evidenced by improved student outcomes and codified by the 4 P's framework (2014).

The 4 P's framework has been particularly useful in understanding school improvement through data use as it integrates both technical and cultural perspectives on change and practice within schools. Subsequent research by Datnow, Green, and Gannon-Slater expands this framework by examining the intersection of data use and equity. Krein and Schiefner-Rohs further advance Datnow and Park's work by analyzing how data practices evolve within schools, emphasizing how data practices expand teacher development and collaboration (2021).

This framework provides a lens for understanding how school leaders utilize data to enhance teaching and learning. Improving data use in schools requires more than just providing access to data; it also involves addressing the systems, policies, and professional capacities that allow data to be effectively integrated into instructional practice (Datnow & Park, 2014). The researcher views this framework through a social constructivist lens, recognizing that instructional leaders' understanding, knowledge, and skills within the 4 P's framework may be developed through active engagement with data practices. Constructivist Learning Theories suggest that individuals actively construct knowledge and that learning is an interactive process situated within specific social contexts (Gronn, 2003). The social context of COVID-19, and

leading through the challenges it has presented, suggests that instructional leaders have learnings regarding the people, policies, practices, and patterns of data-informed leadership.

Datnow and Park identify that data-informed leadership is shared between people in formal and informal leadership positions within a school and wider district (2014), and in this dissertation, data-informed leadership will be discussed as an aspect of shared instructional leadership. Researchers argue that instructional leadership must engage deeply with data to drive school improvement (Horng & Loeb, 2010), and elaborate on the importance of data-driven leadership in schools by describing it as a central component of new instructional leadership (Halverson et al. 2007). People, policy, patterns, and practices are connected by research to instructional leadership to best analyze and organize school leader interviews. With the new context created by the pandemic, exploring each element in this framework could offer insights into how instructional leaders describe data-informed practices.

People

The people aspect of data-informed leadership refers to the roles of formal leaders and teachers in utilizing data to inform instruction. Effective data use requires building the knowledge and skills of school personnel, particularly teachers, who are critical in translating data insights into practice (Halverson et al., 2007). Knowledge and skills are built over time to increase one's capacity, making sustainability a crucial element of data-informed instruction (Datnow & Park, 2014). However, research indicates that teachers often feel underprepared to effectively use data (Datnow & Hubbard, 2016). Some research also suggests that principals or instructional leaders are essential for protecting time to analyze data, fostering collaborative environments, providing systems and resources, and influencing how teachers perceive data practices (Datnow & Hubbard, 2016; Jimerson, 2014). This underscores the need for

instructional leaders to focus on capacity: data practices and patterns, and empowering teachers to address student needs, particularly in the wake of COVID-19 learning loss.

Data-informed instruction is rooted in one key idea: improved student outcomes (Bambrick-Santoyo, 2010; Datnow & Park, 2014). Teachers are critical to student learning, and Datnow and Hubbard found that "efforts to develop teachers' capacity for data use often fall short of their goals" and "teachers have varied beliefs about data use, and some feel they lack the ability to use data to inform instruction" (2016). Capacity is a key component of the knowledge and skills needed to engage in data-informed instruction, and capacity building by instructional leaders could directly support a teacher's ability to address student learning, even as it relates to COVID-19 learning loss (Datnow & Hubbard, 2016).

Policy

Policy includes the external and internal structures that support or limit data-informed practices. While district, state, and federal policies can drive the adoption of data practices, they may also impose constraints (Datnow & Park, 2014). Successful data-informed leadership depends on creating policies that provide some flexibility in the curriculum, use of time, and access to relevant resources. External policies also include state and district mandates regarding student achievement as it relates to COVID-19 learning loss, as this can be a catalyst in inspiring action (Datnow & Park, 2014). While state and federal policies can catalyze to support data practices, they can also provide limitations (Datnow & Park, 2014).

Practices

Data-informed practices involve routine collection, analysis, and application of data to inform instructional decisions (Horng & Loeb, 2010). Effective data-informed leadership establishes structures and systems that facilitate regular data review and ensure that insights from

data translate into actionable steps for improving teaching and learning (Datnow & Park, 2014; Halverson et al., 2007). Key practices include ongoing professional development for teachers, resource allocation, and maintaining a sustained focus on improvement (Halverson et al., 2007). These key practices are essential for fostering a data-informed school culture.

Data-informed school culture is fundamentally built on trust among faculty members, as collaboration thrives when there is a foundation of trust (Datnow & Park, 2012). If teachers are not comfortable discussing their classroom data openly, or if leaders are not transparent about classroom realities, the effectiveness of data analysis, reflection, and subsequent instructional adjustments can be diminished. When educators trust one another and their leaders, they are more likely to share challenges and collaborate on solutions (Tschannen-Moran &Gareis, 2015).

The norms and culture of data usage within a school greatly influence the level of collaboration (Datnow et al., 2007). Trust not only supports collaboration, it also promotes a mindset of continuous improvement and encourages collective efficacy. Trust allows teachers and leaders to believe that the academic achievement goals are attainable, includes a sense of ownership and accountability, increases motivation, and promotes consistency and trust (Blair et al., 2023; Bryk & Schneider, 2002; Marzano, 2003).

Patterns

Patterns refer to the long-term organizational habits and systems that ensure data are continuously used to inform decision-making. Datnow and Park (2014) emphasize that effective schools develop consistent protocols for discussing, analyzing, and acting on data. For instance, quarterly assessments, timely access to data, and the use of structured tools to analyze student performance are essential components of data-informed instructional frameworks (Bambrick-Santoyo, 2010; Datnow & Park, 2014). Effective instructional leaders create and maintain

systems that support data use at all levels of the school (Halverson et al., 2007). Establishing these patterns promotes sustainability and consistent data use that is embedded in the practices of the school's culture.

The data systems of data-informed instruction include the types of data used, organization of data, tools for acting on data, tools for data analysis, and the accessibility of data (Datnow & Park, 2014). Highly effective organizations include systems for assessing student learning at least quarterly, along with ways to collect and see data results quickly (Bambrick-Santoyo, 2010; Datnow et al., 2007). The tools consist of protocols that are used to discuss data, protocols used to adjust curriculum to support student learning, and systems for sharing student performance data (Bambrick-Santoyo, 2010; Datnow et al, 2007; Datnow & Park, 2014).

Datnow and Park's (2014) 4 P's framework – people, policies, practices, and patterns – guided the study by shaping interview questions and coding strategies. Table 1 below presents a structured overview of the theoretical framework, detailing key concepts and their direct connection to instructional leadership. The table identifies core components of each framework element and articulates its relevance to instructional leadership through definitions and components.

Table 1

Framework for Analyzing Data-Informed Leadership

Framework	Definition	Components	Connection to Instructional Leadership
People	Roles of individuals	Knowledge and skills of leaders and teachers	Roles of teachers and leaders Leader efficacy Capacity building
Policies	Internal and external rules and regulations	State and Federal regulations	Support the use of curriculum or creation of materials to respond to data

		Curriculum and materials	Protected meeting times to review data
		Use of time	Rewards and incentives for data use
		Flexibility	
Practices	Actions and methods to work with various types of data	Data meetings	Data meeting facilitation
		Instructional adjustments	Collaboration with teachers
		Professional development	Use of data protocols
		Collaboration	Teacher investment
		Expectations	Support discussing data with students
			Ensure regular summative and formative assessments
Patterns	Recurring themes or behaviors in how data are used in various contexts	Trends for data use	Support progress monitoring for student learning
		Shared beliefs	Use of data to inform their practices as leaders
		Systems to collect and review data	Model and uphold data culture norms

Note. Table designed from Datnow and Park's 4 P's of Education Reform (2014) and Datnow et al.'s Achieving with Data (2007)

The structured organization of the 4 P's in Table 1 helps to delineate aspects of data-informed practices by each category: people, policies, practices, and patterns. For the purposes of this study, the row of "People" relates to the varied roles that teachers, coaches, and principals may play in shaping data-informed practices at a school and how instructional leaders might support teacher development as it relates to data-informed practices. The row of "Policies" relates to internal and external forces that could support or hinder the use of data-informed

practices, such as post-pandemic funding. The “Practices” row refer to the actions that are taken to collect, analyze, and make instructional decisions. The “Patterns” row refer to the re-occurring behaviors in how data is used, including progress monitoring, collaboration, and norms. Each category includes elements of data-informed practices at a high level to allow for a creation of research methods.

Chapter 4: Methods

Research suggests that data-informed practices are cost-effective and increase student achievement, particularly for low-income students and for math (Carlson et al., 2011; Hattie, 2009; Hattie 2023; Lai et al., 2016; Popham, 1987; Poortman & Schildkamp, 2016; Van Geel et al., 2016). There is a gap in the literature addressing data-informed leadership practices in a post-pandemic context. The research question that frames this study is: *How do math instructional leaders (i.e. coaches, teacher leaders, principals) describe the use of data-informed practices in their schools following the COVID-19 pandemic*? COVID-related learning loss has most dramatically impacted eighth-grade math student achievement scores (Bryant et al., 2023; National Center for Education Statistics, 2024). Many research-based learning loss solutions, such as high-dosage tutoring and summer learning, may be cost-prohibitive (Dorn et al., 2020b; Kraft & Falken, 2021), all while COVID-related educational funding has ended. Data-informed practices are low-cost (Popham, 1987) and have been found to increase student achievement, particularly in math and for low-income students (Carlson et al, 2011; Hattie, 2009; Lai et al., 2016; Poortman & Schildkamp, 2016). Scholars have suggested that school leadership is important to support data-informed practices, (Coburn & Turner, 2011; Halverson et al., 2007; Park & Datnow, 2009), and particularly, Datnow and Park (2014) have identified that the context in which data-informed practices exist is crucial for shaping both implementation and effectiveness. Datnow and Park (2014) explore context through the framework of the 4 P's: people, policies, practices, and patterns. Building upon this framework, this dissertation observed school leader's perspectives on data-informed practices pre- and post-COVID-19.

Study Setting

Semi-structured interviews for this dissertation occurred in three states: Massachusetts, North Carolina, and Oklahoma. These states were selected based on their similar patterns of underperformance on the 2024 National Assessment of Education Progress (NAEP) in eight-grade mathematics relative to their 2019 performance (National Center for Education Statistics, 2024). Each state also had stable performance on eighth-grade math NAEP from 2017 to 2019, (National Center for Education Statistics, 2019). Additionally, each state's department of education has established structured processes for school and district-level accountability on improving student achievement and uses state assessment data in annual performance reports. These selection criteria ensure that the dissertation captures data-informed leadership practices within states where math achievement learning loss from COVID-19 is apparent, and where states publish data on this student achievement at a state level.

Participants in this study were selected using critical case sampling, a purposeful sampling strategy that identifies cases with particular significance to the research questions (Patton, 2014). Specifically, middle schools were chosen based on two criteria: a Title I eligibility rate of 40% or higher, as defined by the federal threshold indicating that a substantial portion of students fall at or below 130% of the poverty level, and documented implementation of data-informed practices. These participants represent critical cases because they exemplify contexts in which the impacts of COVID-19 learning loss are likely to be most pronounced, particularly for students from low-income backgrounds. The focus on Title I schools is grounded in the broader national context, where approximately 63% of public schools and 62% of charter public schools were Title I eligible during the 2021-2022 academic year (National Cetner for Education Statistics, n.d.). By selecting schools that are both high-need and actively engaged in

data-informed practices, the study aims to generate insights that are especially relevant for understanding how instructional leadership perceives data practices in the most affected settings.

The schools where interviews were conducted represented a mixture of grade configurations, student demographics, school size, and geographical location. Some middle school interviews occurred within the same school district, and three districts included more than one math instructional leader interview.

Table 2
District and School Demographic Data

District	Type	Location	Grade Configuration	Demographics
District A	Charter	Urban	K- 8	95% Latinx 2% White 1% Black
District B	Public	Urban	5 - 8	89% Latinx 6% White 4% Black
District C	Charter	Urban	5 - 12	43% White 30% Black 19% Latinx 4% Asian
District D	Charter	Urban	5 - 12	65% Black 26% Latinx 6% White
District E	Charter	Urban	6 - 12	64% Black 30% Latinx 4% Two or More
District F	Charter	Urban	K-12	51% Black 40% Latinx 4% White
District G	Public	Urban	7-12	44% Latinx 28% Black 15% White 9% Asian

District H	Public	Rural	K-12	82% Black 7% Native 5% Latinx 3% Two or More 3% White
District I	Public	Rural	6-8	35% Black 34% White 24% Latinx 6% Two or More
District J	Public	Rural	K-12	38% Native 24% Black 20% Latinx 10% White 6% Two or More
District K	Charter	Urban	K-10	70% Latinx 28% Black
District L	Public	Rural	K-12	59% White 20% Latinx 12% Black 7% Asian
District M	Public	Urban	K-12	37% Latinx 23% Black 22% White 4% Native
District N	Public	Urban	7-8	41% Latinx 23% White 15% Black 10% Two or More 7% Asian 4% Native
District O	Charter	Urban	6-12	50% White 15% Latinx 15% Two or More 13% Black 7% Native
District P	Public	Rural	6, 7, 8 Centers	54% White 15% Two or More 14% Latinx

				7% Native 5% Asian 4% Black
District Q	Public	Urban	6-8	42% Black 27% White 18% Latinx 7% Asian
District R	Charter	Urban	5-12	83% Latinx 7% White 6% Black
District S	Public	Urban	6-8	94% Latinx 3% White 1% Black
District T	Charter	Urban	PK-12	57% Black 21% Latinx 11% White 7% Asian 4% Two or More

Participant Recruitment

Middle school instructional leaders from low-income schools were interviewed to address the research question. Instructional leaders – principals, assistant principals, coaches, and lead teachers – must have worked directly with middle school math teachers since before the spring of 2020 and presently. Table 3 below outlines the demographics of each participant. Participant current role descriptions are categorized into five categories: teacher leader, school coach, assistant principal, principal, and district coach. For this research, a teacher leader is defined as someone who currently teaches but also coaches other teachers, while a school or district coach does not teach, but rather coaches full-time. A school coach and a district coach are differentiated in that a school coach works with one school, and a district coach works across multiple schools.

Table 3
Participant Demographics

Participant	Gender	Years of Experience	Current Role	Race	Geographical Location
Participant 1	F	>15	Principal	White	Massachusetts
Participant 2	F	>15	School Coach	White	Massachusetts
Participant 3	M	>15	Principal	Arab	Massachusetts
Participant 4	F	>20	District Coach	White	Massachusetts
Participant 5	F	>15	District Coach	White	Oklahoma
Participant 6	F	>20	Assistant Principal	Black	North Carolina
Participant 7	F	>10	School Coach	Black	North Carolina
Participant 8	F	>10	Teacher Leader	White	Oklahoma
Participant 9	M	>15	Principal	White	Oklahoma
Participant 10	M	>20	Assistant Principal	White	Oklahoma
Participant 11	F	>15	Assistant Principal	White	Oklahoma
Participant 12	F	>10	School Coach	White	Oklahoma
Participant 13	F	>15	School Coach	White	North Carolina
Participant 14	F	>10	District Coach	White	North Carolina
Participant 15	F	>10	School Coach	Black	North Carolina

Participant 16	F	>20	District Coach	White	North Carolina
Participant 17	F	>10	Principal	White	North Carolina
Participant 18	F	>30	District Coach	Black	North Carolina
Participant 19	M	>15	School Coach	Asian	Massachusetts
Participant 20	M	>20	District Coach	White	Massachusetts
Participant 21	F	7	District Coach	White	Massachusetts
Participant 22	F	7	Assistant Principal	Asian	Massachusetts
Participant 23	M	>10	District Coach	White	Massachusetts
Participant 24	F	>10	School Coach	White	Massachusetts
Participant 25	F	>10	District Coach	White	Massachusetts

It could not be assumed that data-informed practices were present within every school system. To identify eligible participants, the researcher leveraged professional networks and conducted background interviews with district and building leadership to determine which formal and informal leaders provided math instructional support to middle school teachers. The process confirmed that the instructional leaders selected for interviews had experience leading data-informed practices both at the time of the study and prior to the pandemic. Preliminary interviews were subsequently conducted with each instructional leader to confirm eligibility and interest in participating. This protocol for identifying participants through professional networks mirrors the strategy employed by Mehta and Fine (2015) in their study of Deeper Learning,

wherein they also could not assume Deeper Learning was present uniformly across schools. Adapting this strategy ensured that the participant recruitment process for the study was purposeful and aligned with the study's research question.

Semi-Structured Interview Procedures

This dissertation used face-to-face semi-structured interviews to gain an in-depth perspective on how instructional leaders describe data-informed practices pre and post-COVID-19 to better discern how changes are perceived (Creswell & Plano Clark, 2017). The semi-structured protocols guided all interviews (see Appendix A for oral consent and Appendix B for the interview protocol), and interviews lasted between 22 and 62 minutes, with the average interview taking 43 minutes. All interviews were recorded with Audacity, transcribed with Otter.ai, and coded with NVivo.

Drawing on the 4 P's framework and related to the empirical literature, interview questions were designed to identify perceptions of people, policies, practices, and patterns as they are in the school currently, and how these may be similar or different to previous perceptions. Interviews began with an open-ended question about instructional leadership experience and data-informed practices (e.g. "please tell me about your experience as an instructional leader"). Questions connected to each of the 4 P's are then asked, with probes that asked the participant to reflect on pre-pandemic practices if they didn't do so naturally. When the interview was complete, participants were asked to share more openly (e.g. "Is there anything I haven't asked you about data practices at your school that you would like to share with me?"). Interview questions can be found in Appendix B. All participants had an opportunity to review the content of their transcripts as well as the codebook before the completion of the dissertation for any final feedback.

Data Analysis

This research employed an interactive, iterative data analysis approach, integrating both a priori and emergent coding strategies (Miles, Huberman, & Saldaña, 2013). All interview transcripts were coded with NVivo software, beginning with an initial set of a priori codes derived from the categories of people, policies, practices, and patterns, as outlined in Appendix Table 1A. Following initial coding, emergent codes were identified inductively while maintaining alignment with the overarching framework (Braun & Clarke, 2006). A subsequent round of analysis examined differences between roles and geographic locations, followed by a final coding phase to identify additional patterns and thematic relationships between emergent codes and a priori codes (Braun & Clarke, 2006). This iterative analysis process aligns with qualitative researchers studying data-informed practices (Coburn & Turner 2011; Datnow & Park, 2014; Farrell & Marsh, 2016), and qualitative researchers more broadly (Miles, Huberman, & Saldaña, 2013).

The initial coding process began with the input of all a priori codes into NVivo, and followed by systematic, sentence-by-sentence coding of each transcript using the 14 a priori codes listed in Appendix Table 1A. Each sentence was analyzed against the 14 codes to identify potential connections. Because codes were already categorized into "people," "policy," "practices," and "patterns," a sentence was compared to each of these categories, and then connected to an individual code. An example of this was when instructional leaders described state assessment systems. Because this was connected to policy, it could be connected to either an external support of data-informed practices or a hindrance depending on how the instructional leader described the assessment. For a leader who shared that the state assessment helped their school to select priority content, this was then classified as an external policy that supported data-informed practices.

As emergent ideas were observed as a trend, they were listed as a potential future code to be deleted if unused or unfounded, or to be listed as disconfirming ideas. The number of files (out of 25) and the number of times each code was referenced was tracked by Nvivo, with a priori codes like data analysis and data decision codes being referenced over 115 times each, and possible emergent topics like student technology addiction mentioned 13 times.

After initial a priori coding, a topical analysis identified frequently discussed subjects not captured by existing codes, which were then re-reviewed in transcripts and added as emergent codes. Each emergent code was reviewed to determine alignment with one of the four framework categories. For example, the emergent code "post-pandemic staffing challenges" was first identified during the a priori coding of a transcript, where a participant described staffing concerns and a greater need for teacher development than pre-pandemic recollection. When similar references appeared in subsequent interviews, the code "staffing challenges" was established in Nvivo and retrospectively applied to previously coded transcripts to ensure consistency.

Once a priori and emergent codes were established, transcripts were examined by state and by participant role to observe patterns across contexts. For instance, participants in Massachusetts did not reference the same type of external pressure as connected to state evaluation systems of schools. When prompted to reflect on state policies or expectations of schools, Oklahoma and North Carolina leaders described the letter-grade assignments, but in Massachusetts, the greater focus of conversations was the recent state vote to remove state tests as a high school graduation requirement. Additionally, the largest difference across roles was in the school coach's description of principal support of their work. Some coaches emphasized the benefits of principal support, while others noted its absence as a barrier. Principals and some

district coaches did not have this same reflection in relationship to those they perceived as above them in the school system.

Following the coding phases, analysis focused on identifying patterns and thematic connections across codes, categorizing them into broader thematic groups. When the four categorical themes were developed, each code was then compared to each them to identify possible connections, disconfirming evidence, or potentially a gap in themes. One theme that consistently emerged across participants was the perceived centrality of collaboration in effective data-informed practices, supported by evidence from six distinct codes.

To enhance the trustworthiness of the analysis, attention was given to identify and examine disconfirming evidence during each phase of the coding (Lincoln & Guba, 1982). Instances of evidence that did not fit the initial coding framework were revisited, leading to refinements and expansions of codes to capture variations in participant perspectives. For example, while many participants described the urgency of addressing pandemic-related learning loss, several also expressed concern about the continued attribution of academic challenges solely to the pandemic, emphasizing the need for forward-focused solutions. These divergent perspectives were noted and integrated into thematic analysis.

Although intercoder reliability was not a validity strategy used for this dissertation, the dissertation committee provided oversight on the rigor and quality of the data collection and analysis process. The codebook, evidence selection, thematic analysis, and pattern observation received multiple rounds of feedback from the committee to improve analysis and communication of the data.

Chapter 5: Findings

This dissertation explores the research question: *How do math instructional leaders (i.e. coaches, teacher leaders, principals) describe the use of data-informed practices in their schools following the COVID-19 pandemic?* This chapter presents the findings from the interviews of 25 instructional leaders regarding their use of data-informed practices before and after the COVID-19 pandemic. Data were coded into the four major dimensions from Datnow and Park's (2014) 4 P's framework: people, policies, practices, and patterns. Analysis of the coded data revealed four primary themes, one theme within each category. The following are the four major themes identified:

1. Building Capacity for Data Use: Instructional Leaders, Teachers, and Students
2. Navigating Supports and Constraints: Data Practices in a Post-Pandemic Context
    a. Internal Policies that Support Data-Informed Practices
    b. Internal Policies that Hinder Data-Informed Practices
    c. External Policies that Support Data-Informed Practices
    d. External Policies that Hinder Data-Informed Practices
        i. Funding Challenges
        ii. Pressure to Return to Pre-Pandemic Student Achievement
3. Adaptive Data-Informed Decision-Making: Different Decisions for New Challenges
    a. Data Collection and Analysis
    b. Foundational Math Gaps
    c. Data-Informed Decisions
4. Fostering a Collaborative Data Culture: Vulnerability and Trust
    a. Relationships Support Collaboration
    b. Collective Efficacy

These themes illuminate how instructional leaders perceive and enact data-informed practices within the post-pandemic education environment. Specifically, the themes reflect leader's perceptions of the roles and capacities of those engaged in data practices, the policies that support or constrain the work, the types of decisions necessary to address data effectively, and the collaborative culture required to sustain implementation. While limitations exist, these themes summarize the perceptions of instructional leaders, suggesting that some leaders use data-informed practices to support unfinished learning from the pandemic.

Building Capacity for Data Use: Instructional Leaders, Teachers, and Students

Instructional leaders described the roles of key stakeholders – leaders, teachers, and students – as central to effective data-informed practices. This theme is tied to the dimension of "People" for the 4 P's framework, emphasizing how leadership roles, teacher capacity, and student agency shape data practices in schools.

Leaders consistently portrayed their role as establishing the enabling conditions under which data practices can flourish. These conditions include providing tools, protected time, professional development, and structures to support teachers in analyzing and applying data to inform instruction. One principal from Oklahoma shared the following about his role:

> *The job is all about creating capacity… providing the tools, providing the time, providing the space for it to happen. (Participant 9)*

The principal's description highlights the importance of the instructional leader in creating capacity and conditions for data-informed practices. This view, echoed by 20 other participants, illustrates how instructional leaders view their role in data-informed practices: supporting teachers' use and implementation. A district coach in North Carolina stated:

> *Teaching is the hardest job. Like we have to we have to give them all the support. And this (data-informed practices) is the most important work, in my opinion. (Participant 14)*

This coach described the importance of data-informed practices and her relationship to supporting the practices. These perspectives illustrate how leaders prioritize teacher development as a lever for supporting data-informed practices. Rather than focusing on teacher compliance, participants emphasized equipping teachers with the supports necessary to collect, interpret, and act on data.

Instructional leaders also discussed the importance of collecting data to support teacher capacity. A district coach in North Carolina shared:

> *I take last year's data on that teacher and what they taught and how the students performed, and then I'm able to look at like the (state) data, also (have) conversations with administration, the anecdotal data that I take on what it is that they would like to see, or what it is that they think (teachers) need support with… it plays a big part in how I address that teacher. (Participant 18)*

The quote illustrates how some leaders integrate academic and observational data while collaborating with administrators to holistically build teacher capacity connected to student data. It also highlights that district coaches may connect with building leadership to better understand teacher needs or individual school priorities.

Leaders also highlighted the importance of data analysis knowledge and emphasized supporting teachers in understanding available resources. One school coach in Massachusetts explained:

> *I personally enjoy the spreadsheet stuff (for analysis). But I try to tell people… you don't actually have to know how to do that yourself. You do have to know what's possible. (Participant 19)*

This coach described conducting student data analyses with simple tools while encouraging teachers to understand the potential tools available for analyzing data, even if they were not yet proficient in all technical aspects themselves.

Twenty-two instructional leaders shared their perceptions of how their roles have changed since the pandemic, and across all four roles in all three states, leaders emphasized evolving responsibilities due to new challenges. One North Carolina principal stated:

> *It's always been teachers' responsibility to check student data. I think it's always been the leader's responsibility to oversee teachers. I think what changed was the accountability piece from COVID. (Participant 17)*

While most leaders described a sense of ownership for supporting teacher data use, as evidenced by the leader's quote above, many also described new challenges in teacher development, including pandemic-related staff turnover, absences, and vacancies. One Principal in Massachusetts shared the staffing challenge like this:

> *People are tired and like, you know, I think there's just more weighing on people post-pandemic when it comes to mental health as well. And I think we're seeing that play out in big ways, still within school when it comes to like absences and people needing mental health days and weeks, and things like that. (Participant 1)*

This principal identified the pandemic as a continuing influence on staff exhaustion and mental health, impacting staff presence in her school. She named the challenges expressing themselves as staff attendance challenges explicitly.

While there were nuances to how these challenges were showing up for leaders across states and roles, the general challenges remained the same: a lack of experienced educators in classrooms each day. Participant 25 called it "the great resignation of teachers," and Participant 6 shared she has never seen so few of licensed applicants for job openings. Participant 18 and Participant 16, district coaches from different districts, said their districts are hiring international teachers and uncertified teachers to try to fill staffing vacancies. Participant 21 said she's never seen attendance issues like this before COVID-19. Participant 17 shared that she had 100% staff turnover the last two years. The "majority of math teachers are in years one through three," for Participant 6, and Participant 10 said that his school lost teachers due to the pandemic, and there

are a lot more novice teachers replacing this staff. The staffing challenges were described by leaders across all roles and all states as a major challenge of instructional leadership and data-informed practices.

Leaders described a sense of fear as well as the need to offer different types of support than what they might have before the pandemic. One principal in Oklahoma described it like this:

> *After the pandemic, I'll be honest, you're just terrified at losing teachers. You're terrified of losing good ones. You're like, if I push this person too hard, I say no to this, they're just gonna leave. Because people are leaving like crazy. (Participant 9)*

The pressure of developing teachers while also helping teachers remain in the work was the dichotomy described by this leader. This pressure required some leaders to rethink their roles and approaches.

As a part of that rethinking, leaders reported taking on responsibilities that were less common before the pandemic, such as co-teaching, lesson and curriculum planning, behavior management, and conducting foundational data analysis to support teacher growth. This was true for school coaches, district coaches, and principals. An assistant principal from Massachusetts shared:

> *The issue of adult attendance and student attendance is a much larger challenge even in 2025, five years after COVID, than I had seen during any time in my career before… it means that I have done more teaching as an assistant principal than I ever thought that I would. (Participant 22)*

This speaks to her challenge in covering instructional needs of classrooms by teaching courses herself. A district coach from North Carolina also described:

> *This is the third year for that curriculum, and we're still learning so we're still needing our teachers are needing support, professional development, help through content. (Participant 16)*

This leader seemed not to expect to need to support a new curriculum in the third year of implementation in the way it was needed, particularly in terms of understanding the content. A district coach described directly tutoring students in math (Participant 20). Helping teachers directly with understanding the content was another theme from school and district coaches (Participant 24, Participant 23, Participant 12). These expanded responsibilities require greater time, energy, and expertise as they describe helping teachers know what to do with student data in their classroom.

Leaders have also described that once vacancies are hired for, the newer teachers are perceived as needing additional support to enact data-informed practices. One Massachusetts district coach shared:

> *With the… great resignation of teachers, there's just in general, like, a slightly lower caliber of teacher coming in. (Participant 25)*

This instructional leader highlights the staffing challenge they experienced. In response to these challenges, some leaders described the steps they have taken to offer additional support. Leaders emphasized that teachers today appear to require significantly more support than they have in the past, with one school coach in Massachusetts sharing:

> *I'm scaffolding to the ninth (for teachers) – and I don't remember having to do that. I feel like teachers would… come up with their own ideas. So we do data dives (to help). (Participant 24)*

Yet another district coach in Massachusetts shared:

> *I find I'm doing a lot of scaffolding (for teacher data use)… and like doing the data analysis, because it wasn't just bringing interim assessments, (teachers were) also like, "Okay, cool. We have all of this data now. What do we do with it?"(Participant 21)*

Leaders describe doing deeper levels of work for teachers and building smaller steps for teachers to take throughout the year to help them learn, and this was described as different from prior to

the pandemic. This perception suggests that instructional leaders do more work and offer more support as it relates to data-informed practices in a post-pandemic context.

This increased need for support and collaboration has also placed additional demands on instructional leaders, expanding their work in teacher development. However, this wasn't true for every study participant. Disconfirming evidence for the challenge of teacher staffing was collected from one assistant principal in Oklahoma:

> *I feel like my department in general, I've been really fortunate that I have not had a lot of turnover in the math department. So, how we used data back when I started, seven years ago, versus now… everybody's still on the same page, and because we have had a few new math teachers here and there, it's been very easy to incorporate them. (Participant 11)*

This leader described a perceived ease of developing data practices on her team due to the experience and longevity of the team, representing the only participant who had this experience.

While every instructional leader described their role as focused on teachers in relationship to data-informed practices, 21 leaders explicitly discussed how student needs and engagement, influenced by the pandemic, impacted their data practices. Some leaders described how student motivation and socialization had changed. A Massachusetts district coach described the challenge like this:

> *Not only did (the pandemic)… kind of, you know, mess up their academic skills, but also their social skills and like, their motivation and their will to do. (Participant 19)*

Motivation challenges were also described as engagement challenges by some instructional leaders, including student attendance in a post-pandemic context. Instructional leaders described chronic absenteeism and student absences, with a North Carolina district coach stating:

> *Our attendance has not recovered still. I mean, we still have kids and families that miss 50 to 70 days of instruction. (Participant 13)*

This leader noted that students were missing nearly half the school year. Leaders also described the engagement challenges, especially as they related to technology, and a Massachusetts principal shared the following sentiments in terms of how difficult these types of challenges are for teachers:

> *Seeing students who majority would just rather like be in front of a screen or in front of their cell phone. And so… trying to maintain a certain level of focus in higher level, you know, work in the classroom… is difficult, and I think teachers are feeling that. (Participant 1)*

These observations highlight how leaders perceive post-pandemic student disengagement, technology-related distractions, academic challenges, and inconsistent attendance as significant barriers to improving student achievement with data-informed practices. These challenges were described as directly connected to interrupted learning and the habits created by interrupted learning caused by COVID-19, and as a challenge that teachers and schools had to meet.

In response to student challenges, 13 leaders described the importance of sharing student data directly with students as an opportunity to increase student engagement and student motivation. Participants 12, 7, and 4 described schools where leadership and teachers discussed student academic achievement data with them. A school coach in North Carolina described student motivation as connected to sharing data with students:

> *But the kids then see these numbers and the way that they're framing the conversations has lit a fire under some children that used to not be super motivated. (Participant 7)*

These insights suggest that some leaders prioritize sharing data with students directly, suggesting that data may be a tool for fostering motivation, encouraging goal setting, and cultivating a sense of shared accountability for learning. `

Instructional leaders described the centrality of people included in data-informed practices: themselves, their teachers, and their students. Leaders consistently described their roles

as creating conditions and building capacity by providing tools, time, and professional development to support teachers' data-informed practices. This positioning highlights leadership as facilitative rather than compliance-driven, with a focus on equipping teachers to collect, interpret, and act upon data. Leaders also integrated multiple forms of evidence – academic, observational, and anecdotal – to identify teacher and student needs and tailor support.

When describing their work, instructional leaders described intensified responsibilities due to staff turnover, absenteeism, and vacancies, with some characterizing the context as "the great teacher resignation." These conditions expanded leader roles to include co-teaching, behavior management, direct student tutoring, re-writing of curriculum, and providing intensified professional development support for teachers.

Descriptions of post-pandemic student support mirrored that of teacher support as leaders described new barriers to learning, particularly attendance, motivation, and executive functioning. Post-pandemic disengagement and technology-related distractions were viewed as ongoing obstacles to student learning. In response, some leaders intentionally incorporated students into the data-informed process by sharing data directly with students, framing it as a tool for goal setting, motivation, and collective accountability. Celebrations of student growth and transparent discussions of progress were described as strategies to foster agency and ownership of learning.

The findings of this theme illuminate the evolving role of instructional leaders in data-informed practices in a post-pandemic context. Leaders positioned themselves as capacity-builders for both teachers and students, while also navigating new post-pandemic challenges. The findings reinforce the "People" dimension of the 4 P's framework, demonstrating that the

success of data-informed practices may rely on the development and support of teachers and the engagement of students.

Navigating Supports and Constraints: Data-Informed Practices in a Post-Pandemic Context

Instructional leaders described the second dimension of the 4 P's framework, policies, as policies that were internal or external, and that either helped or hindered data-informed practices. Instructional leaders described internal and external policies as shaping their data-informed practices, alongside issues of resource allocation and post-pandemic pressure to return to pre-pandemic student achievement that influence implementation. This theme highlights the ongoing tension between supportive and restrictive policies, showing that leaders navigate an instructional landscape shaped as much by enabling conditions and systematic constraints.

Internal Policies that Support Data-Informed Practices

Twenty-one instructional leaders across all roles and states identified internal district and school policies as supportive of data-informed practices, emphasizing the importance of clear expectations set by leadership, structured schedules, and systems for monitoring student academic progress. Such policies were often framed as anchors that normalized the routine use of data, embedding it within the culture of teaching and learning. Leaders described how these policies fostered consistent opportunities for teachers to engage with data to inform instruction. A district coach in Oklahoma described how the expectations for data use were integrated into the school's daily practices, stating:

> *At my school, the expectation is that we use data. We use instructional data. It's part of our culture… We're constantly talking about it. (Participant 5)*

This leader emphasized that discussing and using instructional data was embedded into the school culture, shaping teacher practices and priorities around data-informed decision-making. A

principal in Massachusetts highlighted how district-level initiatives supported data-informed practices with expectations to strengthen instructional practices in mathematics:

> *This year, there was an emphasis as a district on math, and then they utilize like that data to then inform the type of support they're providing to the schools. (Participant 1)*

This quote illustrates how district-level policies influenced instructional leader perspectives regarding priority subjects for data use, demonstrating internal policies supporting data-informed practices. These quotes name the culture of data-informed practices as embedded in school and district policies, supporting leadership decisions to use these practices.

Instructional leaders also described how internal policies directly influence specific parameters of data-informed practices, from meeting frequency to benchmark assessment analysis. A district math coach in North Carolina explained how their district established regular data meetings to ensure instructional alignment:

> *Our district is trying to have that data should be driving the instruction, and that was the reason why it was put into place to have those data planning meetings every two weeks. (Participant 16)*

This coach described the intentional use of regularly scheduled data meetings as a structure to ensure guided instructional planning across the schools in the district. Participants also shared expectations about what happens during meetings, including the types of protocols for data meetings their school systems use. A district coach in Massachusetts described the expectations like this:

> *Every time after there's an interim assessment, we have a data meeting with the with the instructional supervisor and people on the team… It looks kind of different at each school, but there's a protocol for them, what we're using with the data, how it might influence whole-class instruction, and how we're going to use it to individualize with students afterwards. (Participant 20)*

This quote illustrates the systematic nature of data meetings, highlighting protocols that guide leaders and teachers in using data to inform both whole-class and individualized student support,

while also allowing for some nuance between individual school campuses. Collectively, these accounts highlight how internal policies, including the use of structured data meetings, progress monitoring tools, and leadership expectations, create supportive conditions for teachers and instructional leaders to engage in data-informed practices as a part of their instructional improvement efforts.

Internal Policies that Hinder Data-Informed Practices

Eight school leaders described some internal district and school policies as hindrances to effective data-informed practices, particularly noting challenges related to time constraints and design limitations of common assessments. Of these leaders, seven worked in traditional public schools, while one worked in a charter school, highlighting that these barriers may be experienced in varied ways across school contexts. A school math coach in Massachusetts described how proprietary restrictions on assessment data limited teachers' ability to conduct item-level analysis:

> *They don't show you the questions that the students answered right or wrong, because it's it's a business, and they don't want you having access to those questions, because then you could, like, create your own assessment. They give you, like samples, but… you can't see exactly what question… the student answered, and what they chose as their choice to analyze. (Participant 24)*

This coach names the challenge of using district-selected vendor-provided interim assessments that restrict transparency, thereby limiting teachers' and leaders' ability to analyze student misunderstandings and adjust instruction effectively. A Principal in Massachusetts shared a similar concern with district-provided unit assessments:

> *Google Surveys, things like that that aren't necessarily asking the right questions or having students really demonstrate what they've learned in class. (Participant 1)*

The test design she observed not only included a challenge for students to fully demonstrate their thinking, but she also questioned whether the district was asking students the right questions at

all. This comment underscores how the use of convenience-based tools for data collection sometimes results in data that is not meaningful for instructional decision-making, leading to missed opportunities to accurately assess and respond to student learning needs.

While instructional leaders in Massachusetts reflected on district-provided assessments as a challenge, leaders in North Carolina and Oklahoma experienced different challenges with the timeliness of data and the cadence of response time. A North Carolina assistant principal shared the following:

> *Now our district is all they're gonna be on the data. I think their data, though, the time span between… when they want to see data, is far larger than our timestamp. – (Participant 6)*

This quote describes how district requests for data did not align with the more immediate instructional response times within schools, which could pose challenges in using data in a timely and meaningful way to inform instruction. A teacher leader in Oklahoma described the opposite concern:

> *I know that district-wide… you had to collect the data, it had to be at a specific time. It was so rigid that a lot of teachers felt the pressure you're not really taking the time to teach a quality lesson or re-teach as needed. (Participant 8)*

This leader emphasized how inflexible data collection schedules imposed by the district limited teachers' ability to respond to the data in real-time and adjust instruction to meet student needs, turning data practices into a compliance exercise rather than a tool for instructional improvement.

These accounts reveal a paradox: while policies for data-informed practices may be intended to support teaching and learning, their design flaws sometimes act as a hinderance. Internal policies related to assessment transparency, quality of data collection, and data timelines can hinder the effective use of data-informed practices for instructional improvement. These

barriers, sometimes described as mandates, highlight the tension between accountability-driven data policies and the need for flexibility in using data to support responsive, student-centered instruction.

External Policies that Support Data-Informed Practices

Similarly to internal district or school policies, 20 leaders described external policies – primarily state standards, assessments, and accountability systems – as supporting data-informed practices within their schools. Leaders explained that these external structures provided clear benchmarks and reference points that guided instructional priorities and created shared expectations for academic goals. A district coach in Massachusetts explained:

> *The state expectations are set via (annual state exams) and the state standards. So, of course, I'm interacting with them all the time. (Participant 23)*

This leader highlighted that state standards and assessments were central reference points to instructional decision-making, shaping the data leaders prioritized and analyzed throughout the school year. Leaders didn't just describe student assessments as related to students' immediate academic achievement. A principal in Massachusetts added to this perspective and explained how state standards helped to prioritize instructional content, particularly within mathematics, by aligning classroom focus to what would support students in their future endeavors:

> *So that's how we're making standards, (state test) questions. Then… there's too many things being taught. So it, then it's like, okay, this is going to help you in high school. (Participant 5)*

This principal described the role of state assessments and standards in narrowing instructional priorities, allowing leaders and teachers to use data to focus on content most relevant for students' long-term success. External policies like state assessments and standards played a role for many leaders in shaping data-informed practices.

While some leaders described the helpfulness of state assessments, other leaders, particularly in Massachusetts, found challenges with the state assessment. One school coach shared:

> *(The state test) is releasing less and less like, if you wanted to… find out what does the standard mean? Some of them are, quite frankly, confusing. (Participant 24)*

This quote demonstrates disconfirming evidence that the state test could be helpful. Some other Massachusetts leaders expressed a challenge with the state exam no longer counting as a high school graduation requirement, a legislative action that passed a state vote in the fall of 2024. A school coach shared:

> *I'm really curious what's going to happen with the (high school graduation requirement)… being gone... I was really surprised by the reaction from the teachers in my school, because when that passed, many of them were upset, and they're like, how are we going to hold the kids accountable anymore? (Participant 19)*

Participant 19 described the state graduation requirement change and his perceived impact on teachers and their ability to support student instructional growth and motivate student engagement. These quotes together highlight some leaders' description of state assessments potentially hindering usability and urgency for data-informed practices, adding disconfirming perceptions of this generally well-used tool by other leaders.

Some leaders also described that expectations for instructional improvement were set at by at the government level. An assistant principal in Oklahoma noted the role of state and federal accountability structures in maintaining a focus on student progress:

> *And you can see that the state level, at the federal level, the goal is we're, you're going to make gains, or… there's going to be some type of repercussion for not making those gains. (Participant 10)*

This comment illustrates how accountability expectations outside of the district created an external push for schools to monitor student achievement and prioritize continuous improvement.

An assistant principal in North Carolina described how state systems provided structured data and teacher effectiveness measures, which informed local instructional practices:

> *When we talk about the state at the state level, our district coaches work with the state. They bring back that information. They bring back how the state is looking at the data. Our state is very good about, and I think it's about the change from my understanding, but they're very good about (state data system), where we're looking at a teacher's effectiveness, and that is so important. Our state provides that, and our state comes up with those formulas. (Participant 6)*

This evidence highlights the collaboration between state and district systems, where state-provided measures were used to inform teacher effectiveness and guide data-informed decisions at the local level. Additionally, leaders used state comparative data as a critical reference point when interpreting local student data. A district leader in Massachusetts described the system like this:

> *So for instance, in our math (district) assessments that we have, we always want reference points for data, and so being able to say like, like we do all of our data tracking is our plus minus with the state on items, so that like, you're not just looking at like, 60% of our kids got this. We're like 60% of our kids got this. It was a hard item. 28% of the state got it. (Participant 4)*

State-level data described by this coach provided necessary context for interpreting student local performance, allowing leaders and teachers to differentiate between content that was broadly challenging versus areas needing local instructional focus.

Some instructional leader perspectives illustrate that external policies, including standards, assessments, and accountability systems, provided instructional leaders with clear metrics and structured data sources that supported the use of data-informed practices in schools. These policies helped leaders and teachers align instructional priorities with student needs and create more opportunities for data use.

External Policies that Hinder Data-Informed Practices

Sixteen instructional leaders described some external policies as hindrances to effective data-informed practices. Leaders in Oklahoma and North Carolina criticized state-level accountability systems and funding models, emphasizing that these policies often distorted comparisons between schools and did not reflect student growth accurately. Leaders explicitly described school assessment as a challenge, and an Oklahoma district coach shared that challenge like this:

> *So Oklahoma's funding is not, you know, the best. Also, there in the last several years, the school report card, the way they calculate that there's been… some controversy, just with all the schools in the state of how they do that. And so (the district) really advocate(s) for fair assessment of our school by looking at fair data. (Participant 11)*

This leader identified that there is perceived controversy of how the state assesses school, and that fairness in data review was important to them and their school district. A North Carolina leader described the state school evaluation system as a way of recording their school as failing, stating:

> *We are a failing school; the state identifies us as a failing school regardless of how much… growth we made. So while we're making growth in academic performance and academic proficiency, because we don't have, we have not met the threshold for students being proficient in math and English, even though we're growing towards that, the state records us as a failing… school. (Participant 10)*

The rating received by this leader seemed to diminish the leader's work at supporting student growth at their school. A school coach in North Carolina, who worked on the state reporting system, expanded on this idea and described a graphic that was created from her work:

> *There were three pretty comparable schools on paper (but)… one was a B (high rating), one was a C (middle rating), one was an F (low rating). (Participant 13)*

This school coach named that the work she had done helped to identify discrepancies and potentially unfair ranking systems in the state reporting system of school performance. These statements describe the perceived lack of trustworthiness of the state reporting system. Leaders

did not feel that state reporting systems accurately described their students' academic growth and potentially relied on inaccurate or unfair data.

Instructional leaders connected state reporting systems to data-informed practices as it related to the ability to see instructional improvement from their data work. A principal in North Carolina described her state assessment process this way:

> *So the state gives schools a letter grade based on proficiency and growth, 20% growth, 80% proficiency… I feel like the grade level does not accurately represent what we're doing in the building. And so if we're telling teachers and students like, "Hey, you're doing you're making that progress, but by the way, you're an F school," that's really disheartening. (Participant 17)*

The challenges described by Participant 17 speak to the possibility of lower leader efficacy as it relates to data analysis done about the school by an external force. The state accountability systems in Oklahoma and North Carolina were frequently discussed by instructional leaders as a potential hindrance to data-informed practices.

In Massachusetts, instructional leaders did not describe the state system for school accountability in the same way as their peers in Oklahoma and North Carolina. Massachusetts leaders noted a perceived absence of explicit state expectations regarding data reporting or accountability structures, with one district coach stating:

> *I don't know that I would say that Massachusetts has any rules or expectations. (Participant 20)*

This observation of a lack of state expectations may reflect differences in the accountability systems used in the state or may be connected to the specific performance context of the instructional leader's school.

The perceived misalignment between state accountability metrics and local growth was regarded as a major source of leader frustration for instructional leaders in North Carolina and Oklahoma. Leaders worried that the system used to label school performance diminished the

impact of their data-informed practices. This reporting system may create a credibility gap between what students achieved in academic growth and how the state represented that work publicly.

Funding challenges. Funding challenges were described by instructional leaders in every state, ranging from state funding models to the end of federal funds to funds being reduced when schools made improvements. Inequitable funding tied to state accountability systems was a specific challenge for North Carolina instructional leaders. A school coach in North Carolina simply put:

> *Sadly, well, as you improve, they cut money. (Participant 11)*

This leader described funding models that appeared inequitable, as the reason for improvement could likely be tied to larger funding. She described how the funding was used to create enabling conditions for data-informed practices (staffing), and as this funding was cut, so were the methods of improvement.

Leaders in Oklahoma and Massachusetts described the difficulty of maintaining responsive, data-informed decisions amid funding reductions at the federal level. An assistant principal in Oklahoma explained the impact of expiring federal pandemic relief funding:

> *We received something called ESSER funds, which gave us some, you know, additional monies to be used, which allowed us to get some additional resources… that funding is going away. (Participant 11)*

This leader described a reduction in resources because of the end of ESSER. A district coach in Massachusetts described how the end of ESSER funding led to the reduction of critical instructional roles:

> *When we had the ESSER funding, we would have those (teachers), and maybe also a (teaching) fellow who could, like, be there the other times. But now we kind of had to eliminate that fellow in those places, and like, in the middle school grades, we have a*

> *second teacher for math and ELA… we've had to eliminate a couple (roles). (Participant 25)*

The roles of second educators in math and ELA classrooms were described by Participant 25 as teachers who enabled small-group data-informed instruction, a critical loss for the school with the end of ESSER funding. A district coach in North Carolina reflected on how ESSER funding was used to support professional learning critical to building data-informed practices:

> *There was a lot of ESSER money, and so people had to spend it. And so what you could spend it on was professional development… I know our state, like, invested in all the schools that were low performing, like, got to send a certain amount of leaders to (data and coaching training). (Participant 14)*

The end of ESSER funding for this leader in North Carolina meant a lessening of data-informed practices development for instructional leaders. One principal in Oklahoma described the funding challenges as they relate to data-informed practices like this:

> *We instituted these planning camps where instead of people using their planning period, it's like, we're gonna get subs for all four of you for a day so that you can stay in the building, but go and just talk about these things in ways that you couldn't before, because you were like, "Oh, we only have an hour planning period, or it's before school, or it's after school, and we're exhausted," (Participant 9)*

This comment speaks to the types of adjustments to teacher time leaders made to create space, and potential future challenges in funding these types of adjustments. Overall, these leader observations illustrate the end of federal COVID-relief funding and the resulting challenges faced by instructional leaders, including the elimination of teacher positions and reductions in professional development time and opportunities. With fewer teachers, there may be less time available for data discussions and for implementing responsive instructional plans informed by data. With fewer professional learning opportunities for teachers and leaders, schools may experience slowed growth in their data-informed practices.

Across states the expiration of ESSER funds was framed as a turning point for some of the data-informed decisions leaders had made to support COVID-related learning loss. Leaders emphasized that the loss of temporary resources not only reduced staffing and professional learning opportunities but also highlighted the fragility of data-informed systems that depended on short-term funding rather than long-term investment. The withdrawal of support, despite the perceived widening gap in student achievement, required leaders to innovate locally. This innovation created adaptive strategies that will be discussed in theme three.

Pressure to return to pre-pandemic student achievement. Fifteen instructional leaders across all three states described experiencing heightened pressure to address significant learning loss in mathematics following the pandemic. Leaders used words like urgency, pressure, and heightened importance when describing their work with teachers. One Massachusetts district coach summarized it succinctly:

> *I think there is definitely more urgency now, and I feel more pressure. (Participant 23)*

A principal in North Carolina echoed this sentiment:

> *Maybe that's another thing that's changed, like our pace has changed a lot, and the pressure has changed a lot, and I think that's because we're so much further behind post pandemic. (Participant 17)*

This leader described a quickening pace and a sentiment of feeling even more behind as it relates to student learning and their work in education. A principal in Oklahoma noted how the pandemic elevated the perceived importance of data-informed practices:

> *It's made (data practices) seem more urgent, more important, more relevant and necessary than before. (Participant 9)*

The urgency this leader used to describe data-informed practices was directly connected to the post-pandemic education environment. These leaders described the pressure felt for instructional improvement, identifying a connection between urgency and student unfinished learning created

by the pandemic. Leaders across all three states seemed to connect the need for data-informed practices to a greater extent because of the pressure they felt.

The urgency was reported as externally imposed as leaders navigated expectations to accelerate student achievement recovery despite facing wider achievement gaps, staffing challenges, persistent student engagement concerns, and funding reductions. While staffing challenges and student engagement concerns were discussed in theme one, the perceptions of student achievement gaps will be further discussed in theme three. Some leaders described the complexity of helping students return to pre-pandemic academic levels while managing more severe, widespread learning gaps. A district coach in Massachusetts explained:

> *There feels like a huge discrepancy that you know, our school is not doing well with reading and writing, and like you can see that even worse with the math, but then the math is expected to get back to normal (by the state) before their reading is expected to get back to normal. (Participant 1)*

This leader describes the expectations set by the state department of education and how their schools are supposed to perform on the state assessment. She communicated that despite math being further from pre-pandemic normative data, it was supposed to return to those averages faster than the English data.

Leaders also described a profound sense of pressure to restore student achievement to pre-pandemic levels despite wider and more complex academic gaps, staffing challenges, and student engagement challenges. One leader described the feeling like this:

> *For students… from a low-income background... Education has been like the last line of defense, and now, the amount of pressure that is on educators post-COVID, the amount of absenteeism that we're facing in the student population, the amount of like stress, and then stress-induced attrition that we're seeing in the educator workforce. It's like that last line of defense is failing, and we have not sufficiently invested in keeping it in place. (Participant 22)*

As this assistant principal describes, the decrease in support amid persistent COVID-related challenges adds to leader stress as they try to make instructional improvements. She describes education as critical for students in Title I schools, and this perception adds to the pressure she feels.

While 15 leaders connected with a perceived sense of urgency or pressure to address learning loss, some framed the challenges they faced within the broader societal concerns. In relation to the pressure they felt from COVID-19, three other leaders were less connected to COVID-19 as the greatest challenge they faced. A district coach in Massachusetts stated:

> *I think my bigger concerns are not even just COVID-based. They're an overall American devaluation of education and the importance of education at this point in our society at large, and the belief that it's worth working hard to learn math that might not be used tomorrow, but sets up a logical foundation to see the world with. (Participant 4)*

This leader's greatest concern with pressure in the political climate is the nation's messaging about education and actions that actively dismantle education systems.

While a few leaders were concerned with an anti-education political climate, two other leaders were concerned that COVID-19 was given too much attention as it relates to student learning. A school coach in North Carolina framed this difference in COVID-related pressure simply:

> *We can't blame COVID for everything. (Participant 7)*

This leader identified that while students faced challenges, she is trying to move past COVID-19 as it relates to the educational climate. These leader sentiments, while less frequently expressed, offer a deeper perspective into potentially perceived post-pandemic pressure.

The language of pressure and urgency was present in some leaders' descriptions, reflecting a sense of responsibility for addressing unfinished learning. Yet this urgency was often experienced as a double bind: leaders were tasked with accelerating student learning while

simultaneously grappling with depleted human and financial resources. Post-pandemic accountability intensified reliance on data-informed practices while also amplifying feelings of stress for some instructional leaders.

Adaptive Data-Informed Decision-Making: Different Decisions for New Challenges

The third concept in the 4 P's framework, practices, directly ties to the collection, analysis, and decisions. Twenty-four instructional leaders spoke about data collection, data analysis, and data-informed decisions while describing data practices within their schools. A district coach in North Carolina described her district's data cycle like this:

> *But the data that you do collect, you have to make sure it's authentic data, and then you actually have to sit down and look at it, and you have to be a little vulnerable with the data, because it's hard to kind of look at it sometimes, because it is your data. But if you don't look at it and actually analyze it and actually keep drilling down to the root causes, then that means you'll keep the same cycle of not improving (Participant 18)*

This reflection illustrates how leaders framed authentic data as both a technical and emotional endeavor: collecting evidence of student learning requires vulnerability to be able to see the challenges students are experiencing in class. This leader also describes that data analysis cycle that many instructional leaders described: collection, analysis, and decisions that promote improvement in student learning.

When leaders reflected on what made the pandemic particularly challenging from a data-informed practices perspective, the importance and challenges of data practices were highlighted. Some instructional leaders described the challenge of collecting student data and shared that this could be a root cause of some unfinished learning. One principal in North Carolina shared:

> *A lot of teachers… they didn't have those data points on kids. They didn't have the day-to-day touchpoints of how kids are progressing… kids weren't turning in assignments, so they weren't able to give feedback. And I think it kind of opened their eyes to the importance of those minor conversations day-to-day, the formative feedback that you're giving to kids, and the formative assessments that you're compiling. (Participant 17)*

This leader described that it was more challenging to collect and ultimately analyze student data for decision-making during COVID instruction, emphasizing the perceived importance of data-informed practices even during school closures in 2020 and 2021.

While instruction during the pandemic had specific challenges, leaders described post-pandemic data-informed practices as having similar expectations to pre-pandemic practices. One district coach in Massachusetts shared:

> *We're not doing a lot of different things, like we've always believed in, like, individualized instruction and really strong whole class instruction, and we're just continuing to do that… The expectation at our schools is that you are data-driven in the choices that you make that can look differently. (Participant 4)*

This leader shared that her school's data-informed practices have remained largely the same in terms of internal policies or expectations in a post-pandemic context. Such perspectives reveal continuity as well as adaptation: while expectations for data use remained consistent with pre-pandemic norms, leaders acknowledged that the stakes of data-informed work had growth sharper in the light of unfinished learning. The perception that aspects of data-informed practices remained similar in a post-pandemic context will be further explored in the next topic.

Data Collection and Analysis

Twenty-four leaders across all three states described data collection and analysis as systems, specifically describing the types of student assessments they collected and the frequency with which data was collected. Twelve leaders described the use of summative assessments for data collection, (Participant 5, Participant 10, Participant 11, Participant 16, Participant 18, Participant 19, Participant 20, Participant 21, Participant 22, Participant 23, Participant 24, Participant 25). Participants 25, 20, 5, and 16 described the importance of using diagnostic and interim data alongside tests and quizzes. These leaders named assessments that

have larger windows of time in between them, from quarterly assessments to triannual assessments, and described summative assessments as important for data collection.

While some instructional leaders described the importance of summative assessments, 24 out of 25 leaders described formative assessments as a component of data collection. Leaders mentioned specific formative assessments they collect in their schools, such as exit tickets and do nows and quizzes, (Participant 12, 5, 25), and weekly quizzes, (Participant 3, 14, 5). This short-cycle data was described as important for increasing the responsiveness to student need. Across all three states, leaders described daily or weekly assessments that were collected for data-informed practices.

Some instructional leaders made the case that formative, or more frequent, assessments were more useful for teacher instructional decisions. A district coach in Massachusetts noted the type of regular data collected in classrooms:

> *You have everything from like, do nows, exit tickets, checks for understanding during class itself, where you can be making like, real-time decisions, and that's like, I think, on the teacher level of what are you doing day by day to address your students' learning. (Participant 25)*

This leader's description emphasizes the importance of addressing student data daily, which requires short-cycle data collection. Leaders also described why short-cycle data might be more important. A school coach in Massachusetts shared:

> *I'd say the biggest piece of data is the like, day-to-day student work, because some of the more global data, it's hard to like, know exactly what the student did or what even the question was, because they don't always release. (Participant 24)*

This leader emphasized that some summative assessments hinder leader and teacher ability to analyze student thinking in a way that allows for data response, making formative data

potentially more useful for data-informed practices. Some leaders emphasized the importance of daily data-informed practices. An assistant principal in North Carolina shared:

> *Those teachers that wait to not collect data until Friday, their students are not growing at the rate of someone who is collecting every day, who is collecting data every day. (Participant 6)*

This leader noted that students learned more in classrooms where teachers looked at data daily. These quotes illustrate that leaders perceive that collecting more frequent, smaller assessments can be more useful to guide instruction and improve student outcomes.

While the majority of leaders described formative assessments as priority, some leaders shared that they specifically pay more attention to summative assessments. A district coach in Oklahoma shared:

> *I needed to know explicitly what students were learning, and so really paying attention to the big assessments, the Map (NWEA assessment), and the standardized things. (Participant 12)*

This leader described the perceived importance of a triannual assessment for data-informed practices. These accounts demonstrate how leaders navigated the complementarity of summative and formative assessments. Summative assessments offered system-level accountability and broad comparisons, while formative assessments provided granular, actionable evidence that leaders often regarded as more directly tied to student growth.

Student data collection was not the only type of data collection instructional leaders described for their work. Instructional leaders also described the data collection they do in support of teacher development, instructional leader support, and school-level improvement. A school coach in Massachusetts stated:

> *So when I do an observation, I am taking low inference, running notes, I'm a fast typer. I'm typing everything that I'm seeing and hearing. What are kids doing? What are the teachers doing and saying as much as I possibly can. (Participant 2)*

This leader identified how using data allowed them to support teacher observations, and this description matched that of a Massachusetts principal who used data collection to support teacher lesson planning. Observational data wasn't just descripted at the teacher-level. A principal in Massachusetts shared:

> *As an ILT,(instructional leadership team), we use observational data just related to like, our school wide focus to like right now, thinking about the alignment piece, we go on learning walks, and we do district instructional rounds as well. (Participant 1)*

This quote indicates that observational data could be analyzed school-wide to make whole school recommendations. Leaders also gave specific examples of how they described data use at the classroom and school level. A district coach in North Carolina stated:

> *We say, okay, out of the five classrooms that we go into, okay, there are three teachers who are using turn and talks. And we say that to teachers, there are 6 to 7% of you using that turn and talk, that data needs to be higher because the scholars are not talking, then we don't know what they're thinking. (Participant 15)*

This leader not only collected data but described using it to support conversations with staff about school improvement. These examples show that leaders' data practices extended beyond student assessments to include systematic observations of instruction. Such practices underscored leader's dual focus on both student outcomes and instructional processes, positioning teacher learning and school-wide improvement as a critical site of data-informed practices.

Data collection was often described in connection with data analysis, with 24 leaders explicitly mentioning the importance of analysis. Leaders described data analysis as the process of understanding student data so that it can be used to explain student thinking and named the importance of being able to interpret data and distill it into actionable knowledge. A district coach in North Carolina shared:

> *If we don't have well-trained people who know how to read the data, why are we collecting it? You know, it's really not… informing anything, right? It's just existing on paper somewhere. (Participant 12)*

Data cannot only be collected to be used; it must also be analyzed. This leader speaks to the importance of data not just existing but leading to analysis, as well as highlighting the importance of training staff on data analysis.

Once data was collected, leaders described the way they made student thinking visible. One strategy mentioned was the categorization of student thinking by looking at student work. One district coach in North Carolina described the process like this:

> *You're literally going page by page for each of the students' work, looking at questions four, five, and six. And did this person meet the expectation here? Well, they only answered part, but they didn't show their work. They didn't meet that expectation. So there are four categories that we're putting students in. (Participant 12) District Coach, North Carolina*

This leader, along with other leaders, described categorizing student work by problem and proficiency level to identify trends. Leaders also described identifying trends by noting when students changed in proficiency level. One assistant principal in Oklahoma stated:

> *We looked at the number of our students… who had tested or had moved from basic to below basic from our fall to winter (exam)… We had students who regressed in their skill on our measured academic progress in the winter intersession. So then we pulled those students. We identified who those students were. (Participant 10) Assistant Principal, Oklahoma*

The analysis of students by category change allowed this leader to prioritize students who changed categories and changed from higher to lower-levels of understanding. These leaders describe the categorization of student work, student by student, to sort students into their levels of understanding of the content or standard, including identifying students who may have regressed in their learning. These quotes also highlight the use of categorization on both formative and summative assessments. Categorization practices reveal a broader logic of

sensemaking: leaders transformed raw data into usable categories that illuminated individual and group patterns. Importantly, this process was not only technical but interpretive, requiring leaders to decide what levels of proficiency meant for instruction and intervention.

Categorization was often described in tandem with a tracking system to make the categorization easy to see. Six leaders named how to organize the analysis of student work, using simple tools like spreadsheets (Participant 4, Participant 8, Participant 13, Participant 17, Participant 21, Participant 24, Participant 25). These leaders described a simple system, noting that it was something that they typically used to organize and see student data.

Leaders didn't just organize and categorize student work but also looked for student trends in the data during their analysis process. Leaders described looking for strengths and weaknesses as a pat of the analysis process. A district coach in Massachusetts described:

> *(The analysis of) focus questions around, like, who showed the most growth… any trends we can see about those students, looking at things like, which questions did the class perform the worst on? Anything we can say about those questions or standards, and think about like instruction for the year, when that happened, how that happened, and kind of being able to compare that so just like really dedicating time to get into dig into both, like the student achievement part and any trends there, and then also, like areas of strength and weakness. (Participant 23)*

This leader highlights the thinking questions that can be used to analyze student work, describing the need to find strengths and weaknesses in student thinking, as well as identify what happened to create those outcomes for students. Leaders also described the importance of identifying misconceptions as they related to student understanding (Participant 14, 8). These leaders illustrate that reviewing student work during the year can help identify student misconceptions, adding to data analysis.

While leaders described their own analysis of student data, they also described the data analysis process they conducted alongside teachers. Reviewing data side-by-side with teachers, and supporting analysis collaboratively was a strategy described by a Massachusetts leader:

> *We sit down with the teacher and we look at those that data for the particular class, which I think can be really illuminating, I think just a lot of trying to figure out how to make the data digestible and useful for teachers, and to make it feel… valid. (Participant 19)*

This leader describes making data "digestible" for educators to make it actionable in relationship to improving instruction and student learning.

Leaders framed analysis as an iterative cycle of detection (identifying trends and misconceptions, interpretation (understanding the causes), and creating actionable knowledge to inform next steps. Their commentary highlighted both the promise of systematic analysis and the leadership challenge of making findings accessible to teachers. Data collection and analysis were described as similar to pre-pandemic processes.

While many leaders described data analysis systems as the same as pre-pandemic, three leaders believed that data systems have increased in the expediency of analysis. One principal in Massachusetts shared:

> *When we're a more technologically embedded school, I would say we get information quicker… It used to be when you create everything by hand, and sometimes now we have the exit ticket and it's on (online math platform), and we actually can just look and like, look at the check marks. (Participant 3)*

This leader describes how some tech platforms make data more visible, and therefore easier to analyze. Sorting student data was also described as an improvement from pre-pandemic technology. A district coach in North Carolina shared:

> *Once we all moved virtually, we really got into using (online spreadsheets)… The way that we looked at data became even more intense because we could just sort things on a*

> *dime. You're like, oh, I want to look at my like, Hispanic males. Click, there it is. (Participant 13)*

The ability to review subgroups with improved systems was described as an important improvement in the data analysis process. The technology improvements since COVID-19, such as online math platforms and improved ease of spreadsheet coding, have increased the speed and depth of analysis for some leaders. Some described this as different from pre-pandemic data analysis, and credited technology advancements as well as technology use during the pandemic.

Foundational Math Gaps

While leaders (Participant 4, Participant 17) described their data collection and analysis systems as unchanging from pre-pandemic, they described the types of decisions they were making as adaptive to a perceived complex problem that was dissimilar to the pre-pandemic educational context. Twenty instructional leaders noted that a significant widening of foundational gaps, especially in math, had occurred for middle school students. As one district coach in Massachusetts explained:

> *We knew that there were gaps before COVID, but with COVID, it just created those huge fissures, you know, in the foundations that our students are supposed to have, especially when they get to middle school. (Participant 25)*

This leader described the severity of student unfinished learning for middle school math students, echoing the sentiment of leaders interviewed. One assistant principal from Oklahoma stated:

> *So one of the things that we see across the data is students are coming to us as rising middle school students already deficient more than multiple grades. (Participant 10)*

The evidence above indicates that instructional leaders perceived middle school students as far behind what they'd expect for grade-level learning, including seeing students behind by many years of math learning. Leaders described students entering middle school without mastery in basic operations, and some estimated that students were three to four years behind in math

proficiency. Participant 24 shared that she observed students struggling with long division in fifth grade because they struggled to regroup when subtracting in the division algorithm. Participant 9 described middle school math students who did not know the value of a nickel.

These accounts were striking in their unanimity: across states and roles, leaders described foundational numeracy gaps as both deeper and wider than before the pandemic. The perception that students entered middle school without content that is taught between kindergarten and second grade reframed data-informed practices from routine monitoring to crisis response. Leaders no longer analyzed data to refine grade-level instruction but to identify and remediate missing blocks of mathematical understanding.

The perception of student learning loss was accompanied by descriptions of decisions that needed to be made from data analysis. As one leader explained:

> *The gaps are just way more with our kids, and we're seeing that, like, core group of kids really kind of hit middle school right around now... they missed addition, subtraction, multiplication, division, they missed, like, the basics of math. And so it's not just teaching on grade level. It's "how do you close the gaps they have?" So all of our units have actually had to go at least down two grades in order to cover that one unit. (Participant 25)*

This leader described students' academic knowledge and skills as needing curriculum adjustments at the unit-level to address student misconceptions. Leaders also described curriculum challenges overall. A school coach in North Carolina shared a similar sentiment:

> *The problem is, is the curriculum has not changed, and the expectations haven't changed. The bar hasn't been changed, so they're coming with bigger gaps… I can't fill all the holes that all the kids have without some kind of extra support. (Participant 13)*

This was particularly concerning for her as the data-informed curriculum planning needed to address the student gaps had to be planned for unit by unit throughout the school year.

Leaders highlighted the disconnection between curricular expectations and newly widened student academic gap, underscoring the difficulty of planning lessons that meet grade-

level standards and close unfinished learning. The tension illustrated how data-informed decisions were not simply technical, but fundamentally adaptive, requiring leaders to rethink how to sequence, pace, and prioritize standards and content.

Data-Informed Decisions

Across the dataset, instructional leaders emphasized the centrality of student data in analysis and decisions as integral to their data-informed practices. What was important to leaders was that data was used to do something. A district coach in North Carolina shared:

> *That's why data, whether it's summative data, formative assessment, whether it's just the way that they respond in the classroom, you're always collecting data on kids and listening to their responses. You're looking at their work so that you know exactly where to pinpoint and try to help close those gaps right then and there. (Participant 18)*

This speaks to the sentiment described by many leaders: the response to data should improve student learning. Leaders also described how decisions and actions should be tied to data. A district coach in Massachusetts named:

> *Why are you making the decisions you're making? You need a reason. That reason needs to be data. (Participant 25)*

The importance of making choices connected to data improved the quality of decisions for this leader. These leaders' sentiments reinforce the idea that data analysis is not enough; to fully engage in data-informed practices, decisions must be made to improve student learning.

Leaders shared their thinking as it related to the types of data-informed decisions they helped teachers make, or that they made school-wide. Principals and district coaches spoke about structural shifts to support data-informed practices. A principal in Massachusetts shared:

> *It's like, you've got to simplify this. What's the easiest thing that's going to get the most important thing, and we call it watering the grass. I was trying to grow grass in my yard, like, there was all these different tips. I was like, put the mulch thing at this level and do all this like, and it turned out, like, 90% of growing grass is water, right? You just got to water it. (Participant 3)*

This leader described the types of decisions for student learning as selecting the response to data that is going to be simplest while increasing student learning the most. Specific data-informed examples were given by multiple leaders, including leveraging a PE teacher to pull small groups during plan, (Participant 14), creating a student-tutoring system with conceptual flashcards, (Participant 3), shifting schedules to allow for intervention during the day, (Participant 25), and hiring substitutes for teachers to engage in data-informed practices more during the school day (Participant 9).

Leaders noted that the nature of the depth, breadth, and urgency of student learning gaps had fundamentally shifted and required different types of decisions. While some principals described changes in schedules and intervention systems, district coaches more often described curriculum needs. A district leader in Massachusetts shared:

> *A result of some of the bigger learning gaps we're seeing now… (in the past) if you're teaching the curriculum and you're doing the instructional moves, have facilitated a good lesson… you're going to have decent scores. Whereas now… we actually… have to be so laser-focused on that content and what that understanding is like, we spend a lot of our time on conceptual understanding. (Participant 25)*

This leader described a need to adjust the curriculum to support student learning, given that the pre-pandemic curriculum her schools used in the past may not address the learning students missed from previous grades in math. Participant 16, a district coach from North Carolina, described supporting a curriculum that was adopted within the district, and not created. She named that teachers needed support with the content of this curriculum to address students' unfinished learning. These district leaders, while using different sources of curriculum, spoke to the same type of content support teachers need to analyze data within the content.

This sharpened focus on conceptual learning also required difficult decisions about what content to prioritize. One principal in Massachusetts reflected:

> *So there's lots of standards. Some of them you'll have exposure to later in life. Some will help you get through high school, do well in college, maybe get good jobs. And some of them are somewhat arbitrary. But when you can only support a certain amount of students with a certain amount of intervention time, I think we call them primary focus standards—and just making sure kids are all learning those objectives and standards is super important. (Participant 3)*

This leader uses a focused approach for intervention to maximize the learning time on the highest-priority standard. This reflection speaks to the constraints leaders operate within to make data-informed decisions, as well as highlights one of the ways a leader strategically focuses intervention.

While some leaders described new types of decisions from data analysis, one specifically named the hesitancy of teachers to innovate in a post-pandemic context. A principal in Oklahoma shared:

> *Learning loss is just really, really stark, especially in the widening of achievement gaps, and yeah, it makes it hard to try new and innovative things, because people are just desperate for the old way of doing things out of a sense of safety. (Participant 9)*

This principal observed his team returning to pre-pandemic types of instructional decisions. His reflection highlights the duality of instructional leader perspectives on data-informed decisions.

These reflections underscore a consistent throughline: for leaders, the value of data resides in its capacity to dive timely and targeted decisions. Whether reallocating staff, shifting schedules, revising curriculum, or making instructional choices, leaders described data as a chance to act.The pandemic did not interrupt the use of data-informed practices for the instructional leaders interviewed; rather, it reinforced and expanded the importance of the types of decisions made from data. In response to widespread unfinished learning, leaders increasingly viewed data collection, analysis, and action as essential tools for driving instructional decisions and advancing educational equity. Instructional leaders have implemented creative, resourceful solutions to support students in addressing academic gaps.

Fostering a Collaborative Data Culture: Vulnerability, Trust, and Relationships

Instructional leaders described patterns, the fourth concept of the 4 P's framework, as collaboration, culture, and sustainability as they described data-informed practices. Twenty-four out of 25 instructional leaders described collaboration as it relates to data-informed practices. Simply put, a school coach in North Carolina stated:

> *All of us collaborating which is a big part of data. It is a big part of how we view data, of how we come up with strategies based on and the data. (Participant 15)*

This comment captures a widely shared belief: collaboration is central to data-informed practices. Leaders repeatedly framed collaboration as the interpretive space where raw evidence was transformed into actionable strategies. Collaboration was described as a large part of data-informed practices in the analysis and decision-making stages.

The structures that were described as patterns also created conditions for collaboration. Leaders described the scheduling and structures they used to create space for collaboration. One principal in Massachusetts shared:

> *We try to think about how we use our schedule and collaboration times to focus on building those muscles and like habits of looking at data with teachers… our instructional leadership team is comprised of principals and coaches, and we try to take our like really work through looking at data together as a team, and then think about how each coach is then bringing that practice into their professional learning teams. (Participant 1)*

The principals and school coaches at this campus conducted data analysis meetings together in support of the school coaches leading these meetings in organized professional learning teams. This speaks to the systems created by the principal to include layers of meetings in support of instruction and data-informed practices.

While some leaders described the schedules and structures, others spent more time describing the types of behaviors they see in the meeting structures where data-informed work occurs. A school coach from Massachusetts shared:

> *Planning time in collaborative inquiry, in our instructional leadership team meetings, in department time meetings, we have lots of opportunities to look at data… Like, what do you notice? Hoping that as teachers read through the data, they're also coming to their own conclusions and being more facilitative, rather than directive. (Participant 2)*

This quote highlights the type of facilitative nature she envisions in meetings about data-informed practices, describing the collaborative inquiry and facilitative conversations she wants to see. Leaders described their roles in collaboration, but also highlighted the collaboration they saw between teachers in data meetings. An assistant principal in Oklahoma shared what he hopes to hear in professional learning communities (PLCs) about data analysis:

> *A true PLC is, hey, I admit I don't teach x as strong as you do. You take my five kids, you teach over there, and I'm not going to have feelings… feel any kind of way. I teach this. You can your five kids also. Now we have strength on strength, instead of we have isolation in classrooms where we hide weaknesses. (Participant 10)*

His quote speaks to the collaboration of data-informed decisions, moving from working together in a meeting to working together to address the data with students directly. The collaboration described by these leaders shaped how data was discussed.

When leaders described their culture of data-informed practices, some of their work was described as setting the norms, or culture, of collaboration. Twenty-three leaders across roles referenced the routines of collaboration as needing to feel safe, supportive, and honest. A teacher leader in Oklahoma shared:

> *I'm going to show them how to collect their data, and we're going to discuss the best ways to collect the data. But in the end, I don't want any teacher to feel judged because we have different schools that are just lower socioeconomically, and I don't want them to feel "well my kids… are doing a lot worse than these kids," and feel judged for it. (Participant 8)*

This quote suggests a type of ownership that the teacher leader assumes to support teachers in a reflection on data that feels safe and non-judgmental. Leaders didn't just describe how they

hoped teachers would feel, they also named that their actions shaped the culture. One principal in North Carolina shared:

> *I believe in the power of data, so I've created that culture in my building, and I think because I'm knowledgeable and I'm not afraid of the data. It creates a vulnerability with my staff. (Participant 17)*

The principal modeled ownership and communication around data, modeling her vulnerability with the data to support a collaborative data culture. These descriptions reveal that structures alone were insufficient; leaders saw their role as deliberately building a culture where collaboration can thrive.

Relationships Support Collaboration

Twelve of the leaders mentioned relationships with teachers as a moderating factor for collaboration to better support data-informed practices. Across each state and role, save the teacher leader role, leaders describe relationships as important. One principal in Oklahoma shared:

> *It's cliche to say through relationship, but that's important. I think knowing who people are and what they're going through is good if you need them to go above and beyond. (Participant 9)*

His focus on relationships, shared by other leaders, was the starting point for data-informed practices. School coaches, district coaches, and principals referenced relationships as a starting point for collaboration with teachers. Leaders described the importance of first getting to know the teachers they collaborate with:

> *My role as a math instructional leader… The first being I have a coaching relationship with all of the math teachers at our middle school, and that includes like the like relationship building that comes with any like relationship that you have at work. (Participant 22, assistant principal, Massachusetts)*

This leader starts coaching relationships with her teachers by first building a relationship wit them. In the process of building relationships, leaders shared they needed to know their teachers

to be able to support them to best support their work and instructional practices. Principals and assistant principals were more likely to make the explicit connection of the relationship to continue to develop teachers in a less-evaluative way:

> *I'm a relational person. So, I believe in establishing trust and relationships with my staff. So, I get to know them. I try to let them know that I'm here to support them. I'm not a gotcha person. I'm not out to like say you're a terrible teacher. That's not my goal. (Participant 17, principal, North Carolina)*

Leaders perceived that relationships enabled them to enact the process of data-informed practices in collaboration with teachers, as this allowed key elements like trust to take form. In these cases, relationships were explicitly positioned as the counterbalance to evaluative authority. Leaders sought to soften the hierarchical edge of feedback by grounding coaching in relational trust, thereby preserving teacher buy-in.

Culture seemed to build collaboration, but some leaders also described how collaboration helped to build culture. The teacher leader in Oklahoma also referenced a sense of trust in each other built through the collaboration of data-informed practices. She shared:

> *We have to share and rely on each other more, we have to trust that that person is going to create a high quality lesson that we can share and use, because we were trying to do it so fast, and then we just kind of got into the groove of that where we were excited to share things with each other. (Participant 8)*

This leader's description illuminates the duality of systems and culture: practices can influence collaboration, and collaboration can influence practices. When data use becomes collaborative, it is described as less isolating and even exciting to use each other's resources to address student learning gaps. Such accounts suggest that practices and collaboration were seen as mutually reinforcing the data-informed system of a school.

While some leaders described building vulnerability, trust, and relationships with teachers, a few also described collaborative data practices as accountability measures. A district coach in Massachusetts shared:

> *I think it's just philosophically getting people bought into the fact that… achievement matters, and good teaching is measurable… if that you're not aligned on that level, then this is certainly not the right place to you… We regularly look at that data together and then protocols for what we do kind of with that data as a result. (Participant 20)*

This leader speaks to leveraging collaborative data protocols to analyze and make decisions with the underlying values that student achievement matters, teacher practice is measured against student achievement, and teachers must be aligned on these concepts to work within the school system. This speaks to the mindsets sought by this leader for the culture intentionally built within the data-informed practices of this education system.

Relationships were described by leaders as important for data-informed practices, and some leaders added a layer of accountability as a support system for their structures. Some leaders expressed the need to tailor their coaching, balancing urgency and support with teacher retention (mentioned more in depth in theme 1). One leader described this dynamic:

> *So you have to have the relationship. You've got to build the foundation. You've got to explain the why behind the coaching before you can actually get into the process… after the pandemic… you're just terrified at losing teachers. You're terrified of losing good ones… if I push this person too hard, I say no to this, they're just gonna leave. Because people are leaving like crazy. (Participant 10, assistant principal, Oklahoma)*

This comment underscores the dual role of the leader: to improve instruction while also supporting teacher retention. Relationships were described as a support mechanism to share feedback in a way that feels supportive and to be heard by teachers. Leaders described these relationships as prerequisites for data-informed practices.

Collective Efficacy

Instructional leaders' consistent focus on developing and retaining educators reflected a strong sense of collective efficacy – they believed that their efforts could directly impact instructional quality and student learning. One leader shared the following about specifically developing uncertified teachers:

> *So they're not traditionally certified in education… it doesn't mean that they're not productive. It just means they don't have the foundation on the background that some teachers coming out of the traditional certification would, so that part of it presents some technological and some pedagogical missteps that they have to acquire. (Participant 24, school coach, Massachusetts)*

This leader's quote suggests a sense of being able to support and develop teachers who need it the most. Despite the additional effort leaders describe used to collaborate and develop teachers, 19 expressed optimism about their ability to improve student outcomes through effective data use. This emphasis illustrates leaders' optimism that investment of their time in teacher growth, even during challenging seasons of turnover, would yield measurable gains for students.

Leaders consistently described data-informed practices as an engine for improvement, whether in relationship to teacher development or student academic achievement. These descriptions were often accompanied by a sense of efficacy as it relates to student outcomes with data use. As one district coach in Massachusetts shared:

> *We've been able to like grow kids so much, especially post-pandemic, when their gaps are even larger. And without the data collection, we would never have been able to do that. (Participant 25)*

This description highlights the direct perceived connection between data-informed practices and student academic growth. The use of data practices is described by most leaders interviewed as supporting their ability to change student learning. A district coach in Oklahoma also shared:

> *I believe in it. Believe in data practices, because it moves the needle for kids, which is like a super vague statement. But you know, teachers need to know whether or not what they taught was learned. School leaders need to know that they're driving towards*

> *something and that they're leading people towards something rather than just keeping the lights on and staying open. (Participant 5)*

This belief in data-informed practices described by this coach highlighted the importance of both seeing the destination and knowing when one has arrived. Data-informed practices were perceived as allowing teachers and leaders to see what students know and let them see the amount of learning that occurs as a direct result of the education they receive. This knowledge can act as an inspiration to continue the work of educating children.

Summary of Findings

This chapter presents findings from the qualitative analysis of interviews with 25 instructional leaders who have used data-informed practices pre- and post-pandemic. Four major themes emerged from the analysis, representing various aspects of how leaders see changes in data-informed practices as schools respond to COVID-19 learning loss. Together, the themes reveal a multi-faceted understanding of how instructional leaders are navigating post-pandemic recovery through sustained and adaptive data practices. While limitations exist in the generalizability of the findings, and will be discussed further in chapter 6, the perspectives of these leaders offer insight into current instructional leadership work.

The first theme underscores the belief that building capacity is foundational to effective data-informed practices. Participants described their primary responsibility in creating time, tools, and structures necessary for teachers to use data in meaningful ways. In response to post-pandemic challenges, such as staff turnover, teacher absences, and an increase in non-traditionally certified teachers, leaders reported taking on expanded roles, including co-teaching, curriculum planning, and conducting foundational data analysis on teachers' behalf. Many described needing to scaffold data practices for teachers more extensively than before the pandemic. Additionally, several participants shared the complexity of student needs and

persistent disengagement, which required greater instructional support and coordination. As a response to student disengagement, some leaders spoke to the power of sharing data with students directly to support motivation and engagement. This theme reveals a shifting instructional landscape in which leaders are increasingly responsible for both enabling and enacting data use in schools.

The second theme explores how instructional leaders perceived internal and external influence on data-informed practices in response to shifting demands and instructional capacity following the pandemic. Leaders described a complex interplay of internal and external polices that shaped their data-informed practices in the years following the COVID-19 pandemic. Internally, leaders emphasized the importance of district or school expectations, regular data meetings, and progress monitoring systems in creating supportive conditions for data use. Some leaders also cited assessment systems and a lack of question quality as hindering internal factors. Externally, state standards and assessment systems were viewed as providing useful benchmarks and structured data goals. Many leaders in North Carolina and Oklahoma raised concerns about state funding models and school accountability measures, while leaders in Massachusetts raised concerns about the removal of the state exam as a graduation requirement. Across all states, leaders described how the expiration of federal ESSER funds reduced staffing, professional development, or protected learning time, complicating efforts to sustain effective data-informed practices. Amid these constraints, 15 leaders reported heightened pressure to accelerate student achievement recovery and described data practices as increasingly urgent in light of widespread foundational math gaps.

The third theme highlights how instructional leaders perceived changes in their data-informed decisions following the pandemic, even as data collection and analysis practices largely

remained the same. Leaders emphasized that their decisions, based on collected and analyzed data, shifted significantly in response to new instructional demands and unfinished learning in mathematics. Foundational academic gaps prompted a strategic focus on intervention as decisions were more frequently centered on acceleration strategies, targeted small group instruction, and adjustments to core instruction. Leaders described relying more heavily on formative data than summative data to respond more urgently and effectively to student misconceptions. In many cases, the urgency of closing learning gaps reshaped the types of decisions leaders made with teachers in data-informed practices. The stakes and focus of decision-making had shifted towards addressing unfinished learning and supporting academic recovery.

The fourth theme illuminates how instructional leaders foster a collaborative data culture through vulnerability, trust, and relationships, and how this culture can support a sense of efficacy. While nearly all participants described collaboration as central to data-informed practices, their approaches varied. Some emphasized the logistical structures that enabled collaboration, such as layered meeting schedules and instructional leadership teams, while others focused on the behaviors and facilitative inquiry they sought to cultivate within those collaborative spaces. Some leaders described data analysis and planning as shared, non-evaluative, and rooted in safety, with participants describing how they modeled vulnerability or intentionally created nonjudgmental environments for data discussions. Trust and relational leadership emerged as key enablers of effective collaboration, and these relationships helped leaders share honest feedback, support instructional improvement, and may even support teacher retention. This blend of support and development reflected a broader sense of collective efficacy as leaders believed their data-informed practices with teachers could impact student outcomes.

Chapter 6: Discussion

Datnow and Park (2014) describe data-informed practices as practices that happen within the context of a school system. This study aimed to understand the context of data-informed practices in a post-pandemic environment as described by instructional leaders. Existing studies have identified the importance of people, policies, practices, and patterns as they relate to data-informed practices (Datnow & Park, 2014). Research also suggests that there is a relationship between data-informed practices and improvements in student learning, particularly for math (Carlston et al., 2011) and for low-income students (Lai et al., 2016; Poortman & Schildkamp, 2016).

The Centrality of Equitable Practices: Spend More Time on What They Don't Yet Know

The findings of this research, in line with the literature, suggest that data-informed leadership is viewed as a strategy for addressing persistent, inequitable learning gaps in middle school mathematics following the COVID-19 pandemic. Leaders' perspectives in this study confirmed topics from the literature regarding student learning challenges, remediation efforts, and perceptions of data-informed practices. This study highlights how instructional leaders in Title I middle school settings are adapting data-informed practices to address the post-pandemic education environment.

Instructional leaders described the challenges their students faced post-pandemic, noting significant unfinished learning in math. They reported urgent and widening learning gaps found in foundational math skills, with some students entering middle school performing three to four years below grade level. Existing literature confirms that students from low-income communities experienced some of the most substantial learning loss (Dorn, et al., 2020b; Kuhfeld et al., 2020; Pier et al., 2021), and leaders in this study provided concrete examples of math content gaps and how they shaped students' academic challenges. Literature also suggests that Title I students

reported high levels of loneliness, anxiety, stress, and worsening mental health post-pandemic (Juvonen et al., 2021; Ghosh et al., 2020). Leaders in this study expanded on this by describing what they called "executive functioning," "focus," or "engagement" challenges for student learning, naming that these manifested as observed technology addition, chronic absenteeism, behavioral disruptions in class, or incomplete class or homework.

This study interviewed leaders at various grade configurations, and one notable divergence from the literature was the absence of explicit discussion of eighth-grade mathematics. Literature suggests that Pandemic-related learning loss is most pronounced in eighth-grade math (Dorn et al., 2021; Lewis & Kuhfeld, 2024; Methodology Studies – State Standards NAEP, n.d.), with advanced mathematics in high school serving as a strong predictor of college success (Adelman, 2006), and there is a positive relationship between Algebra I in eighth-grade and higher mathematics in high school (Speilhagen, 2006; Clotfelter et al., 2015). However, leaders in this study did not explicitly connect their concerns to college trajectories or advanced high school math outcomes. Instead, leaders focused on broader concerns, describing hopes for students to become functioning members of society and securing meaningful employment. While leaders demonstrated genuine concern for their students' futures, these concerns were not always tied to math performance in high school and beyond.

Leaders perceived a compounded pressure from state accountability measures and internal policies to accelerate learning recovery, even as they continued to grapple with persistent unfinished learning and student engagement challenges. The perceived pressure aligns with literature describing a post-pandemic push for a return to normal in student performance metrics (Kuhfeld et al., 2022; Lewis & Kuhfeld, 2024; Woo et al., 2022). Some leaders noted that state school evaluation systems failed to account for the growth students had made, creating

frustration around how progress was measured and how their school would be perceived by the public. Some leaders also described a reduction in funding, including ESSER and school need-based state grants, which required them to seek low-cost solutions to support ongoing recovery efforts. Internal policies, such as district pacing guides, were also reported to conflict with instructional adjustments needed to reteach essential standards. Collectively, leaders described these internal and external policies as adding layers of pressure and operational challenges to their efforts to support student learning post-pandemic.

Amid these pressures, leaders described the importance of strategies to address unfinished student learning. Literature affirms the effectiveness of remediation efforts such as high-dosage tutoring and extended learning time as strategies for addressing pandemic-related learning loss (Borman, 2020; Nickow et al., 2020; Robinson et al., 2021) while also acknowledging that these interventions may be cost-prohibitive (Kraft & Falken, 2021; McCombs et al., 2011). Additionally, prior research suggests that data-informed practices can serve as a low-cost strategy for supporting student learning (Popham, 1987). Although leaders in this study did not explicitly label data-informed practices as low-cost, they emphasized that using data-informed practices allowed them to target student instructional needs, re-teach critical concepts, and group students strategically for interventions.

Leaders in this study expand on the existing remediation literature by sharing specific strategies for leveraging resources. Some leaders described using existing time and staff during the school day to recreate tutoring opportunities and support without incurring additional costs. Other leaders shared a flashcard system with conceptual math topics that students used to quiz each other. While data itself was not framed by leaders as a cost-saving measure, the use of data to guide instructional decisions enabled some to implement creative, low-cost solutions that

leveraged current resources, staff, and schedules to support remediation efforts. The literature highlights that data-informed practices, when systematically implemented, can promote instructional precision (Datnow & Park, 2014; Hattie, 2023; Marsh et al., 2006). Leader accounts in this study align with these findings, illustrating how data was used as an accessible lever for identifying student learning gaps and creating responses to those gaps.

Leaders' use of data for instructional decisions reflects Datnow and Park's (2014) call for contextually grounded decision-making within data-informed leadership practices. Rather than using data for compliance or retrospective analysis, leaders in this study leveraged multiple, fresh data sources to identify and respond to student needs, making instructional adjustments to address foundational skill gaps. This approach demonstrates how data-informed leadership functions as a mechanism for equity-focused action, allowing leaders to help teachers prioritize and tailor instructional strategies to the most crucial areas of unfinished learning.

From Surviving to Thriving: Collaboration and Shared Responsibility

The findings of this study, consistent with the literature, suggest that relationships and collaboration are essential components for building and sustaining data-informed practices in a post-pandemic environment. The literature suggests that collaborative and distributed leadership structures foster more effective instructional support (Grissom et al., 2013; Hallinger, 2011; Huang et al., 2020; Park & Datnow, 2009; Robinson et al., 2008; Stein & Nelson, 2003). Research further indicates that collaboration supports data-informed practices through collective data interpretation, shared instructional decision-making, and a culture of continuous improvement (Earl & Katz, 2002; Means et al., 2011), with collaborative data analysis often producing stronger instructional plans than individual analysis alone (Jimerson, 2014; Means et al., 2011). While literature describes school leadership as a mediating factor of student

achievement, (Hallinger, 2011); research also suggests that school leaders can either support or hinder data-informed practices in their schools (Datnow & Hubbard, 2016). This study extends these findings by illustrating how post-pandemic staffing challenges, high teacher turnover, and the influx of non-traditionally certified teachers have heightened the need for instructional support. Leaders described staff retention alongside staff development as critical to their work and named that relationships were key to this work.

Leaders in this study described engaging in collaborative practices such as forming principal-coach dyads, facilitating professional learning communities, and conducting one-on-one coaching to help teachers interpret and apply data to instructional planning. These practices were framed not only as mechanisms for instructional improvement but also as strategies for supporting teachers' emotional well-being and mitigating attrition. This aligns with literature emphasizing the impact of relational leadership on teacher retention, particularly in high-need school contexts (Blair et al., 2023). Data-informed practices were described by leaders as opportunities to build relationships and foster collaboration with teachers, highlighting the relational benefits beyond instructional improvement. Leaders noted that engaging teachers in data practices created structured opportunities for dialogue, feedback, and shared goal setting, which strengthened trust and collective responsibility.

Leaders also provided insight into how they navigated the tension between the urgency to accelerate learning recovery and the emotional needs of their staff. Many leaders described intentionally building trust and relational safety as a precursor to engaging in challenging data conversations, balancing vulnerability with confidence as they guided teachers in using data for instructional decision-making. These findings align with the literature on the role of relational trust in sustaining data-informed practices (Datnow & Park, 2014; Park & Datnow, 2009) and

illustrate how leaders perceive their roles not only as instructional leaders but also as relational leaders who must adapt their approaches to effectively engage teachers in data use while fostering a supportive school culture.

Data-informed practices appeared to have a direct, positive connection between instructional leaders and their sense of self-efficacy and reinforcing their belief in their ability to support instructional improvement. Some research suggests that school leaders involved in data use often believe in themselves as able to change outcomes (Earl & Katz, 2002; Leithwood et al., 2008) a concept connected to self-efficacy. This dimension expands on the literature by illustrating how engaging in collaborative data practices can support not only teacher capacity but also leader motivation and commitment during a challenging period of education recovery.

From Analysis to Action: Making Data Live

The participants in this study illustrate how instructional leaders operationalize data as a daily tool for precise, responsive instructional decision-making. Rather than treating data as an accountability measure, leaders described embedding a continuous cycle of assessment, analysis, and action into the fabric of teaching and learning. These descriptions matched empirical research, which describes data-informed practices as the systematic collection and analysis of student data to guide instructional actions at the classroom, school, or district level (Coburn & Turner, 2011; Datnow & Park, 2014; Mandinach et al., 2006; March et al., 2006). Leaders in the study described similar data collection and analysis to pre-pandemic systems. The differences they noticed were primarily in the student learning gaps they identified in student work and the instructional decisions they made to address these gaps within the constraints of their current context.

Leaders described multiple sources of data – interim assessments, exit tickets, classwork, and online diagnostics – and how they used data to identify student learning gaps, inform instructional planning, and make real-time adjustments to instruction. Consistent with the literature on formative assessment and data-informed instructional cycles (Datnow & Park, 2014, Poortman & Schildkamp, 2016), participants emphasized the importance of using short-cycle data to inform re-teaching, skill reinforcement, and scaffolding. Targeted interventions – including flexible small groups and tutoring – were deployed to address unfinished learning. This approach aligns with recovery recommendations emphasizing high-dosage tutoring and extending learning time as key levers for addressing COVID-related learning loss (Borman, 2020; Nickow et al., 2020; Robinson et al., 2021).

Leaders described how the urgency of post-pandemic recovery required sharpened instructional focus and intentional prioritization of essential standards, emphasizing conceptual understanding over broad coverage to ensure students built foundational knowledge necessary for grade-level and future success. These reflections reinforced recommendations from The New Teacher Project (2021), which urged educators to "water up" curriculum by adding scaffolds to make grade-level curriculum accessible. Some leaders referenced high-quality instructional materials, state assessments and standards, resources from Achieve the Core, as well as school and district expectations as resources to align data-informed practices to instructional decisions. These discussions align with research that describes data-informed leadership as the systematic use of data to inform and guide instructional decisions, ensuring that educational practices are responsive to student needs (Blase & Blase, 1999; Datnow & Park, 2014; Hallinger, 2011; Halverson et al. 2007; Horng & Loeb, 2010; Leithwood et al., 2009).

Leaders expanded on these ideas by discussing the types of instructional planning support they offered teachers in response to both teacher and student needs. Leaders engaged in practices such as co-planning with teachers, providing pacing calendars and unit plans, unpacking standards, occasionally teaching content themselves to novice educators, creating student exemplar responses, and helping teachers identify likely misconceptions in lessons. Leaders sought to increase consistency in instruction across classrooms by encouraging the use of high-quality instructional materials and discouraging the use of fragmented or low-quality resources. This support was offered because leaders analyzed the need in the lesson plan feedback they gave, and in their analysis of regular student data. These ideas add to the literature as some researchers found connections between leader involvement in instructional practices and improvement in student achievement (Stein & Nelson, 2003; Robinson et al., 2008).

Leaders also applied data to design and manage school-wide intervention systems. Using diagnostic and exit ticket data, they identified students for targeted support, sometimes creating sub-group-specific intervention plans or integrating intervention into whole-class instruction. A few schools secured grants to extend tutoring opportunities or purchase Tier II curricula or online platforms to support teacher instruction. Across contexts, leaders emphasized a focused approach to intervention, aligning it to priority standards, tracking student progress, and setting goals with students whole providing ongoing feedback, sometimes paired with incentives. These practices reflect a sustained cycle of improvement driven by data use, planning, and targeted instructional support. They also reflect discussions in literature, including leadership offering data-informed decision capacity through collaboration (Datnow & Park, 2014; Poortman & Schildkamp, 2018) and promote instructional programming that correlates with improved student achievement such as formative assessment, feedback, and use of intervention (Hattie, 2023).

Limitations

Any findings should be considered through the lens of the limitations of a study (Creswell & Clark, 2017). The limitations of this doctoral research fall into the following categories: methodological, contextual, theoretical and conceptual, transferability and generalizability, and researcher positionality. Reviewing these limitations helps to situate the findings within their appropriate context and clarifies the boundaries of the study's conclusions (Creswell & Clark, 2017).

Methodologically, this study utilized qualitative interviews with critical case sampling, which inherently limits the breadth of perspectives included in the analysis (Patton, 2014). While the use of interviews provided rich data, these methods rely on participant self-report and interpretation, which can introduce response bias or selective memory (Patton, 2014). Especially in this case, where participants were asked to remember their general experiences from five years before the date of the interview. The use of a priori codes, and the NVivo coding system, may have narrowed emergent findings (Miles, Huberman, & Saldaña, 2013). These methodological constraints necessitate a cautious interpretation of the findings, recognizing that they reflect the perspectives and contexts of those who chose to participate within the bounded timeframe of the study.

Contextually, the study was conducted within three geographical regions and 20 school districts, which may have unique demographic, policy, and cultural characteristics influencing data-informed leadership practices. The district's Title I designation, state accountability structures, and local political climate may differ significantly from other contexts, shaping the way data are perceived, accessed, and used among instructional leaders and teachers (Creswell & Clark, 2017). The study was also conducted in a post-pandemic environment, where lingering COVID-19-related challenges and recovery efforts may have heightened or suppressed particular

leadership practices and teacher experiences with data. These contextual limitations suggest that findings should be interpreted as reflective of these specific settings rather than as universally representative of all public school districts.

This study is framed within the 4 P's Framework - people, policies, practices, and patterns (Datnow & Park, 2014), and constructivist learning theory, (Gronn, 2003), serving as a conceptual structure and theoretical frame for organizing and analyzing findings related to shared data-informed leadership. While the framework and theory provided a clear focus for data collection and analysis, they may also limit the exploration of other potential influences on data-informed practices within schools. For instance, constructivist learning theory emphasizes the social construction of knowledge, shaping the study's interpretation of how instructional leaders and teachers collaboratively build understanding from data. However, alternative learning theories, such as behaviorist or critical pedagogical frameworks, may have illuminated different aspects of how data-informed practices are enacted and experienced.

The intent of this research is not to generalize findings statistically, but rather to provide an in-depth understanding of shared data-informed leadership practices within a particular context (Lincoln & Guba, 1982). While rich descriptions and thematic analysis may support transferability to similar settings, readers should consider differences in school system structures and cultures when attempting to apply findings to their contexts. Transferability is further limited by specific grade bands and instructional levels represented among the participating instructional leaders, as perspectives from other roles, especially teachers, are excluded from this research.

Researcher positionality represents a critical limitation in this study. The researcher's professional experience in K-12 education may have influenced the interpretation of participant responses and the prioritization of themes in the analysis. Although reflexivity strategies,

including journaling and a positionality statement, were used to mitigate potential biases, complete objectivity is neither attainable nor claimed within qualitative research (Creswell & Clarke, 2017). While research was overseen by a dissertation chair and committee, and received IRB approval, there was no inter-coder reliability or double coding. The researcher's positionality may have also enhanced rapport with participants, potentially influencing the depth or direction of their disclosures during interviews. Lastly, the researcher's level of research experience represents a limitation, as this study was conducted as part of an iterative learning process and was the researcher's first attempt at conducting scholarly research at this scale.

By identifying and articulating these limitations, this section provides transparency regarding the boundaries of the study's findings while acknowledging the conditions under which the research was conducted. These considerations are essential for responsibly situating the results within the broader literature on data-informed leadership.

Implications

Data-informed practices are a research-supported, cost-effective means to increase student achievement, particularly for low-income students and in mathematics instruction (Carlson et al., 2011; Hattie, 2009, 2023; Lai et al., 2016; Popham, 1987; Poortman & Schildkamp, 2016; Van Geel et al., 2016). Despite the literature's suggestion of a relationship between data-informed practices and student achievement, there remains a gap in exploring how data-informed leadership practices function within the post-pandemic context. This dissertation sought to address this gap through the research question: *How do math instructional leaders (i.e. coaches, teacher leaders, principals) describe the use of data-informed practices in their schools following the COVID-19 pandemic?* The implications of the findings from this research, albeit limited, may build on existing literature regarding practice, policy, and potential future research.

Findings from this study suggest that some instructional leaders view data-informed practices as a support mechanism for post-pandemic instructional improvement. Aligned with the constructivist learning theory, these practices are most impactful when teachers and leaders co-construct meaning from data, contextualizing it to respond rather than reflecting on data for compliance. Schools can support this work by protecting time for joint data inquiry, building data literacy as an iterative learning process, and using the 4 P's Framework to assess and refine internal policy regarding data use.

Beyond practical implications, these findings may contribute to 4 P's framework by adding a new context under which people, policies, practices and patterns can be used to categorize leader perceptions regarding data practices. Instructional leaders described the importance of including students in data-informed conversations. Within the post-pandemic educational environment, instructional leaders' reflections could be categorically sorted into at least one of the 4 P's. By demonstrating the utility of the 4 P's framework as a categorical tool, this research highlights its adaptability for analyzing data-informed leadership across evolving educational contexts, illustrating how the framework can support both theoretical exploration and practical reflection on how leaders navigate and structure data-informed practices for instructional improvement.

At the policy level, findings may indicate that districts and state education agencies could consider how current accountability and data policies intersect with efforts to foster shared, collaborative data use in schools. While data can inform improvement, policies emphasizing compliance and a narrow definition of success were described as unhelpful by participants in this study. Policies that support flexibility in data interpretation and encourage formative, contextually grounded data use could empower instructional leaders and teachers to respond to

student needs effectively. Additionally, policies should consider equity implications, support the disaggregation of data and ensure its use does not perpetuate deficit narratives, but rather guides responsive, sustaining instructional practices.

Future research could continue to explore how shared data-informed leadership evolves, particularly within the post-pandemic contexts. Longitudinal studies could examine the sustained impact of collaborative data use on teacher efficacy, instructional practices, and student learning outcomes, especially in mathematics for low-income student populations. Research comparing data-informed leadership practices across districts with varied policy and resource environments would illuminate contextual influences on implementation. Additionally, studies could incorporate teacher perspectives to gain a richer understanding of collaborative data practices.

Conclusion

The COVID-19 pandemic intensified existing educational inequities, leaving many students, particularly those from low-income backgrounds, with significant unfinished learning in mathematics. While proposed solutions such as high-dosage tutoring and extended learning time may mitigate learning loss, their cost and scalability present challenges as pandemic-era funding ends. This research suggests that data-informed practices offer a cost-effective, scalable, and research-supported strategy for addressing unfinished learning when implemented collaboratively and intentionally within schools.

By centering the voices of instructional leaders, this study illustrates that the immediacy of data response matters. When teachers and leaders use data in real-time, whether through exit tickets, formative assessments, or observational data, they are positioned to make instructional adjustments that directly respond to current student needs. This immediacy transforms data from a compliance tool into a mechanism for supporting research-based best practices, including

targeted small-group instruction, feedback to students, and scaffolded practice, which are essential for addressing COVID-related learning loss.

Grounded in constructivist learning theory and organized through the 4 P's Framework, this research underscores that data use is most impactful when it is embedded within a culture of shared learning and reflection among teachers and leaders. Policies and practices that prioritize flexible, collaborative inquiry, and teacher agency enable instructional leaders to foster a climate where data informs rather than dictates, empowering educators to act on data to change student learning.

Moving forward, schools seeking to address unfinished learning could consider how to use data not only as a measure of accountability but as a formative tool for continuous instructional improvement. The more immediate and responsive the data practices, the more likely interventions will address the most pressing learning gaps and advance equity. By investing in people, policies, practices, and patterns that sustain effective data use, schools can leverage data as a catalyst for instructional transformation, working towards a world where every student has the opportunity to recover from and thrive in the post-pandemic educational landscape.

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Appendices

Appendix A: Oral Consent to Participate in Research

University of Oklahoma

Would you like to be involved in research at the University of Oklahoma? I am Tera Carr from the Education Administration, Curriculum, and Supervision Department, and I invite you to participate in my research entitled Addressing Math Learning Loss in Low-Income Middle Schools. This research is being conducted at the University of Oklahoma. You were selected as a possible participant because you support math teachers and have been identified as using data practices. You must be at least 18 years of age to participate in this research.

Please read this document and contact me to ask any questions you may have BEFORE agreeing to participate in my research.

What is the purpose of this research? This research aims to understand how data-informed practices are viewed by math instructional leaders in the wake of COVID-19.

How many participants will be in this research? About 30 math instructional leaders (lead teachers, coaches, principals) will take part in this research.

What will I be asked to do? If you agree to be in this research, you will be asked to complete one in-person interview lasting 45-60 minutes that will be audio recorded for qualitative analysis. After the research is complete, you will have the opportunity to provide any final feedback.

How long will this take? Your participation will take 45-60 minutes.

What are the risks and benefits if I participate? There are minimal risks and no benefits from being in this research.

RISK STATEMENTS:

Audio or video recorded data collection: There is a minimal risk of accidental data release if we collect your data using audio recordings. If this occurred, your identity and statements you made would become known to people who are not on the research team. To minimize this risk, the researchers will transfer data to, and store your data on, a secure platform approved by the University's Information Technology Office.

Collection of demographic or geographic location data that could lead to deductive re-identification: You will be asked to provide demographic information that describes you. We may also gather information about your geographic location in this research. Different combinations of personal and geographic information may make it possible for your identity to be guessed by someone who was given, or gained access, to our research records. To minimize the risk of deductive re-identification, we will not combine identifying variables nor analyze and report results for small groups of people with specific demographic characteristics.

What are the benefits if I participate? There are no direct benefits for participating in this research.

Will I be compensated for participating? You will receive a $10 coffee gift card for participation in this research as a thank you for your time.

Who will see my information? There will be no information in research reports that will make it possible to identify you. Research records will be stored securely, and only approved researchers and the OU Institutional Review Board will have access to the records.

You have the right to access the research data that has been collected about you as a part of this research. However, you may not access this information until the entire research has finished and you consent to this temporary restriction.

Do I have to participate? No. If you do not participate, you will not be penalized or lose benefits or services unrelated to the research. If you decide to participate, you don't have to answer any questions and can stop participating at any time.

What will happen to my data in the future? We will not share your data or use it in future research.

Audio Recording of Research Activities To assist with accurate recording of your responses, interviews may be recorded on an audio recording device. You have the right to refuse to allow such recording without penalty.

I consent to audio recording. ___Yes ___ No

Who do I contact with questions, concerns, or complaints? If you have questions, concerns, or complaints about the research or have experienced a research-related injury, contact me at 405-459-0080 or at tera.j.carr-1@ou.edu. My faculty advisor, Dr. Ford, can be reached at 918-660-3000 or at tgford@ou.edu.You can also contact the University of Oklahoma – Norman Campus Institutional Review Board (OU-NC IRB) at 405-325-8110 or irb@ou.edu if you have questions about your rights as a research participant, concerns, or complaints about the research and wish to talk to someone other than the researcher or if you cannot reach the researcher.

I will be asking some questions to find out how you want me to report your ideas. You can refuse any that you do not like without any penalty.

Do you agree for data records to include identifiable information? ___Yes ___ No

Do you agree to being quoted directly, without the use of your name? ___ Yes ___ No

Do you consent to audio recording? ___ Yes___ No

Finally, would you like a printed or electronic copy of the information we have just reviewed? _____ (note response)

Date of interview: _____

Name of Interviewee: _____

Mailing or Email address for electronic consent copy: _____

Name of Researcher and Date of the Consent Process: _____

Signature of the Researcher: _____

Appendix B: Interview Protocol

Semi-Structured Interview Protocol

Warm-Up

1. Please tell me about your experience as an instructional leader.
    a. How has data played a role in your work?

People

2. Has COVID-19 changed your work as an instructional leader?
    a. If so, how?
    b. How do you see pandemic-related learning disruptions playing out in the future?
3. How would you describe the role of teachers and leaders in using data to support student learning?
    a. Have these roles changed since before the pandemic?
    b. Have there been any changes in the types of support needed for data use?

Policy

4. How would you describe the rules and expectations around data use in your school, district, or state?
    a. Have you noticed any differences compared to before the pandemic?
    b. Have you had to adjust how you use resources in the post-pandemic education context? If so, how?

Practices

5. How do you work with the teachers you lead?
    a. What role does data play in your work with teachers?

b. How does your current work with teachers compare to your work with teachers prior to the pandemic?

c. Are there any data tools or strategies you've found to be particularly useful?

Patterns

6. Can you share a recent example of a school-wide effort that used data to improve student learning?

    a. What were similar efforts like before the pandemic?

    b. Are there any similarities or differences?

7. How would you describe your school's overall approach to using data?

    a. How does this compare to before the pandemic?

Closing

8. Is there anything else about how data is used at your school that you'd like to share?

Appendix Table 1A: Categories, *A Priori Codes*, Emergent Codes, and Quotes

Category	A Priori Code	Quotes
People	Roles and responsibilities in implementing data-informed practices (Datnow & Park, 2014)	"So the.. job (of leadership) is all about creating capacity, it is all about providing the tool, providing the time, providing the space for it to happen." (Participant 9)
People	School leader efficacy as it relates to supporting data use and improving student outcomes (Leithwood, 2008; Earl & Katz, 2002)	"We've been able to like grow kids so much, especially post pandemic, when their gaps are even larger. And without the data collection, we would never have been able to do that." (Participant 25) "I believe in it. Believe in data practices, because it moves the needle for kids." (Participant 5)
People	Capacity building for teachers' data literacy and instructional skills (Datnow & Hubbard, 2016)	"I find I'm doing a lot of scaffolding… and like doing the data analysis, because it wasn't just bringing interim assessments, it was also like, okay, cool. We have all of this data now. What do we do with it?" (Participant 21)
Policies	Internal data policies that support data practices (Datnow & Park, 2014)	"At my school, the expectation is that we use data. We use instructional data. It's part of our culture. It's we're constantly talking about it." (Participant 5)
Policies	External data policies that support data practices (Datnow & Park, 2014)	"The state expectations are set via (annual state exams) and the state standards. So of course, I'm interacting with them all the time." (Participant 23)
Policies	Internal data policies that hinder data practices (Datnow & Park, 2014)	"I know that district wide, it was. If you had to collect the data, it had to be

		at a specific time. It was so rigid that a lot of teachers felt the pressure you're not really taking the time to teach a quality lesson or re teach as needed." (Participant 5)
Policies	External data policies that hinder data practices (Datnow & Park, 2014)	"I've worked with the Education Policy Fellowship program in our state… about redoing how we give schools report card grades. And they did this awesome infographic. There was three schools, and they had all this information about the schools underneath it, and you'll see that there are three pretty comparable schools on paper… One was a b, one was a c, one was an F, just on paper." (Participant 13)
Policies	Resource allocation relating to time, funding, and materials for data use (Coburn & Turner, 2 011)	"We spent a lot of money sending teachers to trainings, well, all of which had, like, various forms of data use embedded within them." (Participant 14)
Practices	Collecting student data to inform instruction (Mandinach et al., 2006; Marsh et al., 2006)	"That's why data, whether it's summative data, formative assessment, whether it's just the way that they respond in the classroom, you're always collecting data on kids and listening to their responses. You're looking at their work so that you know exactly where to pinpoint and try to help close those gaps right then and there." (Participant 18)
Practices	Analysis of student data (Mandinach et al., 2006; Marsh et al., 2006)	"I think our challenge is kind of like data storytelling. Like, what is this data meaning? Not just, well, they're at 60% on this like, what does that mean? So I think it's like making it more approachable." (Participant 21)
Practices	Instructional decisions to address student learning needs (Marsh et al, 2006; Hattie, 2023).	"You have everything from like, do nows, exit tickets, checks for understanding during class itself, where you can be making like, real

		time decisions, and that's like, I think, on the teacher level of what are you doing day by day to address your students learning." (Participant 25)
Patterns	Sustained data use, including regular meetings and tools to track progress (Datnow & Park, 2014)	"You should have some data every day. How are you making a lesson plan? How are you making a lesson plan if you didn't collect anything the day before?" (Participant 6)
Patterns	Collaboration among teachers and leaders for data analysis, feedback, and reflection (Means et al., 2011; Datnow & Hubbard, 2016)	"Planning time in collaborative inquiry, in our instructional leadership team meetings, in department time meetings, we have lots of opportunities to look at data." (Participant 2) "I'm finding that I need to, like, give teachers ideas of what to respond to the data with more than ever. Like, I feel like I'm scaffolding their work like to the ninth and I don't remember having to do that." (Participant 24)
Patterns	Setting a culture of data use through modeling and upholding norms (Datnow & Park, 2014)	"I tell my teachers all the time, no one should be able to explain your data better than you. I shouldn't pick up your data and tell you your data better than you can tell the data. Own your data." (Participant 6)
Category	**Emergent Code**	**Quotes**
People	Post-pandemic staffing challenges (Hamlin et al., 2024).	"We're seeing a massive drop in the number of licensed teachers that are coming through traditional pathways. So at the time where you need, like I said, more licensed people and people that know the profession, we're not getting them when kids need it even more than before." (Participant 13)
People	Student engagement and executive functioning post-pandemic (Ghosh et al., 2020; Juvonen et al., 2021)	"Not only did it, did it kind of, you know, mess up their academic skills, but also their social skills and like, their motivation and their will to do."

		(Participant 19) “Our attendance has not recovered still. I mean, we still have kids and families that miss 50 to 70 days of instruction.” (Participant 13) “Seeing students who majority would just rather like be in front of a screen or in front of their cell phone. And so, you know, the like trying to maintain a certain level of focus in higher level, you know, work in the classroom… is difficult, and I think teachers are feeling that.” (Participant 1)
Policies	Post-covid pressure on educators (Kuhfeld et al., 2022; Lewis & Kuhfeld, 2024; Woo et al., 2022)	“For students in like, say, like, from a low income background... Education has been like the last line of defense, and now the amount of pressure that is on educators post COVID, the amount of absenteeism that we're facing in the student population, the amount of like stress and then stress induced attrition that we're seeing in the educator workforce. It's like that last line of defense is failing, and we have not sufficiently invested in keeping it in place.” (Participant 22)
Practices	Intervention and tutoring as a data-informed decision (Datnow et al, 2007; Dorn et al., 2020b; Hattie, 2023)	“That is a campus where we've been starting to, in the second half of this year do these separate kind of within the school day math groups, full students, and try to particularly kids who are behind on some grade level standards. So that was led by the principal and the assistant principal there and pulled me in too, so I get to tutor kids too, which is fun.” (Participant 20) “We don't really think that one data should ever be like, making a pretty big decision, and this big decision is just giving kids tutoring twice a week

		for 25 minutes. It's like, not even that big a decision, but we still want multiple data points to be making it." (Participant 4) "But when you only can support certain amount of students with… a certain amount of intervention time, I think we call them primary focus standards, and just making sure kids are all learning those objectives and standards is super important." (Participant 3) "And then we have intervention class… math and science do their intervention based on the exit ticket data or the quiz data, and we have trackers that they are required to put kids data in." (Participant 3) "So our math interventionist is going to take our students who are not on an IEP, um, we're going to look at their star scores and their (state test) scores… See those (students), the ones that are not meeting the standard. And then… pull the ones that we feel like we can really get up to that proficient level." (Participant 11)
Practices	Foundational math gaps (Dorn et al., 2021; Lewis & Kuhfeld, 2024; Methodology Studies – State Standards NAEP, n.d.)	"Learning loss is just really, really stark, especially in the widening of achievement gaps and yeah, it makes it hard to try new and innovative things, because people are just desperate for the old way of doing things out of a sense of safety." (Participant 9) "We knew that there were gaps before COVID, but with COVID, it just created those huge fissures, you know, in the foundations that our students are supposed to have, especially when they get to middle school." (Participant 15)

Patterns	Teacher and leader relationships in support of teacher well-being (Blair et al., 2023)	“So you have to have the relationship. You've got to build the foundation. You got to explain the why behind the coaching before you can actually get into the process… after the pandemic… you're just terrified at losing teachers. You're terrified of losing good ones. You're like, if I push this person too hard, I say no to this, they're just gonna leave. Because people are leaving like crazy.” (Participant 9)

Appendix C: IRB Approval Letter



Institutional Review Board for the Protection of Human Subjects

Approval of Initial Submission – Exempt from IRB Review – AP01

Date: March 12, 2025 **IRB#:** 18309

Principal Investigator: Tera J Carr

Approval Date: 03/12/2025

Exempt Category: 2

Study Title: Addressing Math Learning Loss in Low-Income Middle Schools: A Qualitative Study of Data-Informed Leadership

On behalf of the Institutional Review Board (IRB), I have reviewed the above-referenced research study and determined that it meets the criteria for exemption from IRB review. To view the documents approved for this submission, open this study from the *My Studies* option, go to *Submission History*, go to *Completed Submissions* tab and then click the *Details* icon.

As principal investigator of this research study, you are responsible to:

- Conduct the research study in a manner consistent with the requirements of the IRB and federal regulations 45 CFR 46.
- Request approval from the IRB prior to implementing any/all modifications as changes could affect the exempt status determination.
- Maintain accurate and complete study records for evaluation by the HRPP Quality Improvement Program and, if applicable, inspection by regulatory agencies and/or the study sponsor.
- Notify the IRB at the completion of the project.

If you have questions about this notification or using iRIS, contact the IRB @ 405-325-8110 or irb@ou.edu.

Cordially,

Aimee Franklin, Ph.D.
Chair, Institutional Review Board