Think Like a Teacher: How Reflective Educators Use Multiple Data Sources to Inform Their Practice

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THINK LIKE A TEACHER:
HOW REFLECTIVE EDUCATORS
USE MULTIPLE DATA SOURCES
TO INFORM THEIR PRACTICE

A DISSERTATION SUBMITTED TO
THE FACULTY OF THE GRADUATE SCHOOL
IN CANDIDACY FOR THE DEGREE OF
DOCTOR OF PHILOSOPHY

PROGRAM IN RESEARCH METHODOLOGY

BY

JANA GRABAREK
CHICAGO, IL
MAY 2020
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The three women who agreed to serve as cases for this dissertation humbled and inspired me. I deeply appreciate their dedication to this study amidst teachings’ many pressures and responsibilities. These educators were brave enough to reveal their practice, thoughtful enough to detail their work, and insightful enough to evaluate their and my sensemaking. I believe their work will meaningfully inform research and practice, and hope their voices shape our field. Every student deserves warm, reflective, committed, and accomplished teachers like them.

Dr. Leanne Kallemeyn is the primary reason I pursued doctoral studies at Loyola. Her persistent centering of equity in education, interest in teacher data use, and exemplary research and evaluation practice positioned her as an exceptional mentor for me. Throughout my time as her student, graduate assistant, and research partner, she has provided opportunities for me to learn, grow, work, and think in ways that are rigorous and rewarding. I thank her for her steadfast support, coaching, and confidence, and look forward to our continued collaboration.

Barron Grabarek’s love has made this years-long, life-changing transformation possible. As individual night classes turned into pursuit of a master’s degree and led to relocation for doctoral studies, he has patiently kept our family flourishing. Throughout our more than 20-year partnership, his presence, intelligence, humor, encouragement, refuge, and care have enriched every aspect of my existence. I am grateful for each day we share. I could not be Dr. Grabarek without him; I would not be this me without him. It’s his turn now.
For the women who taught me love, compassion, and perseverance, and the girl I am now teaching.
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ABSTRACT

Teacher data use has become an increasingly central feature of American education. Messages from the public policy, research, philanthropy, and professional development arenas assert that collecting, analyzing, and interpreting data—particularly number-based achievement data—will increase student achievement.

In this dissertation, a review of literature exploring the link between data use and achievement yielded mixed results. While increased achievement was slightly more likely when data use involved multiple types of data and/or data use strategies, its effectiveness was not consistently supported, and least apparent when tied to marginalized students.

To better understand what effective data use might look like at the micro level in marginalized communities, this dissertation also includes a collective case study of three urban charter school teachers with action research experience. These reflective educators routinely used multiple types of data (e.g., achievement data; student, parent, and peer input; observation of students and peers; instructional feedback; and collaboration data), as well as professional judgment (which is rooted in teachers’ education, knowledge, and experience), simultaneously to solve three primary problems of practice: building relationships with students, monitoring student progress, and informing and improving instruction. This work was shaped by assessment, context, and teacher factors. Implications for research and practice are discussed, as well as the study’s limitations.
CHAPTER ONE
INTRODUCTION

Teachers have always used data. From the days of the one-room schoolhouse through the era of virtual classrooms, teachers have considered assignments, grades, tests, and observations to gain insight into what students know and can do (Datnow, Park, & Kennedy-Lewis, 2012; Earl & Katz, 2006; Jimerson & Wayman, 2015).

In contemporary educational practice, teachers increasingly are encouraged, and even required, to base their decisions about curriculum and instruction on specific kinds of data. The modern education accountability movement, for example, calls on teachers to use standardized test results to improve outcomes for students (Jimerson & Wayman, 2015; Young, 2006).

Several scholars encourage a broader definition of data use, also known as data-driven, data-based, and data-informed decision making (e.g., Bernhardt, 2004; Coburn & Turner, 2011; Datnow et al., 2012; Gummer & Mandinach, 2015; Marsh, 2012; Spillane & Miele, 2007). From this perspective, data use includes consideration of achievement data, student demographics and behavior, organizational context, and teacher professional judgment.

The importance attached to practicing data use in some form is reflected in the extent to which it is written into federal law, incited by competitive grant programs, included in state teaching license requirements, and taught in professional development workshops around the world (Mandinach, Friedman, & Gummer, 2015; Marsh, 2012; U. S. Department of Education [USDOE], 2005, June 21a). As Datnow and Hubbard (2015) wrote, “Data use has been seen as a
A brief history of the modern education accountability movement explains the rise of data use in schools.

**A Brief History of Accountability in Education**

**A Nation at Risk**

The foundation of the modern education accountability movement is in the pages of a report released in 1983. “A Nation at Risk” (National Commission on Excellence in Education [NCEE], 1983) was written during the first Reagan administration, and its purpose was to report on the quality of education in America (USDOE, 1999, October 7b). Citing poor achievement on standardized tests, a lack of higher order skills, and increased need for college remediation, “A Nation at Risk” warned that current educational practice and policy were rendering students less capable than their parents for the first time in the country’s history (USDOE, 1999, October 7a). In response to that threat the Commission recommended development of more rigorous and measurable standards across all levels of education (USDOE, 1999, October 7c). Should this and other recommendations be followed, the Commission believed America could recapture its educational and economic strength.

**Standards and Assessments**

The call for higher standards in “A Nation at Risk” was heeded. During the next four presidential administrations, a variety of initiatives and policies urged and legally required the development of new academic standards and standards-aligned assessments. America 2000, Goals 2000, the No Child Left Behind Act, Common Core State Standards, and the Every Student Succeeds Act all shaped the modern education accountability movement by asserting that implementation of standards could influence student outcomes, and that standard attainment
could be measured with student assessments. Calls for standards and aligned assessments began as suggestions, became mandates, and significantly influenced education culture and practice.

**America 2000.** America 2000 was a long-term national education strategy developed by the first President Bush and state governors (USDOE, 1991). The strategy encouraged creation of “World Class Standards” in English, mathematics, science, history, and geography to be measured by voluntary American Achievement Tests.

**Goals 2000.** Funding to create standards and assessments came during the next administration. Goals 2000 was codified as the Educate America Act during the Clinton administration (USDOE, 2018a). It was billed as a national framework for education reform and aimed to create and monitor voluntary national content, student performance, and opportunity-to-learn standards (USDOE, 2018b) and standards-aligned assessments. States wishing to receive funds under this act were encouraged to detail processes for developing and adopting standards and assessments in their applications (USDOE, 2018e).

**No Child Left Behind.** Enactment of the No Child Left Behind Act of 2001 (NCLB) essentially marked the end of voluntary standards and assessments. NCLB required states to demonstrate adoption of challenging content and achievement standards for all students in math, reading or language arts, and science, and implementation of standards-aligned assessments (USDOE, 2004, September 15; USDOE, 2015, June 21b). Failure to do so would disqualify states from receiving any of the more than $1 trillion appropriated for local education agency grants in fiscal years 2002-2007.

**Common Core State Standards.** After years of NCLB implementation, it became clear that states allowed to set their own standards and definitions of proficiency were measuring success quite differently (Common Core State Standards Initiative, 2018; Duncan, 2009, June 8).
In order to ensure expectations for all of the nation’s children were similarly high, a push for common, internationally-benchmarked standards came to the fore. The Common Core State Standards (CCSS) in English language arts and mathematics were released in 2010. States adopting CCSS, and belonging to two consortia developing CCSS-aligned assessments, were better positioned to receive government funding during grant competitions such as the American Recovery and Reinvestment Act and Race to the Top (USDOE, 2009).

**Interim assessments.** Because success on annual assessments became a prerequisite for maintaining a school’s autonomy and funding (USDOE, 2005, June 21b), states and districts sought methods to monitor student progress throughout the year and predict end-of-year performance (Datnow & Hubbard, 2015). Interim or benchmark assessments are administered at regular intervals to allow schools to react to areas of concern before the high-stakes administration of state tests (Faria et al., 2012). Today, many students participate in frequent testing as part of the modern accountability movement.

**Every Student Succeeds Act.** In response to that frequent testing, and other unintended consequences, steps have recently been taken to create “fewer, better, and fairer tests” (USDOE, 2017, p. 1) and provide states with some flexibility in their accountability efforts. The Every Student Succeeds Act, passed in 2015, encourages states to explore alternative testing strategies, such as utilizing single tests for multiple accountability purposes, introducing universal design into assessments, and providing assessments in students’ native languages (USDOE, 2017). Still, states must test students in reading, math, and science annually in most instances, as well as assess English language proficiency.
Accountability as Standards and Assessments

With clear expectations for standards and assessments in place, the meaning and operationalization of accountability in education shifted in the modern era. Prior to the federal initiatives mentioned above, education quality and effectiveness primarily were measured by student grades, completion rates, and career and college participation. Teachers, relying on their personal knowledge and experience, bore a large amount of responsibility for reporting outcomes (Earl & Katz, 2006). Research regarding teacher bias problematized that situation and contributed to a shift toward standardized, external assessment of school and student success.

The No Child Left Behind Act was most responsible for operationalizing accountability as the use of standards and assessments. In addition to requiring states to adopt standards and annually test students, it required establishment of measurable education objectives and demonstration of adequate yearly progress (AYP) toward those objectives (USDOE, 2005, June 21b). Teachers were expected to consider test results during their educational decision making, and states and schools were to publish annual report cards detailing student and school outcomes. Those not meeting objectives and expectations were to craft improvement plans rooted in achievement data. NCLB codified a movement to attach leader, teacher, and school success with measures of student achievement (Coburn & Talbert, 2006; Jimerson, 2013; Kerr et al., 2006; Means, Padilla, DeBarger, & Bakia, 2009; Young & Kim, 2010).

The Impact of Accountability as Data Use

During this shift toward standardized, external assessment of student and school performance, use of standardized test scores to identify strengths and weaknesses in achievement, instruction, and/or curriculum became known as data use in education. Data use “carrots and sticks” have changed how we do school (Cho & Wayman, 2014; Coburn & Talbert,
Standardized tests became “high stakes,” meaning that failure to score at proficient or above on these assessments carried significant consequences (Kerr et al., 2006). Failing students could be prevented from rising to the next grade level or graduating high school (National Conference of State Legislators, 2018, January 2). Teachers whose students did not perform well may not receive tenure or raises, or could be fired (Jennings & Pallas, 2016). Schools not meeting AYP could lose funding, be restructured, or even close (USDOE, 2005, June 21b).

Because quantifiable data, rather than teacher knowledge and experience, are now expected to be used to make educational decisions and improve student outcomes, school practice and organizational routines have been updated (Little, 2012; Coburn & Turner, 2011). Testing is a much more prominent feature of schooling than it was, generating more hard data than ever before (Earl & Katz, 2006). Teachers are invited or required to participate in data teams with fellow teachers, administrators, and others to collectively discuss and interpret student test results and other records (Little, 2012). Data walls breaking down student achievement by grade, proficiency level, and other student subgroups adorn staff rooms. New professional roles like data coach are present among school staff rosters. Overall, education today is assumed to be a data-driven field which privileges evidence- and scientifically-based decision making (Earl & Katz, 2006). Numbers and test data are now central in school practice (Wayman & Jimerson, 2014).

Exploring the Effectiveness of Data Use

In this climate, resistance to data use exists. While government agencies and district offices (see, for example, Steiner, 2005) use test scores consistently for accountability purposes, teacher buy-in and data use are less common (Cho & Wayman, 2014; Datnow & Hubbard, 2015;
Datnow & Hubbard, 2016; Datnow et al., 2012; Farrell & Marsh, 2016; Hoogland et al., 2016; Ingram, Louis, & Schroeder, 2004; Jimerson, 2013; Little, 2012; Marsh, 2012; Means et al., 2009; Means, Padilla, & Gallagher, 2010; Rinke & Stebick, 2013; Schildkamp, Poortman, & Handelzalts, 2016; Spillane & Miele, 2007; Timperley, 2008; Wasta, 2017; West et al., 2016; Young & Kim, 2010).

In my own work evaluating teacher professional development programs with data use components, I have observed teachers turning away from data and struggling to analyze and apply it. I was curious whether data use was reaching its ultimate goal of increased student achievement. The results of a literature review exploring the relationship between data use and student achievement are included in Chapter 2. As you will read, the results could be categorized as equivocal, but make two important suggestions: data use is more effective when it involves multiple kinds of data and/or multiple data use strategies, and data use is less effective when practiced by teachers serving low-income and/or minority students in urban or rural settings.

**Detailing Comprehensive Data Use with Marginalized Students**

These findings prompted me to design a collective, instrumental case study closely examining the data use practices of reflective teachers serving marginalized students. See Appendix A for a detailed account of the study design. In this work, I adopted a broad definition of data use. Here, data use includes consideration of achievement data, student demographics and behavior, organizational context, and teacher professional judgment. Given the shifts in education accountability detailed above, I was particularly interested in understanding the role of professional judgment (i.e., teachers’ knowledge and experience gained through education, training, observation, and dialogue) in data use. My research question and sub-questions were:
• How do teachers with data use expertise make sense of data sources to inform their curricular and instructional decisions?
  
  o What kinds of data do teachers rely on to solve a variety of educational challenges?
  
  and
  
  o How do teachers balance the use of professional judgment with the use of other data sources?

My goals were to better understand what effective, comprehensive data use looks like, and to share detailed examples of teacher practice with the field.

Chapter 3 introduces readers to the teachers who participated in my study. Chapters 4-6 dig into the ways they used multiple kinds of data to solve important problems of practice. These teachers primarily used data to build relationships, monitor student progress, and inform and improve their instruction. They harnessed a wide variety of data types—including achievement data, observations of students and peers, student and peer and parent input, instructional feedback and coaching, peer collaboration, and professional judgment—to accomplish these tasks, often combining data sources in their work. Chapter 7 draws conclusions from the data collected and suggests implications for future data use research and practice.

**Researcher as Instrument**

Because I believe who I am colors the work I have done, I close this introduction by briefly summarizing my experiences and beliefs related to education, decision making, data use, and credible evidence. I hope that doing so helps readers become familiar with the subjectivities that influenced my interpretations.
Education

I decided to become a teacher when I was three years old. From preschool to graduate school, the classroom has been the place where I’ve felt most at home. Learning is my passion and I believe participating in higher education radically altered my life’s path. Consequently, I greatly respect and admire teachers, and still wish I could have joined their ranks. While training as a secondary English education major, however, I learned that teachers are better able to tolerate arbitrary rules and regulations, and better equipped to respond to myriad personalities, abilities, and ways of knowing, than I may ever be. So, rather than become a teacher myself, I now aim to be a teacher ally, working with educators to evaluate, explore, and improve their practice for both teacher and student benefit. Working with study participants strengthened my esteem for teachers and my desire to support and celebrate them.

Data for Decision Making

In relation to the pragmatic components of my worldview, I am a proponent of mixed-methods investigation. Coursework in methodology and experience in study design lead me to contend that quantitative data can help answer “whether” and “if” questions, while qualitative data tell us “why” and “how.” Before embarking on this study I was not confident this assumption would be shared by teachers, and looked forward to learning whether it could be translated into practice. This was important to me because I believe we must draw from multiple types of data in order to fully understand a research topic and make the best decisions possible.

I remain open, however, to the idea that some people are capable of operating effectively while drawing from practical wisdom. Practical wisdom enables us to make the right choice in a particular situation by drawing on our experiences, empathy, and intellect (Schwartz & Sharpe, 2010). For those who possess practical wisdom, good decision making may occur without
explicit consideration of a variety of data sources because they 1) have developed practical wisdom as a result of repeated, prolonged engagement with a multitude of data sources in a variety of contexts, and/or 2) possess an exceptional understanding of their current context. I am skeptical that anyone relying solely on quantitative data is well-equipped to make effective decisions in complex fields such as education.

After conducting this study, I am convinced some teachers operate like mixed-methods researchers while making educational decisions. Even when relying on practical wisdom or professional judgment, participants often revealed the multi-faceted, evidence-based origins of their moves. They also demonstrated a tendency to use multiple kinds of information simultaneously, although I did learn that single data types and sources could help teachers answer important questions effectively in some circumstances.

**Data Use**

My thoughts about decision making inform my data use beliefs. I find data use, as defined in the current accountability climate, to be insufficient grounds for effective educational decision making. I believe teachers are right to draw from not only achievement data, but also student data, organizational context, and professional judgment to make decisions. In doing so, they are considering a variety of quantitative and qualitative data to inform their practice. For me, this represents comprehensive data use capable of making change. Participating teachers convinced me this kind of data use is possible and productive.

**Credible Evidence**

It is likely clear that I value both quantitative and qualitative data. While researchers largely share that stance today, it seems the field of education has become smitten with numbers alone. By conducting a study that celebrates and disseminates what comprehensive data use
looks like, I hope to contribute to the professionalization of teachers and the democratization of educational decision making (Greene, 2009). If the conceptualization of data use could be expanded, perhaps teachers drawing from a variety of data sources would be treated as knowledgeable experts in their field. If that happened, perhaps different ways of knowing—including qualitative ways of knowing stemming from teacher professional judgment—would be acknowledged and accepted as credible, thereby diversifying the kinds of data sanctioned to inform education planning, practice, and policy.

Participants in this study repeatedly revealed how they drew from a variety of data sources and their professional judgment to respond to student needs and inform their practice. I believe teachers like this should be applauded, lauded, and heard. For me, their work demonstrates the appropriateness and potential of incorporating qualitative evidence in teacher data use. These are not educators shooting from the hip or going with their gut. These are thoughtful, accomplished professionals who work diligently in a complex field to harness all sorts of data in support of students.

As you read more about this work, I think it’s important to remember that it was inspired by my admiration of teachers, skepticism of narrow data use and decision making, and a desire to help educators translate all kinds of data into productive action for all students.
CHAPTER TWO

DOES TEACHER DATA USE
LEAD TO IMPROVED STUDENT ACHIEVEMENT?

A REVIEW OF THE EMPIRICAL EVIDENCE

Teachers have always used data. From the days of the one-room schoolhouse, they have looked to assignments, grades, and test results to gain insight into what students have learned and can do (Jimerson & Wayman, 2015). In contemporary educational practice, teachers are encouraged, or even required, to base their decisions about curriculum and instruction on data. For many, data use (also referred to as data-based decision making, data-driven decision making, and data-informed decision making) refers to utilizing standardized test results to inform their practice (Datnow & Hubbard, 2015). For others, it involves integrating achievement data, student demographics and behavioral information, content and pedagogical knowledge, instructional feedback, organizational context information, peer input, and professional judgment in response to student needs (Bernhardt, 2004; Gummer & Mandinach, 2015; Ikemoto & Marsh, 2007; Spillane & Miele, 2007).

Regardless of one’s definition of data use, teachers’ collection, analysis, interpretation, and application of data is expected as part of continuous improvement efforts (Datnow, Park, & Kennedy-Lewis, 2012; Hamilton et al., 2009). The importance attached to practicing data use in some form is reflected in the extent to which it is written into federal law, incited by competitive grant programs, included in state teaching license requirements, and taught in professional
development workshops around the world (Mandinach, Friedman, & Gummer, 2015; Marsh, 2012; U. S. Department of Education, 2005, June 21). As Datnow and Hubbard (2015) wrote, “Data use has been seen as a panacea for school improvement” (p. 2).

As data use practice has proliferated, so, too, has data use scholarship. Reviews of the amassed literature have provided frameworks for thinking about, implementing, and practicing data use (Coburn & Turner, 2011; Gummer & Mandinach, 2015); identified factors and practices that facilitate and inhibit data use success (Gerzon, 2015; Hamilton et al., 2009; Hoogland et al., 2016; Schildkamp & Poortman, 2015), including a description of teachers’ data use beliefs, knowledge, and attitudes (Datnow & Hubbard, 2016); detailed teachers’ data use practices (Datnow & Hubbard, 2015); and described common data use intervention components and approaches (Marsh, 2012). Missing from current literature is a review of data use outcomes. Data use frameworks and theories of change commonly claim that engagement in data use cycles will lead to targeted and innovative instruction which, in turn, will improve student achievement (Coburn & Turner, 2011; Datnow et al., 2012; Mandinach & Jimerson, 2016; Marsh, 2012; Schildkamp & Poortman, 2015). The purposes of this review are to explore the results from studies linking teacher data use to student achievement evidence, and then to discuss possible explanations for these results. Before doing so, we revisit extant data use literature reviews.

**Literature Review**

Based on theory and research, Coburn and Turner (2011) proposed a framework for data use. Its enduring influence is revealed in the extensive and continued application of its elements as organizing structures in subsequent scholarship. This framework is comprised of four components: processes of data use, organizational and political contexts, interventions to promote data use, and potential outcomes.
Central to the framework are the processes of data use, which refer to how teachers and groups within schools interact with data individually and interpersonally (Coburn & Turner, 2011). Borrowing from social and cognitive psychology, the authors explain that these interactions involve noticing, interpreting, and constructing implications from data, and are influenced by individuals’ knowledge, beliefs, and motivations. The next central elements are organizational and political contexts, which shape how teachers and groups interact with data. Elements that influence these contexts include organizational routines to support data use, time to engage in data use, access to data, organizational norms, leadership, and relations of power and authority.

Data use interventions are noted as potential influences on contexts and processes (Coburn & Turner, 2011). Interventions include comprehensive reform efforts and tools to support data use, such as technology systems and protocols. These tools are often paired with professional development and/or accountability policies. Finally, Coburn and Turner (2011) identified potential outcomes for data use, including organizational changes, changes to teachers’ practices, and student learning. Several data use literature reviews explore elements of Coburn and Turner’s framework in more depth. The next sections highlight what we have learned from research regarding these elements in the framework as related to teachers.

**Processes of Data Use**

Data use literature reviews have pointed to individual-level factors and practices that affect data use. Coburn and Turner’s (2011) framework posited that knowledge, beliefs, and motivations influence actors’ data use sensemaking. Other authors also touched on the general importance of attitudes, knowledge, and skills, while calling attention to specific areas of impact. Marsh (2012) stressed that the interpersonal trust between teachers and administrators influences
openness toward data use. Schildkamp & Poortman (2015) and Hoogland et al. (2016) noted that collaborative capabilities could affect data use practice. Two groups of authors took particularly deep dives into the influence of knowledge, skills, and beliefs. Gummer and Mandinach (2015) developed a framework for teacher data literacy, and Datnow and Hubbard (2016) reviewed the literature to summarize data use capacity and beliefs.

Gummer and Mandinach’s (2015) evolving framework of teacher data literacy suggested educators must grasp a variety of knowledge domains, inquiry cycle components, and elements of knowledge and skill in order to use data well. Beyond content, curriculum, and pedagogical knowledge, Mandinach and Gummer (2016) proposed teachers also must understand how students think and act, education’s purposes and values, and educational contexts. Additionally, teachers must be able to engage in iterative inquiry cycles (i.e., identify problems and frame questions, use data, transform data into information and then into decisions, and evaluate outcomes). The authors posited that data literacy is influenced by teacher attitudes, beliefs, and worldviews, while detailing roughly 60 skills that support data literacy.

Datnow and Hubbard (2016) focused specifically on teachers’ capacity for and beliefs about data use. Although schools in the studies they reviewed often provided collaboration time and tools for data use, as well as coaching, training, and leadership, the teachers involved were not consistently prepared to engage in data use effectively. In addition to lacking knowledge and skills, they also often lacked confidence in their data use abilities, did not buy into the idea of data use, and worried their data would be used against them. These observations regarding individual-level factors influencing data use further illuminate the complexity of the endeavor.

Aware of the contextual and individual influences at play, Datnow and Hubbard (2015) set out to describe teachers’ data use efforts in real life. They found that contextual factors led to
heavy use of benchmark assessment data to the exclusion of other data types, while both contextual and individual-level factors shaped data use practice. Leadership, lack of training, data use agendas, data characteristics, and teacher knowledge, skills, and beliefs all led to variety in data use practice. For example, although teachers had been introduced to a common, cyclical process for data use, Datnow and Hubbard noted that actual practice did not mirror the model. Teachers analyzed data less than they collected it. They could identify patterns in achievement, but struggled to disaggregate data and move beyond measures of central tendency. Interpretation, when it did occur, included identification of student weaknesses; however, interpretation more often did not occur, was superficial in nature, or equated to misinterpretation. Evidence of data use application was more abundant: teachers allowed data to inform their instruction (e.g, through reteaching, remediation, student grouping, pacing, and differentiation), as well as facilitate collaboration with others, feedback to students and parents, and personal reflection. Still, teachers often did not apply data use findings to their instruction, or even misused data. Examples of misuse included narrowing the curriculum to emphasize test-taking strategies, focusing attention on struggling and “bubble” students, and using data inappropriately to make high-stakes placement or promotion decisions.

**Organizational and Political Context**

In addition to Datnow and Hubbard (2015), other scholars have addressed contextual influences on data use, and recommendations for best practices have been extensive. Hamilton et al. (2009) published an IES practice guide detailing five recommendations for using student achievement data in instructional decision making. They suggested school systems establish a clear vision for data use through policies, plans, leadership, and routines; provide human, structural, and training supports to cultivate a data-driven culture; create and maintain data
systems; engage students in data use and goal setting; and embed data use in continuous improvement cycles.

Marsh (2012) echoed some of Hamilton et al.’s (2009) calls, while identifying additional best practices and warning against several data use challenges. In her review of data use interventions, she recommended making data usable and safe, and facilitating both horizontal and vertical collaboration during data use endeavors. She also suggested schools and systems work to provide a mix of specific and generic data use guidance, strive for a balance between accountability pressures and incentives, and find ways to sustain their data use supports.

Gerzon’s (2015) work built upon existing advice. Her culture of data use framework research surfaced the communication of data use expectations, the use of data systems, and availability of data use resources, assistance, professional development, and leadership as key characteristics of successful data use environments. She shed light on the importance of schools and districts working together to instill data use culture and capacity. In a piece focused on factors influencing the work of data teams, Schildkamp & Poortman (2015) discussed the importance of data characteristics and school organizational characteristics in ways similar to other data use literature reviewers.

Hoogland et al. (2016) then pulled the work of all other reviews together to identify prerequisites for successful data use: teacher factors, including collaboration, knowledge, skills, and beliefs; assessment factors, including the types of data, tools, and systems available to teachers; and context factors, including leadership, culture, the use of time and resources, professional development, and other factors external to schools. Collectively, these works provide rich description of the many contextual factors that shape data use implementation, processes, and outcomes.
**Interventions Promoting Data Use**

Practitioners and scholars have also developed and studied interventions that shape processes of data use and organizational and political contexts. Marsh’s (2012) review of data use interventions addressed their designs, implementation, facilitators and barriers, and effects. She reported that most data use interventions incorporated human and technological supports, data production, accountability and incentives, and norms and expectations. The data used in these interventions consisted mainly of student performance data from English language arts, math, and science. The most successful interventions were led by highly capable interveners and organizers, were comprehensive in nature, and targeted multiple leverage points (e.g., by providing access to data, as well as data use professional development). When discussing the effects of data use interventions, Marsh noted that most findings related to changes in teacher attitudes and behavior, rather than student achievement.

Although Marsh’s (2012) review began to address the relationship between teacher data use and its intended outcomes, there is no comprehensive discussion of data use’s impact. In contrast to the other elements of Coburn and Turner’s (2011) framework, potential outcomes of data use have yet to warrant their own review of the data use literature; thus, the focus of this work is to explore evidence of the relationship between data use and student achievement. Other outcomes of data use, such as changes to organizations or teacher practices, are not the focus of this review.

**Systematic Review Process**

To begin this work, several electronic databases (i.e., Academic Search Complete, eBook Collection, Education Index Retrospective: 1929-1983, Education Research Complete, Educational Administration Abstracts, ERIC, OmniFile Full Text Select, Professional
Development Collection, and Teacher Reference Center) were searched using the keywords “teacher”, “data use”, “data-based decision making”, “data-driven decision making”, and “student achievement”. The empirical, peer-reviewed journal articles and reports located during these searches, as well as the data use literature reviews noted above, pointed to additional resources in their references. When work was mentioned but not published, or otherwise publicly available, authors were contacted directly for access to their findings.

The abstracts of nearly 200 studies were reviewed for relevance; studies were excluded if they did not directly address teachers’ data use and its relationship to student achievement (e.g., if they focused on student use of their own data, school administrator data use, and/or data use’s relationship with other outcomes). Ultimately, 27 total sources informed this literature review.

**About the Sources**

The sources reviewed to examine the relationship between data use and student achievement typically were peer-reviewed journal articles ($n=13$) or reports from government agencies or independent research institutions ($n=12$). One conference paper and one book chapter also were reviewed. The data use discussed occurred at the K-12 level, most often in the United States, but with some studies from the Netherlands, New Zealand, and Wales. Results from charter school efforts are included in the review. Many studies adopted the narrow definition of data as standardized test scores, but others embraced a more comprehensive data definition, such as by examining the impact of the use of instructional feedback as data. Data use often occurred as part of a targeted data use intervention in these studies, or as part of a broader intervention with a data use component. Some of the studies reviewed included discussion of the same intervention by different authors and/or at different points in time. Details of each study were recorded, including the involved sample and its demographics; study
location, length, design, and measures; school subject foci (e.g., math and reading); the nature of
the data use intervention examined, type(s) of data used, and type(s) of data strategies employed;
school levels involved; and findings/results. See Table 1 for a full list.

The Relationship between Data Use and Student Achievement

Findings from these 27 studies exploring the relationship between teacher data use and
student achievement are mixed (see Table 1), with no clear indication that using data improves
student outcomes. This fact holds true when considering all the studies, and when filtering
studies by a variety of relevant characteristics.

Overall Results

Many studies reviewed reported a mix of both positive and null relationships, as authors
often shared results from overall and sub-analyses. Of the 27 studies reviewed, 20 reported
positive relationships between data use and student achievement; 16 of those relationships were
statistically significant. Twenty-one of the studies reported no relationship between data use and
student achievement. Of these null results, most demonstrated positive trends, although a few
had negative trends. Only three studies reported negative relationships between data use and
student achievement, with two of those findings labeled statistically significant. Based on these
mixed results, it may be asserted at best that data use does not usually lower student
achievement.
**Table 1. Summary of Empirical Evidence of the Relationship between Data Use and Student Achievement**

<table>
<thead>
<tr>
<th>Study</th>
<th>Nature of Data Use</th>
<th>Student Characteristics</th>
<th>School Level(s)</th>
<th>Subject(s)</th>
<th>Study Characteristics</th>
<th>Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anderson, Leithwood, &amp; Strauss, 2010</td>
<td>No particular intervention studied</td>
<td>Not provided</td>
<td>Elem</td>
<td>Reading</td>
<td>Mixed methods investigation utilizing stratified random sampling; examined relationships between data use and student achievement; collected principal and teacher surveys, qualitative evidence, and test scores from more than 100 schools in nine states; more than two years of achievement data considered</td>
<td>No overall statistically significant relationship between data use and achievement; positive relationship between data use and achievement at elementary schools alone; qualitative findings indicated that data use moving beyond identification of problem areas to investigation of the factors contributing to a problem is more likely to have a positive effect</td>
</tr>
<tr>
<td>Carlson, Borman, &amp; Robinson, 2011</td>
<td>Data-driven reform initiative including quarterly benchmark assessments; training on interpreting and using data to guide reform; detailed reviews of test data, questionnaires, and progress indicators; and help selecting and implementing evidence-based interventions</td>
<td>Students varied in socioeconomic status and race/ethnicity, and lived in a variety of settings</td>
<td>Elem</td>
<td>Reading</td>
<td>District-level random block assigned study collecting benchmark and state test scores after one year from more than 500 low performing schools in seven geographically diverse states</td>
<td>Statistically significant difference in math scores between treatment and control groups; no difference in reading scores</td>
</tr>
</tbody>
</table>
| Cordray, Pion, Brandt, Molefe, & Toby, 2012| Implementation of MAP benchmark tests                                             | Predominantly white, low-income, and African American students in urban and suburban settings | Elem            | Reading    | Random control trial analyzing state and interim test scores from nearly 4,000 students using hierarchical linear modeling after two years of implementation | No statistically significant impact on reading achievement in Grade 4 or 5 │
<table>
<thead>
<tr>
<th>Study</th>
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<tbody>
<tr>
<td>Datnow, Park, &amp; Wolhstrom, 2007</td>
<td>Districts identified as data use leaders invested in professional development; provided support in using, modeling, and discussing data; scheduled time for collaboration; connected teachers across schools to share strategies; crafted specific, measurable goals and system-wide curricula; cultivated a culture of data use and continuous improvement; implemented information management systems; assigned personnel to data use roles; provided timely and accessible data of different types (e.g., interim assessment, achievement, instructional practice, and goal implementation data); and supplied tools, processes, protocols, reports, and feedback to teachers so that they may act on data</td>
<td>Large numbers of low-income students of color residing in four geographically diverse states</td>
<td>Elem Middle High</td>
<td>Reading Writing Math</td>
<td>Case study investigating how high-performing school systems use data to improve instruction; collected qualitative and test score data during one school year</td>
<td>Mixed (positive, neutral, and negative) levels of achievement in comparison to state and district peers</td>
</tr>
<tr>
<td>Faria et al., 2012</td>
<td>Interim assessment use for at least three years</td>
<td>Predominantly low-income, Hispanic, and white students residing in four geographically distinct urban districts</td>
<td>Elem Middle</td>
<td>Read Math</td>
<td>Quasi-experimental correlational study utilizing stratified random sampling; collected principal and teacher surveys, qualitative data, and test scores from more than 60,000 students</td>
<td>No overall relationship between interim assessment implementation and student achievement; positive relationship between teacher data use and middle school math and elementary reading; positive relationship between principal data use and middle school math</td>
</tr>
<tr>
<td>Faria, Greenberg, Meakin, Bichay, &amp; Heppen, 2014</td>
<td>Use of data dashboard including student interim assessment scores, attendance data, behavior data, grades, credits, prior achievement, contact information, and background characteristics</td>
<td>Hispanic and white students residing in five districts in a southern state</td>
<td>Elem Middle High</td>
<td>Reading Math</td>
<td>Multilevel correlational study collecting teacher surveys and test scores from more than 40,000 students after one year</td>
<td>No overall relationship between teacher dashboard use and student achievement; positive relationship for two districts in high school math; negative relationship between level of dashboard use and student achievement in high school reading and math; negative relationship between level of teacher experience and achievement in high school math</td>
</tr>
<tr>
<td>Feldman &amp; Tung, 2001</td>
<td>Data-based inquiry and decision making rooted in an inquiry group process</td>
<td>Predominantly white, middle class students</td>
<td>Elem Middle High</td>
<td>Math</td>
<td>Case study collecting qualitative information for one year</td>
<td>Math failure rate much lower at one school with successful implementation</td>
</tr>
<tr>
<td>Study</td>
<td>Nature of Data Use</td>
<td>Student Characteristics</td>
<td>School Level(s)</td>
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<tr>
<td>Fuchs, Fuchs, Karns, Hamlett, &amp; Katzaroff, 1999</td>
<td>Use of performance assessments; treatment group teachers attended training, administered three performance assessments over several months, met with colleagues to score the assessments and share ideas for instruction and providing student feedback, and received technical assistance</td>
<td>Mostly white students, some from low-income households, in one urban district</td>
<td>Elem</td>
<td>Math</td>
<td>Study employed stratified random assignment by grade and collected teacher questionnaires and assessment scores after one year of implementation</td>
<td>Statistically significant difference in scores between treatment and control groups; stronger relationships for students performing above grade level than students performing at or below grade level</td>
</tr>
<tr>
<td>Henderson, Petrosino, Guckenburg, &amp; Hamilton, 2007; 2008</td>
<td>Implementation of quarterly benchmark assessments</td>
<td>Predominantly low-income, white, and Hispanic students in suburban areas</td>
<td>Middle</td>
<td>Math</td>
<td>Quasi-experimental, interrupted time series design with a matched comparison group; collected test scores from 66 schools after one year of implementation</td>
<td>No significant difference in scores</td>
</tr>
<tr>
<td>Herman, Yamashiro, Lefowitz, &amp; Trusela, 2008</td>
<td>Schools with higher-than-average student growth and comparison sites all were found to use data in the following ways: meeting collaboratively, using indicators to support planning, and using data to make school-wide goals; types of data used included curriculum-based assessments, student portfolios, and teacher-created assessments</td>
<td>Predominantly low-income, minority students residing in an urban district</td>
<td>Elem</td>
<td>Reading, Math</td>
<td>Mixed methods case study collecting qualitative data, district surveys, school transformation plans, and seven years of test scores for nearly 4,000 students</td>
<td>No substantial link between data use and achievement</td>
</tr>
<tr>
<td>Kallmeyn, 2014</td>
<td>Use of interim assessments, data use routines (e.g., grade-level teams and gallery walks), processes of inquiry, and schoolwide professional development</td>
<td>Low-income, Hispanic students</td>
<td>Elem</td>
<td>Reading, Math</td>
<td>Case study collecting qualitative data; assessed achievement data after two years of implementation</td>
<td>Percentage of students meeting or exceeding state test standards rose from 73 to 86 in two years</td>
</tr>
<tr>
<td>Konstantopoulos, Miller, &amp; van der Ploeg, 2013</td>
<td>Use of interim assessments</td>
<td>Students attended a variety of urban, suburban, small town, and rural districts</td>
<td>Elem Middle</td>
<td>Reading, Math</td>
<td>Large-scale, school-level stratified cluster randomized experiment collecting test score data for approximately 20,000 students after one year</td>
<td>Treatment effects mostly positive, but not consistently significant; larger effects for upper grades</td>
</tr>
<tr>
<td>Lai &amp; McNaughton, 2016</td>
<td>Professional development and professional learning communities focused on collaborative data analysis to determine achievement problems, identify causes, and co-create and test solutions; achievement and instructional practice (i.e., teacher observation) data used</td>
<td>Low-income and minority students included in some studies; rural, small town, and suburban areas included in some studies</td>
<td>Elem Middle High</td>
<td>Reading, Writing</td>
<td>This article reports on a series of quasi-experimental studies collecting qualitative data, teacher and student surveys, test scores, and high school qualification data; the studies incorporated 53 schools over eight years in New Zealand; each study examined more than two years of data</td>
<td>Reading achievement statistically significantly higher than projected; attainment of secondary school qualifications increased significantly over previous attainment at rates faster than the national average; impact sustained over time</td>
</tr>
<tr>
<td>Study</td>
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<tr>
<td>Marsh, Sloan McCombs, &amp; Martorell, 2010</td>
<td>Statewide reading coach program that included support for data-based decision making</td>
<td>Not provided</td>
<td>Middle</td>
<td>Reading</td>
<td>Randomly sampled, mixed methods study collecting qualitative data, teacher surveys, and achievement data from more than 70,000 students at 86 schools; coaches had been on-site for up to four years</td>
<td>Data analysis support had a significant association with higher student achievement in reading and math for reading teacher students, but not social studies teacher students</td>
</tr>
<tr>
<td>McDougall, Saunders, &amp; Goldenberg, 2007</td>
<td>Getting Results program, incorporating grade-level inquiry teams examining student assessment data and student work; the setting and sharing of academic goals; professional development; release time; data use tools; and assessments in reading, writing, and oral language proficiency at the beginning, middle, and end of school years</td>
<td>Low-income, Hispanic students in an urban setting</td>
<td>Elem</td>
<td>Reading, Language Spelling, Math</td>
<td>Quasi-experimental external program evaluation comparing Getting Results schools to demographically similar schools in the same district; collected five years of test scores for nearly 14,000 students</td>
<td>Getting Results schools demonstrated greater student achievement than control schools, and improved achievement more rapidly than the district as a whole</td>
</tr>
<tr>
<td>Poortman &amp; Schildkamp, 2016</td>
<td>Eight-step data use intervention including teams that analyzed and used data collaboratively to solve achievement problems; supported by external coaches</td>
<td>Dutch students</td>
<td>High</td>
<td>Varied</td>
<td>Case study collecting qualitative and quantitative evidence of whether or not teams solved their achievement problems over two years</td>
<td>Four of nine teams solved their achievement problem, four teams did not solve their problem, and one team made significant improve related to part of its achievement problem</td>
</tr>
<tr>
<td>Porter &amp; Snipes, 2006</td>
<td>Bay Area School Reform Collaborative (BASRC) model including district-level coaching, inquiry-based practice, evidence-based decision making, and networking within and across schools; some use of interim assessments and data systems</td>
<td>Predominantly white, low-income, Hispanic, and Asian students</td>
<td>Elem</td>
<td>Reading</td>
<td>Program evaluation utilizing interrupted time series design; collected teacher surveys, qualitative data, and test scores from approximately 3,000 students after three years</td>
<td>No statistically significant difference in scores</td>
</tr>
<tr>
<td>Quint, Sepanik, &amp; Smith, 2008</td>
<td>Formative Assessment of Student Thinking in Reading (FAST-R) model including use of interim assessments, data reports, and coaching</td>
<td>Low-income, African American, and Hispanic students in an urban environment</td>
<td>Elem</td>
<td>Reading</td>
<td>Program evaluation collecting teacher surveys and test score data from 57 treatment and comparison schools after one and two years of implementation</td>
<td>No statistically significant difference in scores</td>
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<td>Study</td>
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<tr>
<td>Randel et al., 2011</td>
<td>Classroom Assessment for Student Learning (CASL) model including professional</td>
<td>White and Hispanic, low-income students in rural, urban, and suburban settings</td>
<td>Elem</td>
<td>Math</td>
<td>Cluster randomized trial collecting teacher surveys and test scores from nearly 10,000</td>
<td>No statistically significant difference in scores</td>
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<td>development focused on classroom and formative assessment; implemented via teacher</td>
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<td>students after two years</td>
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<td>teams</td>
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<tr>
<td>Saunders, Goldenberg, &amp; Gallimore, 2009</td>
<td>Getting Results program, incorporating grade-level inquiry teams examining</td>
<td>Low-income, Hispanic students in an urban setting</td>
<td>Elem</td>
<td>Reading</td>
<td>Quasi-experimental investigation comparing Getting Results schools to demographically</td>
<td>Getting Results schools demonstrated greater student achievement than</td>
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<td></td>
<td>student assessment data and student work; the setting and sharing of academic</td>
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<td>Language</td>
<td>similar schools in the same district; collected five years of test scores for nearly</td>
<td>control schools, and improved achievement more rapidly than the district</td>
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<td>goals; professional development; release time; data use tools; and assessments</td>
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<td></td>
<td>Spelling</td>
<td>14,000 students</td>
<td>as a whole</td>
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<td>in reading, writing, and oral language proficiency at the beginning, middle, and</td>
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<td>Math</td>
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<td></td>
<td>end of school years</td>
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<tr>
<td>Slavin, Cheung, Holmes, Madden, &amp; Chamberlain, 2013</td>
<td>Data-driven reform initiative including quarterly benchmark assessments; training on interpretin</td>
<td>Predominantly low-income White, African American, and Hispanic students</td>
<td>Elem</td>
<td>Reading</td>
<td>District-level random block assigned program evaluation collecting state test scores</td>
<td>Few important differences in state test scores at the elementary and</td>
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<td>g and using data to guide reform; detailed reviews of test data, questionnaires,</td>
<td></td>
<td></td>
<td>Math</td>
<td>after one, two, and four years from schools representing nearly 300,000 students; one</td>
<td>middle school levels (i.e., mostly nonsignificant differences in reading</td>
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<td>and progress indicators; and help selecting and implementing evidence-based</td>
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<td>of largest cluster randomized experiments conducted in education</td>
<td>and math, with some positive results for different subjects at different</td>
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<td></td>
<td>interventions</td>
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<td>different levels and times); reading effects larger for schools</td>
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<td>implementing reading programs with good evidence of effectiveness</td>
</tr>
<tr>
<td>Snipes, Doolittle, &amp; Herlihy, 2002</td>
<td>Central office staff trained themselves, administrators, and teachers to diagnose</td>
<td>Predominantly low-income, Hispanic, and African American students in urban areas</td>
<td>Elem</td>
<td>Reading</td>
<td>Retrospective, exploratory case study with comparison schools collecting qualitative</td>
<td>Using data enabled improved student achievement, generally outpacing</td>
</tr>
<tr>
<td></td>
<td>teacher and student weaknesses, refine instruction, and direct resources to</td>
<td></td>
<td></td>
<td>Math</td>
<td>and achievement data in four large, urban districts identified as &quot;beating the odds&quot;;</td>
<td>statewide gains; low achieving, African American, and Hispanic students</td>
</tr>
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<td></td>
<td>students, schools, and teachers; data was used for progress monitoring;</td>
<td></td>
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<td>more than two years of achievement data was gathered for each district</td>
<td>experienced the most growth; most progress at elementary level, some at</td>
</tr>
<tr>
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<td>performance assessment data provided regularly, disaggregated by school, race, and</td>
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<td>middle school level, but none at high school level</td>
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<td></td>
<td>socioeconomic status</td>
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<table>
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<tr>
<th>Study</th>
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<th>Study Characteristics</th>
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</thead>
<tbody>
<tr>
<td>Stringfield, Reynolds, &amp; Schaffer, 2008</td>
<td>High Reliability Schools model for whole school reform incorporating grade-level teams to discuss data, the use of data systems, and data use professional development</td>
<td>Welsh students living in areas experiencing greater than average poverty</td>
<td>High</td>
<td>Literacy</td>
<td>Case study paired with multi-level statistical analysis; collected data about qualifications earned at 12 schools after four years of implementation; also collected data five years after implementation</td>
<td>75% more rapid gain than the nation as a whole in students achieving more than five qualifications; more qualifications earned than predicted, with large positive effect; better results for schools with higher implementation fidelity</td>
</tr>
<tr>
<td>Timperley, 2008</td>
<td>Implementation of evidence-informed conversations</td>
<td>Low-income, minority students in New Zealand</td>
<td>Elem</td>
<td>Reading</td>
<td>Case study collecting qualitative data and test scores after three years of implementation</td>
<td>Most students demonstrated improved levels of literacy achievement in comparison to previous years; results were more positive when teams displayed urgency to solve the achievement problems of slowly-progressing students, and when they used multiple sources of evidence to diagnose student learning difficulties</td>
</tr>
<tr>
<td>van Kuijk, Deunk, Bosker, &amp; Ritzema, 2016</td>
<td>Professional development about goals, data use, and instruction; topics included formative assessment, basing instructional decisions on assessment results, and using and interpreting student monitoring systems</td>
<td>Dutch students</td>
<td>Elem</td>
<td>Reading</td>
<td>Pre-post quasi-experimental design with a propensity score-matched control group; collected test score data for more than 800 students after one year of implementation</td>
<td>Significantly higher scores on standardized assessments for treatment group students, representing more than 1/2 year additional gain in reading comprehension</td>
</tr>
<tr>
<td>West, Morton, &amp; Herlihy, 2016</td>
<td>Achievement Network program including use of quarterly interim assessments in math and English language arts, data use tools, coaching of school leaders, networking among peer schools, data meetings, and professional development</td>
<td>Low-income, minority students in three geographically diverse states</td>
<td>Elem Middle</td>
<td>Math</td>
<td>Matched-pair, randomized evaluation collecting school leader and teacher surveys and test score data from approximately 20,000 students after two years</td>
<td>No overall impact of Achievement Network program implementation; positive and negative statistically significant results and null results in math alone; null and negative statistically significant results in reading alone</td>
</tr>
</tbody>
</table>
Results by Nature of Data Use

In addition to mixed overall results, diverse empirical evidence also derives from studies reporting on a variety of data use approaches. While some authors investigated programs focused solely on the use of benchmark assessment and other test scores, others explored the impact of data use professional development, data-focused teams, other data types, and data systems, either individually or in combination with other data use strategies. No single approach to data use yielded better results than another, although some demonstrated more positive trends. Improved achievement was slightly more often detected when data use involved multiple data types and/or multiple data use strategies.

Use of benchmark assessments alone. Because standardized test scores feature so prominently in prevailing data use definitions, frameworks, professional development, initiatives, and policies, special attention is paid to sources reporting relationships between benchmark assessment use and student achievement. For example, in a randomized control trial evaluating the impact of NWEA MAP implementation at 32 elementary schools, Cordray et al. (2012) found no overall significant impact on reading achievement after two years. NWEA MAP is a system of benchmark assessments that encourages teachers to plan and differentiate their instruction based on student performance. Subgroup analyses performed as part of this study found a positive, nonsignificant effect of the program on fourth grade students’ Illinois State Achievement Test (ISAT) and MAP scores and fifth grade students’ MAP scores, but a negative, nonsignificant effect on fifth grade ISAT scores.

The Urban Data Study (Faria et al., 2012) was a large randomized study involving 193 elementary and middle schools in four midsize, urban districts across the United States. These districts were included in the study because they had been using benchmark assessments for at
least three years. Researchers ascertained the benchmark-related data use practices of teachers and principals through the collection of self-report surveys. Student scores were then matched to teacher and principal responses, and analyzed using multilevel modeling. The analysis indicated positive, significant relationships between benchmark data use and middle school math and elementary school reading achievement after less than one year, but not between benchmark data use and elementary-level math and middle-level reading achievement.

Konstantopoulos, Miller, and van der Ploeg (2013), using data from a school-level cluster randomized experiment investigating the influence of benchmark assessment data use on K-8 mathematics and reading achievement in Indiana, also reported mixed results. While treatment effects were generally positive, they were not consistently significant. Furthermore, smaller effects were detected in lower grades, and small town schools even experienced some negative, nonsignificant effects.

**Use of a variety of data types.** Although studies interrogating the use of benchmark assessment scores alone returned inconsistent findings, studies focused on efforts utilizing multiple types of data were slightly more likely to report positive results. For example, Lai and colleagues (Lai & McNaughton, 2016; Lai, Wilson, McNaughton, & Hsiao, 2014) provided the most consistent, positive evidence of the impact of data use. Their studies of the Learning Schools Model (LSM), which emphasizes team data use and consideration of both achievement and instructional practice data, took place across eight years in three different contexts. The work assessed reading achievement and comprehension, writing achievement, and secondary school qualification attainment in New Zealand. Students in schools implementing the model achieved significantly higher reading and writing scores than predicted, and earned more qualifications than in the past at a rate growing faster than the national average.
Use of a variety of data use interventions. Just as researchers found slightly more positive outcomes when data use efforts included a variety of data types, studies examining data use interventions comprised of multiple strategies yielded mixed, but slightly more positive results. For example, Kallemeyn’s (2014) case study exploring data use practice, facilitators, and inhibitors reported that the percentage of students meeting or exceeding state test standards increased by 13 points during a two-year period focused on the use of interim assessment scores, data teams, and data use professional development. van Kuijk, Deunk, Bosker, and Ritzema (2016) also returned positive results when they employed a pre-post quasi-experimental design to compare reading comprehension scores of second- and third-grade students whose teachers did or did not participate in a professional development program. The program was designed to support teachers in goal-setting, data use, and improved instruction. Treatment group teachers were trained to use a student monitoring data system and met in teams to discuss instruction. Their students’ scores were significantly higher than those of the propensity-score-matched control group, with the difference in scores representing more than a semester’s worth of additional learning acquired by students in treatment classrooms.

Results by Student and School Characteristics

Inquiries into the relationship between data use and student achievement include records from a wide variety of student groups and school types. Of the 27 studies reviewed here, 19 considered populations containing a significant percentage (i.e., roughly 30% or more) of minority-group, low-income, urban and/or rural students. When a study considered outcomes for students outside these parameters, it was 80% more likely to demonstrate a positive relationship between data use and student achievement. However, when students were labeled with one or more of these identifying markers, null or negative results were 50% more likely.
Several examples from the literature will illustrate this discrepancy. A comparative interrupted time series study by Quint, Sepanik, and Smith (2008) reported a mix of positive and negative, nonsignificant effects after implementation of the Formative Assessment of Student Thinking in Reading (FAST-R) program at a sample of urban schools serving African American, Hispanic, and low-income students. Similarly, Randel et al. (2011) found a positive, but nonsignificant treatment effect on elementary mathematics achievement in their random block assignment study of Classroom Assessment for Student Learning (CASL) implementation at urban schools serving Hispanic, low-income students. The CASL program groups teachers in learning teams to improve classroom assessment practice. Furthermore, a matched-pair, school-randomized external evaluation of the Achievement Network (ANet) program found no overall impact on math or reading achievement after two years of implementation at urban elementary and middle schools serving African American, Hispanic, and low-income students (West, Morton, & Herlihy, 2016). ANet provides quarterly interim assessments in math and English language arts, individual student reporting, coaching, and peer networks in the hope of helping teachers target their instruction based on data. Notably, this study was one of three to report statistically significant negative effects on both math and reading achievement for some students.

**Results by School Level**

The studies reviewed shared results from data use initiatives at the elementary, middle, and high school levels. Approximately two-thirds of the studies shared results from elementary school efforts, roughly half covered middle school practice, and nearly a third examined high school programs (some studies examined outcomes at multiple school levels). Data use was no more effective at any of the levels, with mixed results reported at each one. For example, Fuchs, Fuchs, Karns, Hamlett, and Katzaroff (1999) found mixed effects of teacher implementation of
performance assessment-based elementary mathematics instruction. Students of treatment group teachers performed better than control group peers on measures of mathematical problem solving, but above- and at-grade-level students experienced more positive outcomes than their below-grade-level classmates.

Results also were mixed at the middle school level. For example, the three studies with middle-school-only samples contained both positive and null effects. In a large, mixed-methods study exploring the impact of a coaching program for teachers that included data use support, Marsh, Sloan McCombs, and Martorell (2010) found a small, positive effect on middle school reading and math achievement on state standardized tests. Henderson, Petrosino, Guckenburg, and Hamilton (2007; 2008), however, found positive, nonsignificant differences in mathematics achievement after one and two years of benchmark testing implementation.

Studies in high schools also yielded mixed results. For example, a longitudinal evaluation of the data-driven High Reliability Schools (HRS) model (Stringfield, Reynolds, & Schaffer, 2008) measured secondary student academic achievement against Welsh national averages during and after HRS implementation. HRS schools acquired secondary qualifications at a rate higher than the national average four years into implementation and five years after. In a study of the impact of an eight-step data use intervention at secondary Dutch schools, however, Poortman and Schildkamp (2016) found that only five of nine data teams solved or significantly improved their stated student achievement problem following intervention implementation.

Studies with samples comprised of multiple school levels also yielded mixed results. Anderson, Leithwood, and Strauss (2010) drew from surveys and interviews with district leaders, school administrators, principals, and teachers to explore data use effects. Weak statistical evidence linking data use to achievement was found only between principals’ perceptions of
district data use and elementary school achievement. No effects were found for data use overall or for middle or high schools. Similarly, a case study of eight elementary, middle, and high schools identified as leaders in data-driven decision making showed most case schools outperforming district, state, and grade-level norms, but not all (Datnow, Park, & Wohlstrom, 2007). In some instances, case schools performed worse than their peers.

Results by Subject Area

The studies reviewed primarily examined data use’s relationship to student achievement in reading/English language arts, mathematics, or both. Regardless of the subject(s) covered, however, results across studies were mixed. Studies exploring both reading and math achievement were most prevalent in this review, and also returned mixed results. For example, Carlson, Borman, & Robinson’s (2011) cluster randomized study investigating the impact of a data-driven reform initiative yielded positive, significant results for math achievement, but positive, nonsignificant results for reading achievement after one year. A follow-up study of the reform conducted by Slavin, Cheung, Holmes, Madden, & Chamberlain (2013) reported positive, significant results for reading achievement during the second and fourth years of implementation, but no additional significant findings pertaining to mathematics.

As an example of findings from studies focused solely on reading achievement, Timperley (2008) found that of seven treatment schools trained to conduct evidence-based conversations in New Zealand, only those with higher levels of implementation fidelity and more frequent discussions of both student work and teacher practice experienced higher reading scores than comparison schools over three years.

Several studies that focused solely on mathematics described both positive and null relationships between data use and achievement. Feldman and Tung (2001), who conducted an
evaluation of six schools implementing a whole-school reform program rooted in data use and
teacher inquiry teams, noted that one school was able to attain much lower failure rates of
students in mathematics. As noted above, however, Randel et al. (2011) and Henderson et al.
(2007; 2008) also found no statistically significant difference between treatment and control
groups when assessing the relationship between data use and math achievement.

Results by Study Characteristics

Patterns within the data use literature also were sought among studies of varying lengths
and designs, but again mixed results emerged. Among inquiries considering one, two, or more
than two years of student achievement data, no amount proved more capable of tying data use to
student improvement; shorter and longer studies were equally likely to return positive or null
results. Programs studied repeatedly over time alternately yielded consistent positive (e.g., Lai
& McNaughton, 2016; Stringfield et al., 2008) or null results (e.g., Henderson et al., 2007;
Henderson et al., 2008; Quint et al., 2008), or shifted from null to positive results over time (e.g.,
Slavin et al., 2013).

Similarly, positive results were no more often reported when applying certain study
designs or collecting specific kinds of data. Experimental, quasi-experimental, nonexperimental
correlational, and case studies all returned a variety of results. Even studies of large numbers of
schools and/or students were no more likely than others to demonstrate positive outcomes.
Similarly, investigators collecting quantitative, qualitative, and mixed methods data all found
both positive and null effects of data use on student achievement.
Summary

Whether considering the empirical literature on the relationship between data use and student achievement as a whole, or within distinct categories, no clear understanding of when, why, and for whom data use works was found. Analyzing these studies based on data use interventions, student characteristics, school level, subject area, and study characteristics consistently returned mixed results. Many yielded positive effects, many generated null effects (i.e., both positive and negative nonsignificant results), and a few reported negative impacts.

Discussion: Understanding Data Use’s Mixed Results

This review demonstrated that the relationship between data use and improvements in student achievement are murky. Given the theory of change for data use and what we know about teachers’ data use in practice, these findings are anticipated. The contextual and individual-level factors that facilitate and inhibit data use vary among teachers, and therefore yield varying results as teachers make sense of data (Bertrand & Marsh, 2015; Datnow & Hubbard, 2015; Spillane & Miele, 2007). Here we move beyond the influence of these contextual and individual-level factors to focus on two additional explanations for equivocal results that have received less attention in previous literature: the positive influence of multiplism in data use, and the inequitable outcomes for students of marginalized groups. These explanations relate to what Coburn and Turner (2011) referred to as the processes of data use, or how teachers notice, interpret and construct implications for practice. Because the 27 studies reviewed did not consistently elaborate teachers’ processes for data use, in this section we also draw on other data use studies that did not explicate its impact on student learning to draw our interpretations. We conclude with implications for supporting data use among teachers.
Understanding the Positive Influence of Multiplism in Data Use

Studies of the relationship between data use and student achievement reviewed here point to the benefits of data use involving a variety of data types and interventions. In the case of data use implementation, it may be that interventions incorporating multiple kinds of data and strategies are more successful because teachers already pull from a variety of information sources to inform their work. Spillane, Reiser, and Reimer (2002) contend that local implementation of initiatives is more palatable when change in actor attitudes and beliefs is less necessary. Because teachers primarily pull from information about what students know and can do (i.e., achievement, assessment, and student work data), but also consider who their students are (e.g., student demographics) and how they behave, and their own professional judgment to make educational decisions, data use approaches incorporating these strategies may be more successful. The following sections detail the kinds of data teachers use and are encouraged to use.

**What students know and can do.** Prevailing data use models and professional development programs tend to advocate for teacher use of student achievement data (Bernhardt, 2004; Bocala & Boudett, 2015; Coburn & Turner, 2011; Datnow & Hubbard, 2015; Datnow & Hubbard, 2016; Faria et al., 2012; Gummer & Mandinach, 2015; Mandinach & Gummer, 2015; Marsh, 2012; West et al., 2016). While some call for use of teacher-created assessments and student work, use of interim or benchmark assessments and state or other standardized test scores is especially encouraged. Many schools have responded by implementing benchmark or interim assessment systems to monitor and predict standardized scores that will be used for accountability purposes. Empirical studies confirm that teachers do use data demonstrating what students know and can do, and that use of teacher-created assessments outpaces
recommendations for their use (Anderson et al., 2010; Datnow & Hubbard, 2015; Datnow et al., 2012; Datnow et al., 2007; Faria, Greenberg, Meakin, Bichay, & Heppen, 2014; Farrell & Marsh, 2016; Kallemeyn, 2014; Marsh, 2012; Snipes, Doolittle, & Herlihy, 2002; West et al., 2016).

Who students are and how they behave. Several guidelines for teachers and recommendations from scholars also suggest using data related to student demographics, behavior, and organizational context (Bernhardt, 2004; Gummer & Mandinach, 2015; Mandinach & Gummer, 2016; Mandinach & Jackson, 2012; Marsh, 2012). For example, Mandinach and Jackson (2012) discussed the utility of using a wide variety of student data when making educational decisions (e.g., attendance, mobility, dropout, graduation, ethnicity, language, gender, age, family situation, enrollment, discipline, and special program participation information). The literature reports that although only suggested by a minority of data use frames and programs, practitioners have used this data regularly (Datnow & Hubbard, 2015; Datnow et al., 2012; Marsh, 2012; Spillane & Miele, 2007).

Professional judgment. Teachers also commonly rely on—and are sometimes encouraged to incorporate—their own professional judgment during data use. Teacher observations and notes were identified by Mandinach and Jackson (2012), the Data Wise framework (Bocala & Boudett, 2015), and the Marsh (2012) data use intervention literature review as potential data sources for data use. Despite this limited endorsement, many instances of teachers relying on professional judgment in their decision making appear in the data use literature (Coburn & Turner, 2011; Datnow & Hubbard, 2015; Datnow & Hubbard, 2016; Datnow et al., 2012; Datnow et al., 2007; Hoogland et al., 2016; Kallemeyn, 2014; Spillane & Miele, 2007). Teachers’ relationships with students, beliefs, experiences, observations, and intuition all were noted as influential factors in teacher practice.
Several authors provide insight into teachers’ data use preferences. Their work suggests that the data sources most often recommended to teachers are not the ones teachers find most useful or the ones that contribute to reaching proximal data use goals. For example, use of state assessments were tied to student grouping and placement, but not to changes in instructional delivery (Datnow & Hubbard, 2015; Farrell & Marsh, 2016). Benchmark assessments were linked to decisions about reteaching, retesting, grouping, and placing students, and encouraging student reflection on their own performance, but not to changes in instructional delivery (Datnow & Hubbard, 2015; Farrell & Marsh, 2016). Common and classroom assessments, teacher-created assessments, and student work were deemed more useful by teachers and linked not only to regrouping and reteaching, but also most often to change in instruction (Datnow & Hubbard, 2015; Farrell & Marsh, 2016). Although evidence exists that teachers rely on multiple data sources, data use interventions do not consistently acknowledge and address this.

Teachers’ comprehensive data use habits, and especially the slightly more positive outcomes associated with multiple data sources and/or strategies, align with a strategy commonly used in social science research—critical multiplism. Just as a teacher would not base a student’s grade on a single test score, proponents of critical multiplism urge researchers to avoid ascribing truth to a single study or method by intentionally varying their question posing, data sources, analysis, and interpretation (Shadish, 1993). They argue that no one single approach to understanding is perfect, and that every research method carries its own strengths, weaknesses, assumptions, and biases (Shadish, 1986). In order to arrive at a more robust understanding, critical multiplism calls on practitioners to package data and strategies that intentionally offset each others’ vulnerabilities. When diversity yields similar results, confidence in results grows, and when results diverge, work can begin to identify the cause of the inconsistencies (Shadish,
This deliberate mixing invites criticism from across disciplines and paradigms in order to strengthen results and understanding. Teachers, perhaps subconsciously, already work in this way, and this literature review suggests planned multiplism may help data use increase student achievement.

**Understanding Inequitable Outcomes for Students of Marginalized Groups**

As noted above, studies examining the relationship between data use and student achievement more often returned null or negative results when 30% or more of the students involved were identified as a racial-ethnic minority and/or low-income, and/or the school was located in an urban or rural area. This is a disheartening finding given that marginalized populations experience significant educational opportunity gaps that negatively impact their academic achievement (Carter & Welner, 2013; Diamond, 2013; Flores, 2007). In schools where the promise of data use might be most anticipated, its effects do not mirror its potential. Narrow data use, bias in expectations and attribution, and data use practiced without an equity lens may help explain this dilemma.

**Narrow data use.** The preceding discussion about the importance of using multiple kinds of data and data use strategies helps contextualize the disappointing data use results at schools serving marginalized populations. Of the eight studies exploring use of a single data type or strategy, six examined effects at urban schools serving racial minority and/or low-income students. Two of those studies (Faria et al., 2012; Faria et al., 2014) yielded a mix of positive and null results, but the rest reported no relationship between data use and achievement (Cordray et al., 2012; Henderson et al., 2007; Henderson et al., 2008; Herman et al., 2008). These outcomes suggest an intensified need for comprehensive data use at schools serving marginalized groups, but also may point to the need for data use with explicit equity aims.
Bias in expectations and attribution. The importance of applying an equity lens to data use is underscored by what is known about teacher expectations and attribution. Teachers’ expectations can impact student performance by creating self-fulfilling prophecies, which has been documented to produce negative impacts on students belonging to marginalized groups. For example, some teachers have demonstrated higher expectations for Asian and White students than African American and Hispanic students regardless of prior achievement (Bartolome, 1994; Beady & Hansell, 1981; Dee, 2005; Godsil, Tropp, Atiba Goff, & Powell, 2014; McKown & Weinstein, 2008; Phelan Kozlowski, 2016); others have presumed students with low socioeconomic status possessed less potential than their peers (de Boer et al., 2010; Dusek, 1975; Jussim et al., 1996; Madon, Jussim, & Eccles, 1997; Wilson Cooper, 2003). Unchecked implicit bias, racial anxiety, deficit thinking, and stereotype threat all have been cited as causes for these expectations. Teacher bias, at times, has led to discriminatory school practices (e.g., discipline, instruction, and class placement), and contributed to and maintained the achievement gap (de Boer et al., 2010; Dee, 2005; Godsil et al., 2014; McKown & Weinstein, 2008; Valencia, 1997; Wilson Cooper, 2003).

Several scholars (Bertrand & Marsh, 2015; Park, 2018) suggest that implicit biases, deficit thinking, and low expectations also influence the ways teachers use data. This can be problematic when teachers attribute the cause of low student achievement to external factors like student characteristics. Studies by Nabors Oláh, Lawrence, and Riggan (2010), Bertrand and Marsh (2015), and Evans et al. (2019) all explored teachers’ data use while accounting for teachers’ attributions or explanations for poor performance. In all instances, teachers regularly pointed to stable student characteristics, such as race/ethnicity and socioeconomic status, as the cause for undesired outcomes. The “students’ home life” category of explanation detailed by
Evans et al. (2019) comes closest to linking membership in a marginalized group to potentially harmful data use. Teachers invoking this kind of explanation tied a lack of resources at home to poor performance at school.

Interpreting external student characteristics as the cause for low academic achievement may result in poor data use outcomes. Diamond (2008) asserted that teachers feel less responsible for student’s performance when they believe its cause lies within students or families. As a result, teachers become less motivated to find other causes for low achievement, and are less likely to interrogate their practice or change their instruction in response to low achievement (Bertrand & Marsh, 2015; Diamond, 2008; Schildkamp & Kuiper, 2010). In fact, Georgiou, Christou, Stavrinides, and Panaoura (2002) found that teachers attributing low achievement to factors like family background were more likely to “give up” on a child. When this happens, data use can reinforce teachers’ low expectations and stereotypes, and is less likely to have positive effects on student outcomes (Bertrand & Marsh, 2015; Nabors Oláh et al., 2010; Holmlund Nelson, Slavit, & Deuel, 2012; Park, 2018).

**Data use without an equity lens.** Scholars have begun to address the importance of applying an equity lens to data use. They contend that data use without an intentional focus on the needs of marginalized students is unlikely to improve academic achievement (Datnow & Park, 2018; Gannon-Slater et al., 2017; Park, 2018; Garner, Thorne, & Horn, 2017). Although 18 studies, which is nearly two-thirds of the studies from this review, explored the impact of data use on racial minority and/or low-income student achievement, only one described an emerging application of an equity lens. In a case study of urban districts improving more than others, Snipes et al. (2002) reported that several exemplary districts used disaggregated data to push for uniform improvement across student subgroups, and one used data to disrupt potentially
racist student course placement practices. Across the remaining 17 studies, minimal mention of

equity applications of data use was made, and no clear, positive impact of data use on the
achievement of marginalized students was evident.

**Implications: Moving Data Use Forward**

Despite the long odds on success, schools and teachers have found ways to influence
teaching and learning positively through data use. Amid imperfect circumstances with imperfect
tools, educational practices, policies, and outcomes sometimes have improved. The benefits are
not yet consistent or equitable, but the promise seems evident. If we are to fully realize the
potential of data use, this review of the literature suggests some productive next steps.

1. **Learn more about how teachers reason with a variety of data sources and center equity**
in their data use. To date, few empirical studies provide detailed accounts of teacher data
use, which is considered problematic by a variety of scholars. In a national survey, Means,
Padilla, DeBarger, and Bakia (2009) discovered that teachers wanted examples of strong data
use practice to improve their own implementation. A few years later, Little (2012) called for
additional data use micro-process studies so that teacher data use practice could be better
understood. In 2015, Datnow and Hubbard’s review of literature on teachers’ use of
assessment data still noted that “…the field lacks a detailed understanding of how teachers
actually use assessment data to inform instruction…” (p. 1).

This study suggests that future data use inquiries should pay particular attention to
how teachers use data to promote equity and incorporate professional judgment into their
data use. Although biases can undermine progress, many teachers develop useful insights
and meaningful relationships that support nuanced responses to student needs, including
minoritized student needs. Better understanding how teachers use both quantitative and
qualitative data in service of their diverse students should help teacher professional judgment more readily be received as a complement to the use of hard data (Datnow & Park, 2018; Evans et al., 2019), and point to strategies for harnessing data use’s power for all students.

2. **Revise data use frameworks and interventions to better mirror practice.** It must be acknowledged that teachers use a wide variety of information sources to make decisions. Rather than rely on standardized test results alone, teachers take into consideration what they know about their students, their practice, their context, their content, and themselves to do their work. Data use interventions that mirrored this reality by incorporating multiple kinds of data and data use strategies were slightly more likely to yield positive results in our review of empirical literature. Similarly, several leading data use scholars already have encouraged broader definitions of data and data use. By continuing to focus heavily on the use of quantitative data alone, data use frameworks and interventions dismiss teacher practice, expert advice, and empirical evidence. Better aligning to practice may help to advance our thinking about data use’s components, purposes, and outcomes, while increasing teacher buy-in.

3. **Continue to provide teachers and school leaders with data use professional development.** This literature review suggests teachers would benefit from guidance on how to ask questions of data; access data systems and generate reports; move beyond measures of central tendency, disaggregate, and consider outliers when analyzing data; and reconcile discrepant data, triangulate, and explore alternative explanations when interpreting results. Already teachers have expressed a desire for more and different kinds of data use training, with a specific interest in better understanding how to apply results from standardized tests.
and turn data use evidence into instructional and curricular change. If we are asking teachers to use data well, comprehensive guidance must be provided.

4. **Re-evaluate the impact of teacher data use rooted in teacher practice and explicitly committed to equity.** To date, studies exploring the relationship between data use and student achievement have measured significantly limited attempts. Facilitators of data use have been absent, barriers have been abundant, data use has been narrow, and equity has not been centered. Additionally, teachers have not bought into data use as an enterprise. Should data use become more comprehensive and inclusive, it is possible educators will embrace and implement it more fully. Exploration of the impacts of this new kind of data use may more realistically reflect the practice’s potential and yield additional guidance for making equitable, data-informed educational decisions.

**Conclusion**

This review demonstrated that teachers’ data use practices have a varied impact on student achievement. Data use is a school reform intervention that shows some promise, but fails to demonstrate consistent, positive results. Most concerning, it disproportionally fails to produce positive results for students from minority, low-income, urban and/or rural communities. Although these findings are consistent with what scholars have demonstrated about organizational facilitators and barriers to teachers’ data use, these findings also demonstrate two areas for data interventions to address regarding the micro processes of teachers’ data use practices. First, many teachers prefer to use multiple data sources and strategies. Practicing multiplism seems to support student achievement. Second, data use interventions do not consistently integrate an equity focus, and research has demonstrated that biases shape
misinterpretation and misuse of data. Data interventions to assist teachers in integrating multiple data sources intentionally through an equity lens are worth pursuing.
CHAPTER THREE

MEET THE TEACHERS

Overview

The three teachers participating in this study—Meg, Chelsea, and Nikki (all names are pseudonyms)—were White women working in charter schools serving low-income students from marginalized communities in a large Midwestern city. All three had engaged in at least one action research study investigating problems of practice in their own classrooms and schools. They were identified as potential participants for the study based on their selection to an action research fellowship (see Appendix A for full study design details). Each fellowship lasted one academic year, and provided participants with professional development and mentoring. Fellows developed a literature review, collected and analyzed data, completed journals about their experience, and wrote up and presented their findings and recommendations. The program’s goals were to improve teacher practice and student outcomes, build research and reflection capacity, create community among cohorts, and contribute to the teacher inquiry literature base. See Table 2 for a summary of participant characteristics.
Table 2. Participant Characteristic Summary

<table>
<thead>
<tr>
<th></th>
<th>Meg</th>
<th>Chelsea</th>
<th>Nikki</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Race/ethnicity</strong></td>
<td>White</td>
<td>White</td>
<td>White</td>
</tr>
<tr>
<td><strong>Gender</strong></td>
<td>Female</td>
<td>Female</td>
<td>Female</td>
</tr>
<tr>
<td><strong>Grade/subject(s) taught 2018-19</strong></td>
<td>Middle school Math</td>
<td>Elementary school Generalist</td>
<td>Elementary school Generalist</td>
</tr>
<tr>
<td><strong>Years of experience</strong></td>
<td>4</td>
<td>12</td>
<td>13</td>
</tr>
<tr>
<td><strong>Education level</strong></td>
<td>Masters in Urban Education</td>
<td>Bachelors in Education &amp; French</td>
<td>Masters in Reading Masters in Curriculum &amp; Instruction</td>
</tr>
<tr>
<td><strong>Certification/specialties</strong></td>
<td>--</td>
<td>NBCT in early literacy</td>
<td>NBCT in early literacy Reading specialist MTSS coordinator</td>
</tr>
<tr>
<td><strong>Leadership</strong></td>
<td>Host of teacher interns</td>
<td>Member of school leadership team Teacher leader, mentor</td>
<td>Member of school leadership team Lead teacher, grades K-2 Study group coach</td>
</tr>
<tr>
<td><strong>Schools taught</strong></td>
<td>Current charter</td>
<td>Religiously-affiliated preschool Public elementary school Current charter (8 years)</td>
<td>Catholic elementary schools Current charter (9 years)</td>
</tr>
<tr>
<td><strong>Data use training</strong></td>
<td>Action research fellowship Math teacher leader program</td>
<td>Action research fellowship School-based PD</td>
<td>Action research fellowship School-based PD</td>
</tr>
</tbody>
</table>

As noted above, all participants taught at charter schools in the same city, within and yet largely independent from the same school district. The schools served different student populations in different areas of the city, and varied in size, structure, mission, history, culture, climate, and grade levels taught. They also varied in student mobility, attendance, achievement, and growth. The district as a whole had less than 66% of the financial resources projected as necessary to meet its needs. See Table 3 for a summary of school characteristics¹.

¹ Data for Table 3 was gathered at school websites and through state school report cards, and verified by participants. Sources have not been cited to maintain confidentiality.
<table>
<thead>
<tr>
<th></th>
<th>Meg’s School</th>
<th>Chelsea’s School</th>
<th>Nikki’s School</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Year founded</strong></td>
<td>1998</td>
<td>1999</td>
<td>2004</td>
</tr>
<tr>
<td><strong># of students</strong></td>
<td>approx. 650</td>
<td>approx. 500</td>
<td>approx. 500</td>
</tr>
<tr>
<td><strong>Grade levels</strong></td>
<td>6-12</td>
<td>P-8</td>
<td>K-8</td>
</tr>
<tr>
<td><strong>Structure</strong></td>
<td>Unit of an umbrella organization working to</td>
<td>Unit of an umbrella organization working to</td>
<td>Stand-alone school with an extended day and year</td>
</tr>
<tr>
<td></td>
<td>improve urban education; one of several schools</td>
<td>reduce the achievement gap; stand-alone school</td>
<td>that admits students via blind lottery; offers a</td>
</tr>
<tr>
<td></td>
<td>within a network serving 1600 students P-12;</td>
<td>with an extended day, year-round calendar;</td>
<td>Spanish immersion model</td>
</tr>
<tr>
<td></td>
<td>students are admitted through a lottery,</td>
<td>students are admitted via blind lottery</td>
<td></td>
</tr>
<tr>
<td></td>
<td>with neighborhood students given preference</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Mission, vision, and</strong></td>
<td>100% college acceptance and graduation; strive</td>
<td>To remain one of the country, state, and district’s</td>
<td>Focuses on whole child development, health and</td>
</tr>
<tr>
<td><strong>goals</strong></td>
<td>for cultural relevance, technology integration,</td>
<td>most high-performing charter schools; to serve</td>
<td>wellness; privileges data-informed academics,</td>
</tr>
<tr>
<td></td>
<td>expert data use, performing arts exposure,</td>
<td>as a demonstration site for other urban charters;</td>
<td>social-emotional growth, nutrition and movement,</td>
</tr>
<tr>
<td></td>
<td>strong community and parent relations, development of</td>
<td>to encourage excellence in academics, arts, and</td>
<td>and family engagement</td>
</tr>
<tr>
<td></td>
<td>higher-order abilities, and student research</td>
<td>personal/social development</td>
<td></td>
</tr>
<tr>
<td></td>
<td>training</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Student population</strong></td>
<td>98% Black</td>
<td>100% Black</td>
<td>91% Hispanic</td>
</tr>
<tr>
<td></td>
<td>84% Low-income</td>
<td>93% Low-income</td>
<td>77% Low-income</td>
</tr>
<tr>
<td></td>
<td>4% Homeless</td>
<td>9% Homeless (twice the district; quintuple the</td>
<td>47% Emerging Bilinguals</td>
</tr>
<tr>
<td></td>
<td></td>
<td>state)</td>
<td></td>
</tr>
<tr>
<td><strong>Mobility and absences</strong></td>
<td>Half as mobile as district</td>
<td>Quarter as mobile as district</td>
<td>Less mobile than district</td>
</tr>
<tr>
<td></td>
<td>High rates of truancy</td>
<td>High rates of truancy</td>
<td>Less truant than district, but double truancy of</td>
</tr>
<tr>
<td></td>
<td>Half as absent as Black students in district and state</td>
<td>Half as absent as Black students in district and state</td>
<td>state, Half as absent as Hispanic students in district and state</td>
</tr>
<tr>
<td><strong>Academic achievement</strong></td>
<td>ELA, Math and Science scores far below district and state averages</td>
<td>ELA scores far above district and state; Math scores above district and state; Science scores below district and half of state</td>
<td>ELA scores same as district, lower than state; Math and ACCESS scores below district, half of state; Science scores above district, below state</td>
</tr>
<tr>
<td><strong>Student growth</strong></td>
<td>Not available</td>
<td>Below average on MAP</td>
<td>Average on MAP</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Above average in ELA, Average in Math on PARCC</td>
<td>Below average on PARCC</td>
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Deep Dives

Now that you have a general sense of who participated in the study, let’s take a closer look at the teachers’ personalities, backgrounds, and philosophies, as well as their neighborhood, school, and classroom contexts. My goal is to provide enough information about the teachers and their environments that you are able to put yourself in their shoes, understand their perspectives, and identify whose strategies may be most useful and applicable in your own work.

Meg

For me, meeting Meg was intimidating. She attended some of the most prestigious schools in the country, and I have an inferiority complex about never reaching for a “top tier” education. During our screening call, Meg was so self-assured in her concise and specific responses that I thought she might be a “tough nut to crack.” I am accustomed to people being nervous about the prospect of being studied, and always prepared to prove that I am not a judgmental monster interested in exposing their shortcomings. Meg didn’t seem to need to know that. She came across as completely unphased by the idea of someone intimately inspecting her work. It felt as if she already had decided to commit to the project, and was eager to get into the
specifics and logistics of participation, rather than dally with introductory niceties. I immediately worried that I would not be able to build rapport with this accomplished, no-nonsense professional. I also was concerned that her to-the-point responses might indicate she easily would tire of explaining to me how her excellent mind works. Would she simply point to her fancy degrees as justification for her choices without elaboration? Fortunately not.

From my perspective, Meg is an accessible, humble, and determined teacher. Committed to professional learning and growth, Meg engages in continuous improvement through coaching, professional development, peer collaboration, data collection and analysis, and personal reflection. She approaches her work through an equity lens while attempting to build both content and interpersonal knowledge and skills with her students. When asked how she became this way, Meg cited her upbringing, her early forays into the field, her graduate education, her teaching position, and her work in action research as key influences:

There’s some of the chicken or the egg question there. My parents are both doctors, and so from very early on I have thought about diagnosis. I think that that honed my lens very early to always be, um, trying to understand, like, “Why did you do that? How is it actually affecting a student or a classroom?”

My junior and senior year of college I was in a, uh, public school internship where I spent a lot of time in one school. The idea was a fresh set of eyes and a fresh perspective. I had spent a lot of time watching and being like, “Well, this is hard.” Like, I’m crashing and burning often when I’m doing this.

So then when I was choosing a place to learn, [my master’s program] appealed to me because so much of their focus is on reflecting on your practice. And then coming out of that program, …getting a job here…appealed to me as a first-year teacher because immediately we were talking about reflective feedback cycles. And the educators that I work with are incredibly reflective.

And then, you know, going to work [in an action research program] with other teachers who are spending their time outside of school doing that, it just— It keeps happening and happening and happening. (June 5, 2019)
As you can see, Meg purposefully nurtured early-developed skills and stances to establish a teaching practice that encourages reflection and growth. With a bit of insight into Meg’s personality, we’ll now learn more about where she worked.

**Meg’s context.** Meg’s school is surrounded immediately by public and private apartment buildings housing seniors and families of mixed incomes, as well as some churches, several vacant lots, and a now-empty school building. Nearly 20% of adults looking for work there are unemployed; nearly all residents are Black and considered low-income. By city standards, the area experiences higher than average rates of violent, property, and public, gun-related crime. Its current reality belies its history as a bustling, Black enclave. Over time, the area has been disconnected from the city through discriminatory policies, infrastructure, and disinvestment, but maintains a strong sense of civic engagement as residents steadfastly organize themselves for improvement.

Today, branches of several public service agencies are within walking distance of the school, as are a variety of small, service-oriented businesses. The area is home to a branch of the public library, several grocery stores, and parks both large and small. The nearest large employer is a prestigious university system, which has a tenuous relationship with the neighborhood. Public, private, charter, and religiously-affiliated schools are available to local residents; their specialties include science, technology, engineering, and mathematics (STEM) disciplines, culturally-relevant pedagogy, and gifted and special education. Several schools in the neighborhood have been closed by the local district, and one elementary was forced to take in displaced students as a result of mass closings.

The charter where Meg has spent the entirety of her career is part of a university-affiliated network in operation for more than 20 years. The network values culturally-relevant
practices, teacher data use, and community and parent engagement. It also strives to expose students to technology, performing arts, and research training. Although academic achievement as measured by standardized test scores is low in the network, and its schools are not consistently considered to be organized to improve student learning, its mission is to prepare every student for college graduation.

Meg’s building hosts approximately 650 students in grades 6-12. The charter used to be housed in a closed neighborhood school, but now inhabits a new, minimalist building. Awash in shades of gray, the site features culturally-relevant design elements, large banks of windows, and predominantly hard surfaces. Some of the walls are adorned with colorful murals and mosaics; college pennants are displayed throughout the space. Administrative offices are located on the first floor, as are common areas such as the cafeteria, gymnasium, and college resource center. The second floor is home to the middle school and shared teacher spaces, and the third floor is reserved for the high school. Outside, the school features a garden and open space for athletics. A security team presides over it all, and it is common for a police vehicle to be parked near the building.

The entrance to Meg’s classroom was surrounded with information for students, math tenets and quotes, and photos of amusing math “fails” Meg spotted in daily life. One of the math fails announced customers could pay $10 per month for a gym membership or $199 for 18 months. Inside, student desks were grouped in twos, threes, and fours, allowing 4-12 students to sit together. Meg lined her walls with photos of and introductions to accomplished, diverse men and women in STEM fields. White boards hung throughout the space featured both her instructional content and students’ group work. Book shelves housing STEM titles and extensive storage for hands-on STEM project materials were also present. The current cohort’s definition
of productive math discourse was shared on the wall in one corner, along with photos of students at work. Anchor charts related to math strategies, feedback terminology, levels of mastery, and classroom procedures were also posted.

**Meg’s class structure.** In addition to teaching seventh-grade math, Meg also led a STEM course during the 2018-2019 school year. Due to these dual responsibilities, Meg dedicated four days of the week to math content and activities, and one day to research and design projects. Three of her math days focused on learning new content, while one—called math lab—was reserved for individualized learning and practice.

Meg’s students did not use a math textbook. Instead, Meg pulled from various sources to plan her lessons and craft her assessments and activities. To provide students with a roadmap and record of their learning, she created daily class “blueprints” and weekly homework menus, captured written notes from class, and required students to take their own notes in math notebooks each day. Almost all of Meg’s classroom materials were available on her website for students and families to access at any time.

Upon entering the room on a math content day, students collected half-sheet “blueprints” that informed them of the day’s planned activities. After finding a seat, students completed a First Five activity, which could be considered a “Do Now”. First Fives were meant to ease students into learning by providing them with accessible tasks that encouraged a math mindset. Students discussed their First Five responses before the class engaged in whole group share-outs.

Progress checks took place after First Fives as appropriate. Progress checks helped Meg get a sense of students’ progress after they’d had a chance to digest new material and apply it through homework practice.
After progress checks, students tackled new math. Meg drew from what students should already know to introduce new ideas, and had students grapple with the material through activities. This work took place primarily in student groups, which were randomly assigned at the beginning of each week. If students were not already sitting with their groups, they moved to a group seating cluster at the beginning of math content coverage. During this time, Meg circulated throughout the room. Her goals were to coach groups through conceptual misunderstandings and interpersonal miscommunication, while taking note of struggling students, challenging material, and exemplary student solutions. Students’ white board work and dialogue informed Meg’s check-in priorities. Multiple activities could be scheduled for a single day.

At the close of each activity, the class would debrief. Meg took notes for the “textbook” as the class discussed the math as a whole and as groups. She also shared any exemplary student solutions at this time.

In addition to shared class work, students completed homework individually. Meg had expectations about how much work was completed and when it was turned in, but students primarily selected from a homework menu to personalize their modes of out-of-class practice. In addition to tackling any required practice Meg assigned, students might work in an online math program, do review problems, or complete Math Missions.

Math Missions were opportunities for students to keep their math skills fresh and expand their thinking. They were focused primarily on math students should already know, but also included some challenges. Math Missions began as voluntary exercises in the first semester of 2018-2019 and became mandatory in the spring. Students often completed Math Missions during their personalized math lab each week.
In terms of formal assessments, students completed group tests before taking summative individual exams. Meg intended for discussions taking place during group tests to serve as “verbal study guides.” Individual tests eventually were administered across multiple days. Students advanced only after demonstrating mastery; higher-order skills were addressed as the test progressed.

Meg also held office hours three times a week during the lunch hour. Students could use this time to consult with Meg and complete schoolwork. Technology and other resources were available for students who needed them. One day a week, office hours were by invitation only so that Meg could work with individuals and small groups requiring extra assistance. Office hour attendance was posted online so families could see when/whether students were accessing the resource.

Overall, Meg structured her practice with the goals of helping students understand math, communicate effectively, and build strong work habits. She engaged students in new and review mathematical content, while allowing them to make choices about how and when they would engage. She coached students through group dialogue and mathematical misconceptions. She also allowed for revisions and re-takes across all types of student work.

Chelsea

Meeting Chelsea was like reconnecting with an old friend. From the initial screening chat through the final interview, conversation flowed easily and frequently was punctuated with laughter. Our comfort level was likely facilitated by a number of shared traits and experiences. Chelsea and I are a few years apart in age, hail from the same state, and grew up attending church in the same, obscure denomination. In terms of personality, we both demonstrate a certain kind of dogged curiosity. Chelsea once told me a story about wanting to understand why
some Britons pronounce “th” as “f.” She had shared her question with a friend, describing the degree to which it was burning in her brain. The friend suggested that—since Chelsea had so much on her plate—she simply let it go. To that, Chelsea and I had the same exasperated response: “What?!”

Chelsea and I both also seemed committed to growth through education, introspection, and helping others. While I’m more of a behind-the-scenes type, Chelsea is a frontline warrior. She’s the type of person that signs up for the Peace Corps. She’s the type of teacher that shows up every day despite having been punched and called names on the job. In fact, Chelsea often gets to class two hours early because she can’t sleep while “thinking about children who aren’t mine” (January 3, 2019). I found her care, concern, and compassion for students remarkable every time she talked about them. It’s possible that Chelsea’s approach is rooted in faith. She graduated from a university associated with our childhood church and still attends services at a local congregation.

When we talked about external influences in her work, Chelsea “blamed” her parents for her thoughtful, reflective style and commitment to lifelong learning. Chelsea’s mom was a teacher for more than 40 years, and Chelsea regularly consults her for perspective and suggestions. Chelsea’s dad is just as inquisitive as she is: When she told him the pronunciation story, his immediate response was, “Let’s look that up!”

Chelsea models her interaction with students on the way her parents supported her. She explained:

Being the child of teachers, …when I was younger and I messed up, my parents…would always take the time to figure out what I didn’t understand. I think that kinda laid a framework for me when I look at my students. If they’re not understanding something, then my job is to find a way to get them to understand it. But I have to know what they don’t understand first. (January 3, 2019)
She calls that discovery process “putting fingers in brains,” and she hopes the kids she teaches will become just as hooked on asking questions and finding answers as she is.

**Chelsea’s context.** Chelsea’s school sits on a main street that runs into the nearby downtown. Standing out front, you can look into the heart of the city and spot famous skyscrapers. Despite this proximity, you may not mistake the school’s neighborhood for the urban core. Indeed, even residents paint a different picture of the area depending on the block in which they reside. Bullish observers note that a renowned park anchors the space and draws visitors from across the city, nation, and world. The community is served by two rapid transit and numerous bus lines, as well as churches, YMCA branches, government service centers, and a variety of public and charter schools. A few restaurants and small, service-oriented businesses are available, and people primarily live in medium to large apartment buildings and other multi-family housing. A recent uptick in real estate investment is anticipated to spark renewal.

Bearish observers, however, may point to crime, census, and health data, media reports, and local histories to combat that sunny take. They could relay that an expressway installed in the 1950s displaced many of the area’s businesses and citizens, and that most of the remaining population lives in poverty. Residents do not enjoy consistent access to healthy food, higher education, or gainful employment, and may encounter gangs and drugs. Pockets of the community are exposed to more violent and other crime than any other place in the city. Furthermore, the area is home to more than its fair share of “million dollar blocks,” where so many people are in jail that it is estimated at least $1M is spent on their incarceration each year.

Chelsea’s school is positioned near the center of this contradictory community. The building is part of a religious complex, and once functioned as a parish school. Though still spatially connected to the church, it has been operating as a charter for more than 20 years. The
brothers who founded it in the 1990s were interested in reducing the racial achievement gap. Both aesthetic and structural evidence suggests that organizing ideal endures. Banners affixed to the building’s facade tout local and federal recognition of academic excellence. Grade-level and whole-school data routines ensure student performance remains top-of-mind.

In this test-score-oriented culture, teachers operate rather autonomously. There are only two administrators at the school, and no instructional coaches. Teachers comprise the leadership team, plan special events, and facilitate weekly meetings to build community among students and staff.

The facility itself is a typical three-story, turn-of-the-last-century school building. Stairwells bookend long hallways off of which classrooms and communal spaces branch. Floors, walls, and ceilings coalesce into a sea of neutrality, pierced sporadically by vibrant pops of color. An eye-catching, culturally-relevant mural brightens the landing between Floors 1 and 2; pennants representing historically Black and other colleges are posted in every classroom. Outside, a small playground and large, open lawn provide opportunities for movement and play.

Chelsea’s room is located on the second floor and filled with storage. A variety of waist- and full-height bookcases line most walls, some topped with additional assortments of drawers, bins, and boxes. Student desks are grouped in sixes throughout the space and flanked by two kidney tables, where Chelsea and an instructional aide pull students for small group instruction. A wall of large, curtained windows provides natural light and houses the room’s two portable air conditioning units. The opposite wall is covered by a white board, its rails hosting a range of texts featuring diverse characters and social justice themes. Leveled book bins dominate an adjacent wall. Anchor charts and bulletin boards are everywhere, reminding students of strategies, goals, and expectations.
**Chelsea’s class structure.** Most days, students experienced a very similar schedule in Chelsea’s room: reading, writing, spelling, and math in the morning, and specials (including art, music, gym, and computers), science, and social studies in the afternoon. The curriculum for language arts (Expeditionary Learning) and math (Eureka Math®, formerly known as EngageNY Math) were selected by the school and based on the Common Core State Standards; Chelsea was responsible for designing science and social studies units.

During the study, students were using data binders designed by Chelsea to track their performance. Chelsea hoped this exercise might motivate students to set goals, reflect on their progress, and achieve at higher levels. Students continuously collected their work and assessments in the binders, and used that data to inform weekly check-ins about their learning. On Mondays, students identified reading, math, and non-academic goals rooted in the previous week’s results. On Fridays, they evaluated to what extent they reached that week’s goals and shared feelings about their efforts. Both Chelsea and students used the binders to become more familiar with individual strengths, challenges, and emotions.

Standard practices in reading included morning work, use of the Benchmark Assessment System from Fountas and Pinnell to determine student reading levels, independent reading, book clubs, and independent practice using online tools. In math, students routinely participated in timed multiplication tests, group and independent review tasks, individual online practice, exit tickets, and mid- and end-of-module assessments. Chelsea and her full-time instructional aide pulled individuals and small groups for personalized instruction during reading and math, and also during lunch, recess, and specials as necessary. On Fridays, students were released early while teachers engaged in professional development and planning.
Chelsea organized her practice to emphasize learning in reading and math, in keeping with her school culture. She also worked diligently to get to know her students. To encourage their continuous improvement, she modeled the ways she tackles challenges in her own life, and strived to communicate the importance of goal setting in the pursuit of lifelong learning. To push herself, Chelsea engaged in professional development, data collection and analysis, and personal reflection. She viewed participation in this study as a chance to analyze her practice in a new way, and hoped it would lead to the identification of next steps for herself as a teacher. For all learners, Chelsea believes “learning how you can access knowledge” and being “curious about the world” are essential for success (March 14, 2019).

Nikki

The first time I called Nikki, she didn’t pick up. My out-of-state number shares an area code with her venerated undergraduate institution, and she thought I might be a solicitor. Knowing those folks always call back, she (ironically) kept the line clear for me. Once we did connect, she generously made time and space for our work for months to come.

It was impressive that Nikki found opportunities for us to get together because, like most teachers, she wore many hats. Nikki served as the lead teacher in the primary grades at her school, meaning she supported others in their teaching, facilitated team meetings, contributed to conversations around curriculum and intervention, planned off-site visits to other schools and classrooms, and organized peer observations among her team. Nikki also was a leader at the school level, working as a member of the advisory council toward building-wide goals. Outside her charter, Nikki led a study group with other area teachers, something she has done repeatedly to encourage her learning and growth. In addition, Nikki is an avid reader for personal and
professional purposes, an occasional education blogger and frequent Twitter conversationalist, and a serial international Habitat for Humanity volunteer. She’s also a devoted dog mom.

Nikki attended religiously-affiliated institutions of higher education and taught in parochial schools as part of her educational training. In the decade she’s spent at her current charter, she has taught a variety of elementary school grades, and has led both mono- and bilingual classrooms.

**Nikki’s context.** Nikki’s school is located in a working class, majority Latinx neighborhood outside the city center. An expressway and interstate link the community to the rest of the city, its suburbs, and neighboring states; rapid transit and bus lines further enhance residents’ mobility. A range of local and national retail stores, restaurants, grocers, and services are available. An industrial area near local freight rail lines means a variety of jobs are available in the neighborhood, although many residents still leave the area for work. Green spaces, including a large park with outdoor recreation and sporting amenities, promote health and camaraderie, as do nearby indoor sporting spaces. The area is home to a variety of churches, a post of the American Legion, a public library, a nonprofit literacy center, and numerous educational institutions. There are two schools dedicated to early learning; public, private, charter, and parochial schools specializing in STEM and holistic education; and one higher education institution providing vocational training and adult continuing education. Residents rent and own a mixture of single-family homes and two-to-four flat buildings.

The charter school where Nikki works has been operating in an old Catholic school building for 15 years, although it did build an addition and undertake renovations to become compliant with the Americans with Disabilities Act. It sits next to the church it once supported and across from a funeral home in a residential area. The school is a stand-alone charter with an
extended school year and health and wellness mission. Students receive healthy meals, engage daily in an hour of physical education, visit a volunteer-built playspace during recess, and start every morning with a movement routine that typically includes yoga. Common areas of the building publicize recognition the school has received for being active and healthy. Colorful artwork adorns several walls, and resources, announcements, and information are posted in English and Spanish. A parent center/peace room on the lower level provides books, computers, and printers for adult use, and space for conflict resolution and decompression for students.

It was common to find volunteers working in classrooms during my visits to the school, and Nikki was supported by an instructional aide approximately half-time. Early release of students on Fridays allowed staff to gather for professional development and team meetings. Tensions among staff seemed to be easing after a recent, rocky push for unionization, and efforts were being made to build trust and community among students, staff, and parents. Increased parking restrictions near the school hinted that its new family engagement coordinator would need to work diligently to create lasting bonds between the residents holding neighborhood permits and the “outsiders” running the charter.

The complex dynamics at the school felt muted in Nikki’s classroom. It was positioned in the northeast corner of the building, meaning sunlight could flood the space from multiple angles. Storage for individual book bins, choice activities, and other supplies fit snugly under the north wall’s windows, while a portable white board Nikki utilized during morning meetings sat toward the center of the room. A projector and screen were nestled among windows on the east wall, which also hosted topical book bins, a student communication center, and another portable white board used during mini-lessons. The south wall was home to a large white board, anchor charts, bulletin boards, and a kidney table where Nikki worked with small groups. The
east wall was dominated by a chalkboard and samples of student work. Students sat at tables in
groups of four with individual supply bags hanging from their chairs.

**Nikki’s classroom structure.** Students in Nikki’s room cycled through a dozen
activities on a typical day. First up was community meeting. Nikki used these group gatherings
as an opportunity to both discuss students’ personal lives and reinforce reading and writing
strategies. Next, students had reading workshop. Nikki’s version was heavily influenced by the
work of Lucy Calkins. She often shared a mini-lesson with the whole class before students
participated in a variety of reading activities. Book bins containing texts at their individual
reading level enabled students to practice in their zone of proximal development. The
Benchmark Assessment System helped Nikki assess students’ reading level every trimester. She
used student performance to ascertain independent and instructional reading levels, and to form
guided reading and strategy groups. Nikki convened students at similar reading levels and with
shared challenges for personalized instruction, feedback, and guidance. Students below reading
level often met with an instructional assistant for additional support at another time.

Math followed reading workshop. Nikki’s school used the Ready Mathematics®
curriculum. After a mini-lesson, students again engaged in a variety of tasks to encourage
independent growth. While other students worked in an online program to practice math skills,
Nikki met with small groups for more personalized support. Students struggling in math were
paired with an assistant or interventionist as necessary. Weekly quizzes helped Nikki focus her
instruction on tricky concepts and strategies.

Word study using Words Their Way® and shared reading followed math. After students
had lunch and physical education, their only special, Nikki afforded them some quiet time before
writing workshop began. Also inspired by the work of Lucy Calkins, Nikki’s writing workshop
included a mini-lesson and shared and independent writing. Shared writing allowed Nikki to model writing and teach grammar at the same time. Independent writing time afforded her an opportunity to check in with individual students and provide targeted feedback on their work. Student work was graded using a rubric at the end of each unit. Four writing units were provided by the curriculum, and two—about animal research and letter writing—were developed by Nikki and her peers.

Interactive read aloud, science and social studies, and choice time finished the day. Science and social studies units typically were tied to content being covered in reading and/or writing. Nikki used choice time to chat with students about their interests and other non-academic topics, and build social-emotional learning skills for students.

Overall, Nikki organized her practice using established curricula and tools to encourage and monitor student progress. In the less structured parts of her day, she designed rewards and routines that allowed her to get to know students more personally. She strived to focus less on direct instruction so that she could serve as a facilitator of student learning. Nikki’s continuous improvement efforts were fueled by professional development, peer observation, collaboration, data collection and analysis, and personal reflection. She worked diligently to gather and respond to student data in real time to support young minds learning to read, write, and compute.
CHAPTER FOUR

USING DATA TO BUILD RELATIONSHIPS

In my time working with teachers, they repeatedly discussed the importance of knowing their students. From family background to hobbies, opinions, and preferences, teachers felt being acquainted with students’ unique personalities was necessary to meet individual needs. Meg explained,

For me it really comes down to having some sense of each of them, as enough of a sense of them as people, to be like, “I can tell that what’s happening in this moment…has nothing to do with what’s happening at school right now.” (May 20, 2019) When I’m working with students every day…there is a lot that I can fit into a narrative about them. (June 5, 2019)

It may be surprising to read about teacher-student relationships in a study about data use. Getting to know students could be categorized as “just good teaching,” separate from teachers’ efforts to collect, analyze, and interpret data. But participants’ frequent and consistent mentions of how much knowledge about students informed their work led me to closely monitor the types of data they discussed during relationship-focused conversations.

What I realized is that teachers made concerted, repeated efforts to gather student data from multiple sources in order to build familiarity and rapport. This relationship-building data—which included achievement data, observations of students, peer and student input, and collaboration data—assisted participants in making sense of student behavior and performance. The work would not be accurately characterized as teaching “from the gut.” In fact, armed with a holistic knowledge base, participants typically made evidence-informed, rather than emotional, responses to students.
Furthermore, teachers’ efforts to use data for other purposes likely would have suffered in the absence of their relationship building efforts. The context and nuance provided by knowing students well allowed for better understanding and diagnosis of challenges and strengths. Participants’ work suggests that data can be used to target instruction, as already suggested (Coburn & Turner, 2011), but that the ability to meaningfully differentiate might be mediated by a teacher’s relationship building attempts. I do not believe these uses and purposes of data use have been previously addressed in the literature.

The novelty of this emergent finding, as well as the potentially foundational nature of data use for relationship building, encouraged me to address it first in my findings in its own chapter. Because achievement data is prominently featured in teachers’ efforts to monitor student progress, it is not centered here.

Nikki

Nikki worked with first graders, so she created opportunities for dialogue in order to promote relationship building. I witnessed some of her strategies first-hand when I observed a session of summer school. After breakfast, Nikki gathered students on the classroom rug and asked if anyone had something to share. Multiple students were eager to talk about their “feelings, happenings, and excitements” (July 31, 2019), and receive questions and comments from Nikki and their peers. Later in the day, Nikki provided the students with choice time. She toured the room as students read, played games, and worked on their tablets. She already had explained that she views choice time as an opportunity to build relationships. “Sitting with them and building something with Magna-Tiles®, and [asking], like, what are they building, what are they excited about, what are they gonna do this weekend. Those opportunities to sit and meet with kids in small groups or individually” (May 25, 2019) were significant for Nikki. She also
paid close attention to students in day-to-day observations, and embedded relationship-building
data gathering in her behavior incentive system. Students reaching a certain threshold of table
points were rewarded with lunch and a movie with Nikki, again allowing for meaningful
interaction between student and teacher.

Chelsea

Chelsea worked with fourth grade students more able to communicate thoughts and
feelings in a variety of ways. Chelsea took advantage of that by not only observing students day
to day, engaging in dialogue with them, and making herself available before, during, and after
school, but also by creating opportunities for students and their families to express themselves in
writing. Writing conference tools were omnipresent in Chelsea’s classroom, allowing students to
reach out to and receive a response from Chelsea indirectly. Chelsea created surveys to gather
background information about, and feedback from, students. An introductory questionnaire
asked for parent perspectives on student personalities, interests, and preferences. A mid-year
reflection asked students to weigh in on what was and was not going well, and how Chelsea
could support them during the second semester. Details follow about each relationship-building
approach.

Writing Conference Tools

At any given time, there might have been several notebooks circulating around Chelsea’s
room. These notebooks were available for students to write to Chelsea with a public comment,
question, or concern. Private, personal issues could be discussed by placing a note in the
“troubles and problems” box. Chelsea explained that this box was often full and that she read its
contents every day before school. If she deemed the matter urgent or serious, Chelsea spoke
directly with the submitting student that day. Other issues would be responded to in writing or
via a quick chat as convenient. Students used the box to express conflicts and concern for others. On the day I was introduced to the box, students were frustrated by others’ behavior, confused by the symptoms of menstruation, and worried about friends. Chelsea used both the “troubles and problems” box and the writing conference notebooks to better understand students’ personal and interpersonal struggles and respond to individual needs.

**Introductory parent questionnaire.** At the beginning of the school year, Chelsea sent home a questionnaire for adults. Over one page, front and back, Chelsea asked families “how your child responds to stress, things teachers have done that work well with them, things you notice, what do they love, what do they hate. Basically, like, what do you know about your kid?” (October 16, 2019). Chelsea cherished the responses she received, and was often pleasantly surprised by how much information families shared. “Parents fill them! They, like, write all through, they attach extra pages,” she said (October 16, 2019). Chelsea read all the responses as they were returned, but also stored them for the year so that she could revisit them as necessary. “If I’m having trouble with a kid, if a kid is really struggling, I go back to what the parent said” (October 16, 2019) for guidance.

**Student mid-year reflection.** Chelsea also received guidance from the students themselves. For example, after what Chelsea felt was a rather turbulent second quarter, she created and administered a mid-year reflection for students. She asked them,

> What’s been going well this quarter? What’s not been going well? Who are you having problems with? What are the problems? Is there anything going on at home you want me to know about? Any problems you specifically need adult help with? And who would you pick if you were making your own group? (January 3, 2019)

She was interested in whether students shared her assessment of their recent experiences, whether happenings outside of school might be shaping classroom interactions, and how she might support students in having a more successful second semester.
Chelsea’s relationship-building data gathering practices reflected her stance that her students are “not just little test-taking machines,” but rather “little people” (March 14, 2019), who find themselves at a complex stage of development. Knowing that fourth grade is a year of significant academic, social, and physical change, Chelsea strived to know her students well and foster open, honest relationships with them. In response, students trusted her with their emotions, relationships, and health issues.

Meg

Meg’s students were in seventh grade and even more capable of reflection and communication. To build strong relationships with them, Meg made herself and her space available during and after school, created many opportunities to elicit verbal and written student feedback, and collaborated with peers in ways that broadened her student understanding. Structures within Meg’s school facilitated relationship-building efforts.

“I’m Around”

Students made an appearance at nearly every data collection session I had with Meg. Her open-door policy related to her time, space, and resources. You may recall that Meg taught a design class and housed many tools for STEM projects in her classroom. She also led the gardening club after school, made pancakes for students once a week, and corralled electronic devices for student use outside of class time. If students needed anything from scissors and seeds, to sustenance and software, Meg was prepared. She fielded student questions and concerns about clubs, assignments and projects, tests, and group dynamics in the midst of our interviews and observations, both in person and over the phone.
Office Hours

Meg was especially present during her office hours. While not required, Meg added office hours that coincided with students’ recess to her schedule. Nearly every day of the week, students could gather in Meg’s room to complete school work, access technology and other resources, and receive support from Meg. These sessions were rather popular: “I will have days where I have more kids in office hours than in any given section of class” (May 20, 2019). They also were voluntary, even on the one day of the week when admission was by invitation only. Meg explained, “That’s where I’ve been taking people who are failing. I’ll have generally a small crew…[so] I can give them more one-on-one attention” (May 20, 2019). Meg publicly tracked office hour attendance so parents could see whether students were taking advantage of the resource.

“Tell Me Something”

The warmth Meg communicated through her presence helped her encourage students to speak up. She sought their feedback throughout the year, in both scheduled and spontaneous circumstances. Planned opportunities included beginning-of-the-year daily feedback and continuous, weekly feedback during math labs and tribe meetings. At the beginning of the year, they had name tents, and in the inside of the name tent, they had to tell me something or ask me something or communicate with me, and I would write something back. [I think it set] up a space where it’s, like, “You can tell me if you’re having, like, a really bad day.” And I’m gonna be, like, “You know, I’m sorry to hear that, what can I do?”…but also, “We’re gonna keep doing this work together.” (May 20, 2019)

Ongoing, weekly, written feedback opportunities helped sustain teacher-student dialogue. Meg asked for input during the individualized math practice period called math lab, and during tribe meetings (Meg’s school recently had implemented a house system—à la Harry Potter©—called “tribes” to encourage relationship building among students and staff). Submission was
voluntary and feedback ranged from personal reflections to suggestions, such as “I think math labs should have more time for us to talk to each other” (May 20, 2019). Meg was relieved when students “got things off their chest” and tried to demonstrate that their voices were heard through personal interactions and structural change (May 20, 2019).

Meg also engaged students in spur-of-the-moment conferencing as necessary:

Sometimes that means pulling a kid into the hall and having a quick check-in with them. Sometimes it means just, like, crouching down by their table in a moment where it’s gonna be innocuous and just, like, asking them to tell me something about what’s going on. (May 20, 2019)

Regardless of the circumstances, Meg valued student input and allowed it to guide her practice. It “often informs how I respond to them in the future, and how I am more proactive around conversations with them” (June 5, 2019).

Gaining Peer Input through Collaboration

In addition, the tribe and grade-level team (GLT) structures in place at her school allowed Meg to get peer feedback about students in order to expand her understanding of them. At the tribe and GLT meetings I observed, core subject and special education teachers discussed problematic behavior and performance they had observed, sought colleagues’ input about the students involved, and brainstormed appropriate next steps in response to their consensual assessments (April 3, 2019). For example, teachers shared how they each were encouraging a student struggling academically based on their unique observations of that student. They also discussed who the best person was to contact within students’ families to discuss problems, as well as the best way to reach and communicate with families. In response to interpersonal conflicts in tribes, teachers changed seating arrangements to deter cliquish behavior. Teachers’ professional judgment and student achievement data were used to contextualize issues and reach solutions.
All of Meg’s work to show up for and communicate with students and peers resulted in observable closeness. With every knock on the door, question fielded, laugh shared, opinion sought, and response given, it was clear Meg had built the relationships required to respond to individual student needs. Her openness and commitment to hearing from others created a give-and-take culture in which, “I mean, they just— They talk to me” (May 20, 2019).

Summary

The teachers participating in this study similarly demonstrated their commitment to knowing their students, but approached relationship building in a variety of ways that acknowledged student capacities and school structures. Participants made themselves available to students during outside-of-class time—often working through their lunches and prep periods, and showing up before and after school—in order to make connections. Each observed students daily to get a sense of who they were in the classroom. They all gathered verbal and/or written student feedback to allow student perspective to inform their understanding. Parent and peer input further informed student narratives for some. All of these forms of data allowed teachers to build relationships and professional judgment that informed their instruction, interpersonal relations, and student support. See Table 4 for a summary of the kinds of information and strategies I observed teachers using to build relationships with students.
Table 4. Relationship-building Data and Strategies

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<th>Nikki</th>
<th>Chelsea</th>
<th>Meg</th>
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<tr>
<td><strong>Availability</strong></td>
<td>Summer school</td>
<td>Before school</td>
<td>Office hours</td>
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<td>During school</td>
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<td><strong>Choice time</strong></td>
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<td><strong>Community meetings</strong></td>
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<td><strong>Peer collaboration</strong></td>
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<td>Tribe meetings</td>
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<td><strong>Surveys</strong></td>
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<td>Introductory parent questionnaire</td>
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<td>Mid-year student reflection</td>
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CHAPTER FIVE

USING DATA TO MONITOR PROGRESS

One of a teacher’s primary responsibilities is to monitor student progress. Each year, students should gain knowledge and skills required to understand and complete increasingly sophisticated ideas and tasks. Most teachers have a variety of tools available to help them gain insight into student development. The purpose of this chapter is to detail the tools case study teachers used, how they deployed them, and how they applied what was learned in their practice.

The Teacher Data Use Survey (Wayman et al., 2016; see Appendix B), which all participants completed, asks teachers about the types of data available to them and how often they use each type. The instrument probes teachers’ use of state, periodic, local, and personal achievement data. Teachers participating in this study regularly used periodic (e.g., benchmark and interim assessments) and personal (e.g., classroom-based assessments, quizzes, homework, end-of-unit tests, and writing assignments) data to monitor student progress. It also became clear during observations and interviews that they relied on other types of data not included in the survey to do this work. Student feedback, peer collaboration, and student observation served as additional sources of input.

This chapter addresses all the data teachers used to monitor student progress during data collection sessions. Each section spotlights a different category of data used for this purpose, while acknowledging the wide variety of data sources teachers consider during this task. Primary data sources are called out in headings, while secondary sources are named throughout
the text. Examples of teachers gauging growth are featured to demonstrate how they used diverse data sources to respond to student needs.

**Achievement Data**

**Standardized Interim Assessments: NWEA MAP®**

The first kind of data Meg used during data collection was standardized interim assessment results. Meg’s school was required by its district to administer the NWEA MAP®. MAP® is a computer-based test in reading and math that is meant to help teachers understand student achievement and growth, and to differentiate instruction based on results. Meg’s seventh-grade students received scores in overall math performance, as well as sub-scores in operations and algebraic thinking, statistics and probability, real and complex number systems, and geometry. As a dynamic assessment, student responses inform the questions they receive during MAP® testing. If Meg’s students answered questions correctly, they were likely to see more advanced math that they might not yet have been taught. If they answered incorrectly, they might encounter skills and concepts covered before they reached Meg.

Before we dug in, Meg shared her feelings about the role and importance of standardized testing. Meg was concerned that the tests did not adequately represent what students know and can do, but she did appreciate their usefulness in detecting strengths and weaknesses among students.

I definitely have a lot of mistrust around standardized tests that can be very noisy. I get why [standardized testing] exists and I understand why [it] began in the first place, and that it was from a point of equity. But I think it’s unfortunate that at this point it is often used to punish students of color and districts that already have higher needs. That being said, I think you can look at trends. And I, for myself, like to look at…“Are there certain categories mathematically that students seem to be pretty strong with, and are there categories mathematically that students are struggling with more?” (December 17, 2018; June 5, 2019)
Meg’s feelings seemed in line with her context. Standardized testing was not centered at Meg’s school, although students did take district-mandated interim assessments twice a year, and the school’s rating was heavily influenced by whether spring-to-spring growth goals were met on those assessments. State test results were not discussed in my presence there. Likewise, I didn’t encounter any data walls or other public displays of student data in the building.

Despite personal and institutional skepticism about testing, Meg used test administration as an opportunity to both learn about student strengths and weaknesses, and engage in elective data collection, analysis, and interpretation. In addition to test scores, Meg took note of student questions during testing, captured student reactions to their benchmark performance, and created a spreadsheet to facilitate results analysis that was not spurred by existing reports.

During test administration, Meg circulated throughout the room. MAP®’s adaptive nature meant every student likely encountered a unique set of questions. Observing students as they worked allowed Meg to acquaint herself with the questions students were asked since a record of those questions was not available to her. Circulating also enabled her to respond to student queries.

**Common concerns during testing.** When students sought assistance with their tests, Meg took note of the problems, concepts, and language that caused concern. While she often was unable to answer students’ questions during testing, she did make plans to address common concerns in her instruction, class activities, and assignments. Meg frequently used instructional knowledge, a kind of professional judgment, to make sense of students’ difficulties. The following excerpt from our first think aloud illustrates how Meg applied combined achievement and experiential data:

As I was walking around while people were testing, I also was taking down notes of words and symbols that people really seemed to not know. Like, for example, square...
root. I realized I just hadn’t shown them the symbol for square root at all this year. So already today I have a Do Now, like, “This is a square root symbol, guys. This is what it does. Here are a couple examples, and now you go.” And then I have a whole bunch of other ones. Things like correlation, volume. (December 17, 2018)

Because the interim test often assessed students on topics that had not been covered in Meg’s classroom, keeping track of students’ questions helped Meg grasp which foundational and advanced topics she could address to help move students forward.

**Student feedback about testing.** In addition to the list of concepts and vocabulary Meg gathered during interim assessment, she also sought student feedback about testing when sessions closed. Students’ reactions were recorded in a notes column of a spreadsheet Meg used to facilitate analysis of test results. Despite having used the spreadsheet previously, this was the first time Meg captured students’ feelings about what went well and what didn’t, how they felt they did, and what they wanted to work on in response to their perception of their performance. Meg explained, “I sat down or, you know, kinda crouched down, and wrote things and was like, ‘What do you think? How are you feeling?’” (February 4, 2019).

**Meg’s MAP® analysis spreadsheet.** The spreadsheet where Meg recorded student reactions helped her engage in data analysis not facilitated by reports from the testing company and her school’s technology team. Meg’s file included student names and test scores by test area, as well as student feedback data. After data were entered, Meg used the tool to highlight areas of relative student strengths and weaknesses:

Anybody who was within, like, two or three points of meeting their spring goal, I did a light green. Anyone who is meeting or exceeding their spring goal, I have in this bright green. I was filling in red for the areas, uh, that needed the most growth. (February 4, 2019)

The highlighting allowed Meg to identify performance trends, as did her calculation of class score averages, her observations during testing, and student feedback.
Meg used her spreadsheet to consider results on two separate occasions during data collection. In December, roughly one-third of students had completed winter testing; in February, nearly all winter scores were available. Meg looked at whether individual students were meeting or exceeding their growth goals, and if there were obvious strengths and weaknesses within classes and across the grade. According to Meg, the school focused on students’ growth rather than achievement: “Generally we find that it’s not incredibly fruitful to be looking at national percentiles, because in general…our student scores are not very high in terms of national percentile. But we can…still be looking at growth” (February 4, 2019). Meg used her instructional knowledge and observations of students, as well as student feedback, to predict, contextualize, and plan her response to results.

**Individual performance analysis.** When considering individual performance, Meg noted students’ progress toward growth goals, areas of relative strength and weakness, and feelings about test performance. Together with her professional judgment, this information helped Meg identify individual student needs and plan to intervene (or not). In one instance, she identified an area for improvement for an otherwise well-performing student (all student names are pseudonyms):

I can already see some different students like Anthony performed above his goal in two areas. His work with number systems and statistics and probability were both above his spring goal, but his geometry work was significantly below. So, you know, that, for me, is a clue. Geometry is an area that it would be helpful for him to have more spiraling practice with and more building of concepts. (December 17, 2018)

In another instance, Meg reasoned about whether to be alarmed about a rather high-performing student’s slip in score. She took student feedback and her knowledge of the test into account when deciding how to proceed.

This student was very frustrated. His spring goal is a 251, which is high. I think that that’s objectively eightieth percentile, generally. He had a 236 in the winter and really felt
like he dropped. I don’t get too worked up if I see someone had what looks like a massive drop, because I think that can also just tell me that they had worked themself into a kind of a hole. (December 17, 2018)

For this student, one-time testing results did not corroborate long-term classroom performance, so Meg posited that the adaptive nature of the test did not allow the student to demonstrate what he knew. As noted above, students providing incorrect answers, especially early in the test, may find themselves being asked less rigorous questions that limit their ability to score highly.

**Group performance and trend analysis.** Individual performance analysis took place as Meg considered her test results, but she focused more on identifying trends within classes and across the grade. Her classroom observations and instructional knowledge—in addition to her score highlighting and calculation of averages—helped her make sense of the outcomes. This occurred even when the new evidence contradicted existing schema. In this instance, Meg’s familiarity with a class’s challenges contextualized their weak performance in geometry. This encouraged Meg to incorporate more review problems as a scaffold.

They really struggle with formulas for area. I keep putting triangle problems in, and some of my kids who generally are the most computationally proficient and tend to, like, remember various formulas and things that they did in previous years, they’re still struggling. So even some of the things that they might have known, they’re not remembering. And so that has to come up a lot more. (February 4, 2019)

In a class without clear strengths and weaknesses, Meg used her knowledge of students to reflect on how her perception of the group might need to evolve. The test data challenged her expectations.

This an interesting class, because in my mind they often feel like my highest class…but there is a huge diversity of student background and student comfort with math. I forget that when I’m thinking about them…[but] this is the group that had the fewest students meet their goal, their spring one. (February 4, 2019)

Meg was not surprised when a class struggled in statistics and probability or geometry. Pulling from her instructional knowledge she explained that those scores “end up being the
biggest weaknesses because we so often leave it ‘til the end of the year” (December 17, 2018).

To combat this trend, Meg worked with circles and inserted a statistics and probability unit early in the year. She generally felt that scores in these areas were better than in past years, but worked to understand one class’s continued struggles using what she knew about their preferences and past performance.

Statistics is more of an issue in this one. Also interesting because probability work is one of those things where there’s not one—and it’s true for lots of things—but it’s less procedural in a lot of ways. And, this is the cohort that I often do find to be more, “We wanna know how to do it. We want a procedure.” And so I wonder if, in some way, that could be related to, to some of this.

I also sometimes feel like I get less done with this cohort. Or, like, less sticks. And with probability being my second unit, when I was probably dealing with that even more, it may not have stuck in the same way that it did with some other students. Because they didn’t do probability before seventh grade. And so it is the— Those are the concepts that could fade away if they’re not using them. (February 4, 2019)

**Responding to MAP® data.** That fading away was Meg’s main concern after reviewing winter scores. She worried that students were not retaining information from previous grades and units, and that she hadn’t adequately supported them in retaining that information. Her instructional knowledge supported that interpretation.

For example, we have done very little in geometry. We have worked with circles and we’ve worked with scale copies, but we haven’t done much, anything, very minimal with angles. I haven’t spiraled a lot with the angles. So I haven’t exposed them or reminded them of it much this year. (February 4, 2019)

Meg’s goal, in response to this analysis, was to get students practicing, reviewing, and growing at their individual levels of mastery. She asked herself, “How do I continue to incorporate foundational pre-seventh grade [material] that I haven’t touched with them yet, and also the things that I have done with them, so that they are using it and not losing it?” (February 4, 2019). Her solution was to adapt her course structure to allow for additional review: “I’m gonna use [what I’ve learned from test data collection and analysis] to start spiraling things,
spiraling concepts, spiraling vocabulary in those places where it makes sense to fit that in” (December, 17, 2018).

Meg considered incorporating personalized Khan Academy exercises as homework to allow students to work at their zone of proximal development. She also mentioned the possibility of employing a strategy she had used in the past: pulling small groups based on test scores to work with in math lab, the class period designated for individual math practice. Ultimately, Meg decided to incorporate the review she felt the test performance warranted through First Fives, Math Missions, and homework. The analysis facilitated by her spreadsheet influenced the selection of review problem topics; professional judgment and peer input inspired the selection of review mediums.

**First Fives.** Meg used First Fives to engage students in mathematical thinking before diving into the day’s content. The short, five-minute exercises were meant to be fun and encourage creativity. Meg worried that addressing review issues during First Fives might compromise her ability to pull students into class, but she did apply what she learned through test-related data collection to provide some review through that tool (see the square root example above). “[I’m] making sure that students are having opportunities to use some of the language that is coming up that is good mathematical language to have” (December 17, 2018). Meg’s use of First Fives as review opportunities was limited due to students’ stronger-than-usual test performance:

more than half of my kids are within five points of where they need to be, where they should be in the spring to show growth, and 36% of them have already met their spring goal. So it was slightly cheerier results than it has been in recent years in the winter, because we did show growth. This doesn’t look like a massacre, which is what it’s looked like in some past years. (February 4, 2019)
Math Missions. Meg’s light touch on review in First Fives was balanced by her introduction of Math Missions. Meg created more than 30 Math Mission exercises. Most were focused on foundational skills that should be mastered by seventh grade, but some tackled more challenging skills. Students had to earn perfect scores for Math Missions to be considered complete. Completion of Math Missions was voluntary in the fall semester and became mandatory in the spring semester. Meg adapted the idea for Math Missions from a colleague whose students also required review of math concepts:

My colleague who’s doing something similar, …he’s been making it mandatory since the beginning of the year for eighth graders. He reflected, “Those people that were completing [Math Missions], those people that really, actually took it to heart and did a lot of them, they showed tremendous growth. And those people who were not doing those and not taking that, kind of that side time on it, they were some of the students that then correlated with not showing growth.” (February 4, 2019)

Meg created a tracking sheet to record which students completed which Math Missions on which days. That sheet was available to students and parents on Meg’s website. Meg used the sheet to keep tabs on student progress and identify trends in completion across students and classes. When reflecting on Math Mission implementation, Meg shared that she was pleased Math Missions allowed students to demonstrate mastery within their zone of proximal development while working toward goals she had for them as seventh grade mathematicians.

So that’s one of the things that I’m hoping will support on some of the stuff that…students, I, all of us cannot let slip around math basics. Like, “Oh, you haven’t practiced multiplying fractions in seven months? No wonder you don’t remember how fractions work.” Like, that’s not on the kid. So I’m trying to help with that a little bit. (February 4, 2019)

Homework. Meg also provided opportunity for continuous growth and review with a change in her homework procedures. A big believer in student choice, Meg had implemented a homework menu for students. She provided some required practice problems, as well as a menu of options for additional work. Students could choose their options based on their resources,
interests, and needs. Prior to the winter benchmark testing, all student homework from the menu was due on Friday.

Meg already had noticed that some students were struggling with the weekly format. Analysis of their work led to her to believe they were procrastinating and limitedly engaging with the content. “For some of my students, the week-long push—They don’t have the stamina or the executive functioning at this point to be successful” (December 17, 2018). Her pedagogical knowledge also made her question the utility of providing feedback about homework to students at the end of the week (i.e., often at the close of a unit). Student performance on the winter interim assessment—specifically, students experiencing rather large scoring decreases—further indicated to Meg that a homework tweak was in order.

In an attempt to ensure students meaningfully considered their work, received useful feedback, and practiced foundational skills regularly, Meg instituted a daily homework menu. Student choice remained intact but, rather than turning in all work at the end of the week, students began turning in one piece of the menu every day. Meg also used the results of the benchmark test to inform her homework menu options. She intended to focus on student struggles in both algebra and geometry by crafting homework problem options incorporating both angles and equations. “I think the more I can connect between them and across the units…that lets me kill two birds with one stone” (February 4, 2019).

**Summary.** While standardized interim assessment results were not the data most highly valued by Meg, she thoughtfully and thoroughly considered her students’ performance in order to monitor their progress in mathematics. She collected additional data through observations and student debriefing during test administration and created a tracking tool to facilitate analysis of individual and group results. Ultimately, Meg intuited from the interim test results that her
students would benefit from additional practice with foundational and recently-covered skills and concepts. She planned to touch on those skills and encourage student review through Do Now activities, newly created Math Missions, and a revamped homework protocol.

**Benchmark Assessments: Fountas & Pinnell Benchmark Assessment System**

While first-grade NWEA MAP® scores were not factored into school rating, teacher evaluation, or student promotion decisions for Nikki, she did use MAP® and other benchmark assessment results to help her identify priority students and instructional areas. She viewed standardized test results as valid, objective measures that should inform her work.

> There definitely is bias that comes into play, um, when assessing students. Data doesn’t tell you everything, but it does tell you something. There have definitely been kids over the years that have performed more poorly than I would have anticipated based on their classroom performance. ’Cause I do think sometimes we confuse, like, compliance for, um, understanding. (August 7, 2019)

One of the tools Nikki relied on to monitor student progress in reading was the Fountas & Pinnell Benchmark Assessment System (BAS). Her entire school used BAS to determine whether students were below, at, or above grade level in reading. The system provided books and assessments that helped teachers determine students’ instructional and independent reading levels. Nikki administered BAS running records every trimester to students who had yet to meet their end-of-year reading goals.

**Data collection.** During these one-on-one assessments, individual students read BAS leveled texts aloud while Nikki observed and took notes about their performance. She recorded whether students skipped, added, mispronounced, or misidentified words, and categorized the kinds of mistakes students made as meaning, syntax, or visual errors. The read-aloud portion was followed by a comprehension discussion, during which Nikki logged student responses to system-provided questions rooted within and beyond the text. For example, after a student read a
nonfiction text about koalas, Nikki asked questions like, “What did you learn about koalas in this book?” and “Do koalas remind you of any other kind of animal?” (March 5, 2019). I observed Nikki conducting BAS testing during the second trimester. She appeared to be an accomplished and polished administrator

Data analysis and interpretation. Based on first trimester results, guided reading group performance, and expected growth, Nikki entered into second trimester BAS administration with a decent sense of students’ current reading levels. To track whether the achievement, observation, and professional judgment data she had gathered had led her to the right assumptions, she kept a list of students’ anticipated and actual reading levels alongside individual running record results. When students did better or worse than expected with a selected text, Nikki re-started the assessment until a more appropriate text was identified. Once she completed a full assessment with an appropriate text, Nikki determined students’ new reading levels. As suggested by the BAS, Nikki calculated accuracy, fluency, self-correction, and comprehension scores for each student. She also timed students as they read with a stopwatch on her phone so that she could calculate how many words they read each minute (WPM). This metric was not suggested by BAS or used to determine reading level but, based on her professional judgment, Nikki viewed a WPM speed below 25 as an indication that a text was too difficult for a student. Nikki also was sure to include her reflections about student performance in each assessment, although no space for these thoughts was specifically provided. Together, these required and added, quantitative and qualitative, achievement and observational pieces of data all helped Nikki monitor student progress.

Responding to BAS data. Armed with students’ new reading levels, Nikki was prepared to form guided reading and reading strategy groups, update students’ individual book bins,
communicate with parents, complete report cards, and assign students to reading intervention as necessary. The notes she took about individual student performance would serve as a guide for skills and strategies to emphasize during small group guided reading instruction. They also informed parent conversations and often were included as comments on report cards.

In addition to periodic data, participants also used personal achievement data as a primary data source during problem solving and progress monitoring. The kinds of classroom data covered in this chapter include an end-of-unit math test provided by Chelsea’s curriculum, student work in writing, a teacher-created formative assessment, and other teacher-created and school-provided tools.

**Curriculum-provided End-of-unit Test: Standard Measurement in Math**

During our first session together, Chelsea analyzed results from an end-of-unit math test her students had taken just before winter break. Although she knew her students were struggling with the content, she administered the test so that she could better understand their issues. Her purpose was to “figure out where they are so I can address that when we come back” (January 3, 2019). This was a slightly risky proposition for Chelsea, as she knew the results would be reviewed by her principal in a weekly meeting with her grade-level partner. Students scoring below proficiency would be highlighted in red on a shared, school-wide data tracking sheet, which could have personal and professional implications for Chelsea. “I won’t lose my job or anything like that,” Chelsea explained, “but I’ll feel insecure in myself as a teacher. I’ll feel like I haven’t done my job well, and I won’t feel like I’m able to explain it to my principal” (January 3, 2019). Despite these risks, Chelsea proceeded to thoroughly consider and respond to her students’ work in our time together.
The test came from the Eureka Math® curriculum and covered standard measurement. Chelsea already had graded students’ individual tests using a provided rubric that rated responses on a 1-4 scale; a score of 4 represented mastery of the measured skill and an ability to apply it in novel contexts. Now she was interested in detecting patterns and themes across responses. With the test as her primary source for understanding student progress in measurement, Chelsea also pulled from her observations of students; her knowledge of her instruction, organizational context, and math standards; past student performance; and professional development training to plan instruction, group students, and reflect.

**Item-by-item analysis.** The first thing Chelsea did was count how many assessments she had in order to determine the percentage of students answering each of the six questions correctly (scores of 3 and 4 were counted as correct). Based on their scores, four students whom Chelsea already had identified for extra support during this module were considered outliers. Their work was reviewed separately from the rest of the class. She reviewed the responses of the remaining students to each question individually, starting with the question the most students got right and working her way through to the question with which students were least successful. For each question, she sorted student papers into piles of correct and incorrect responses, and looked for themes in mistakes and/or misunderstanding. She explained, “I didn’t used to do this physical sorting. I would get the numbers, and…kinda be like, ‘Oh, this many kids have As, this many kids have Bs’” (January 3, 2019). But for Chelsea, “that doesn’t really mean anything” (January 3, 2019). For her, sorting the physical papers helped her gain a nuanced understanding of students’ performance that allowed her to more adequately respond to student needs.

Chelsea’s review of an item requiring two conversions from quarts to pints demonstrates how she tackled this task. She started by relaying that she noticed many students didn’t
remember how many pints are in a quart when completing their calculations. She wanted to see if there were common errors among the seven students who answered incorrectly. She used students’ work and her content knowledge to diagnose mistakes when possible.

I have three kids who multiplied by three instead of multiplying by two. These two both got six, so they just forgot to add in their extra pint. I have no idea how this one got five, but this one got four. I’m guessing she just added the three and the one to get four. (January 3, 2019)

Based on these results, Chelsea decided “the majority of students would benefit from a quick re-teach where we model [conversion] again” (January 3, 2019). In the instances where she was unable to diagnose a student’s error, she planned to have them work the problem in front of her during small groups. She hoped this additional observation would help her pinpoint each student’s individual needs. Chelsea made these efforts so that she could move from knowing how many students got the questions wrong, to understanding exactly how the students erred and how she planned to address their issues.

At times, Chelsea used her observations and content knowledge to perform additional or alternative analyses. She credited her action research experience for helping her ask more and different questions of her data. For example, when one item included both addition and subtraction tasks, Chelsea probed the correct number of each type of task rather than assessing student performance on the item as a whole. She predicted there would be more incorrect subtraction responses because those tasks would involve a kind of borrowing that was unique to measurement. When her prediction was supported by student data, she planned to review subtracting mixed units with the whole class. Later, Chelsea took the time to work a particularly involved question herself so that she would fully understand what was being asked of her students. Multi-step word problems had been troubling the class all year, so she was on a continuing mission to build proficiency with them. These extra steps made Chelsea’s
interpretation of students’ performance faceted and precise in a way uniform analysis of responses might not have.

In some instances, Chelsea allowed her professional judgment to weigh more heavily in her assessment of student progress than individual test items or the grading rubric’s definition of success. For example, when one question required work that was “not actually something a fourth grader is supposed to be able to do, according to the standards,” Chelsea did not view success on that task as necessary for students to demonstrate mastery (January 3, 2019). When the assessment included fractions—which Chelsea knew she had yet to cover—Chelsea either explained to students what the fraction represented during test administration or removed the fraction from the assessment, and didn’t include that content in her analysis of student progress. Allowing her knowledge of the standards and her instruction to inform her work further enabled Chelsea to fine tune her understanding of student performance.

Throughout test analysis, Chelsea consistently recorded the names of students who struggled on a notes sheet she created. Next to each test item, she logged the percentage of students who were successful with the question(s), the names of students struggling with the item, and the challenges students encountered. She then grouped students with common issues into small groups for re-teaching. The note sheet would serve as a guide to move students forward with measurement after they returned from break.

**Responding to end-of-unit test data.** As Chelsea worked through her item-by-item analysis, she drew conclusions from the data that would direct subsequent teaching and learning. One of her overall takeaways was that students had at least a basic understanding of measurement as a whole. She remarked, “I didn’t have that many students that got 1s, which is good, because if they’re getting a 2 they’re at least grabbing the concept” (January 3, 2019). Her
interpretation of most of the student’s errors as minor made her optimistic that “there’s a lot of, like, kids who I think are really close to being able to tip them over into understanding it” (January 3, 2019). She also noticed that most students were successful with the test question most directly assessing the module’s key skill (i.e., converting one unit to another).

Where students did struggle, Chelsea planned for whole- and small-group re-teaching and re-testing. Whole group instruction was planned when many students struggled with the same issue (see, for example, the mixed unit subtraction discussion above). If an error was shared by a smaller percentage of the class, Chelsea planned for small group intervention. She intended to pull students, review relevant concepts and skills, administer an exit ticket comprised of problems similar to test questions, and count the exit ticket as a re-assessment of students’ understanding.

In preparation for re-teaching and re-testing, Chelsea thought about how she might update her approach the second time around.

When I’m looking at an assessment, I’m always trying to figure out, like, (a) what do I need to re-teach, but [also] what do I need to teach differently next time? What is the thing that maybe they didn’t have enough practice with? Maybe they need more explicit teaching around this thing, or even less explicit teaching, because sometimes it becomes so formulaic that if they don’t have a formula to follow they don’t know what to do. (January 3, 2019)

Chelsea did not make explicit, comprehensive plans for changing her instruction when we were together, but she did mention attempting a new hands-on demonstration of adding and subtracting mixed units, clarifying some of the new mathematical language introduced in the measurement unit, and revisiting the new skills introduced by the unit individually. The test had combined a large number of skills in single questions that students often missed.

Chelsea’s approach to end-of-unit test data analysis yielded a detailed record of student progress. Her item-by-item strategy was adapted from the data protocols used by her school in
weekly meetings between teachers and the principal. The questions she asked of the data and her analysis tactics also were influenced by her knowledge and experience. Perhaps most integral to the success of this task was her attitude toward data analysis.

For me, grading is...a means for recognizing both where your students are not understanding, and sometimes where your teaching is flawed. If they’re not understanding something, then my job is to find a way to get them to understand it. But I have to know what they don’t understand first. (January 3, 2019)

**Student Work: Opinion Writing**

Near the end of the school year, I observed Nikki grading some student writing. Her students had finished their unit on opinion pieces and she was using a rubric provided by the curriculum to assess their progress. Because Nikki knew first-graders often were unable to select their best piece of writing for assessment, she encouraged them to turn in all the opinion pieces they had developed. “The one that they give me is not always the best work, so I kinda look at, um, a group of their pieces and kind of judge from, from there” (May 25, 2019). This application of professional judgment and consideration of multiple samples gave Nikki a better understanding of students’ abilities.

As she read student work and assigned grades, Nikki pulled from the work, knowledge of her instruction, and knowledge of her students to help her make sense of what students produced, why they struggled, and how they should be graded. Rationales for the scores she assigned typically sounded like this: “She was really working hard to apply the mini-lessons...[but] I think there are probably some words that she could have used [from the word walls] that she didn’t. So strong in structure and development, a little lower on conventions” (May 25, 2019).

Nikki devised alternate or additional strategies to monitor progress for some students based on what she knew about that child. For example, Nikki planned an additional task to better assess an emerging bilingual student’s understanding of opinion writing principles. She
said, “I’ll have him read it back to me to see, like, what he was trying to do in structure and development” (May 25, 2019). She had observed the child working diligently to revise this piece but, because he was learning to speak English while he was learning to write, Nikki felt his composition most likely did not accurately convey what he knew. The same held true for a student with an Individualized Education Program (IEP). Knowing that the student typically, but not always, worked with a paraprofessional during writing, Nikki was uncertain whether the work she was reviewing was completed by the student alone or with assistance. She planned to connect with the paraprofessional to get a clearer picture of the student’s performance.

**Responding to student writing work.** In order to respond to the work she reviewed, Nikki primarily thought about how she could apply what she learned from opinion writing products to the final writing unit. One identified struggle that still could be addressed was writing conventions. “I really need to drill [conventions]. Like, they know them, but just applying them to their own writing is something that I definitely need to hammer home this last month of school...in writer’s workshop, shared writing and word study” (May 25, 2019). Nikki also hoped that she could make time for additional formative check-ins before grading the final unit’s writing products. “It’s easy in writing for kids to go too far without getting pulled back,” she said (May 25, 2019). In response, during the final writing unit, she hoped to read students’ developing work more frequently and spend more time in writing conferences with students.

**Formative Assessments: Math**

Toward the close of a unit on proportional relationships, I sat with Meg as she reviewed individual progress checks and provided feedback for students. Progress checks were administered at the beginning of classes to take students’ temperature on the previous day’s learning. On this day she was looking at two progress checks meant to help her understand
whether students could accurately graph plot points and recognize a proportional graph. Again, she used knowledge of her teaching and her students to help her make sense of answers and respond to needs. Her reaction to one student’s errors demonstrates how she analyzed written achievement data in context by also considering student feedback and observational data.

Now he is incredibly quiet. He’ll sometimes stick around to ask me a question after class. Today he stuck around after and was like…“I’m getting this, I have no questions for you.” And I was like, “Let me know.” Because I look at this, and it reflects that…he may have questions about plotting points and determining if it’s proportional. So he’s—Tomorrow he’s someone that I will be sticking to. Whatever group he is in for his partner work, group work, I will be by that group listening, and, you know, kind of pushing to have him speak up more, share what he’s doing so that it’s clear that he’s not just sitting through it and not necessarily absorbing what’s happening. (December 17, 2018)

Overall, Meg noted that students generally were able to identify proportional relationships. She was confident most were prepared for an upcoming end-of-unit test on related material. Several student errors, however, prompted her to observe or touch base with certain students (as described above), and remind all students that points do not need to be close together to represent a proportional relationship. Results also pushed her to incorporate number lines into upcoming Do Now activities and finalize her instruction leading up to the test. Achievement data from two progress checks and one group test, as well as student observations and feedback, pointed Meg to the few topics she would emphasize the next day.

Other Tools: Trackers, Gradebooks, and Binders

Tracking sheets. The use of tracking sheet for the monitoring of student progress already was introduced above. Meg created tracking sheets containing NWEA MAP® and Math Mission data. We also discussed one she made for a long-term student interdisciplinary project. These trackers typically lived as Excel® files or Google® sheets, but sometimes were forms carried around on a clipboard. Meg said, “If it’s something where I wanna make sure that I do
not let someone slide, I will make myself a tracking sheet. It’s kinda accountability to myself and accountability to students” (June 5, 2019).

In most instances, Meg used tracking sheets to keep tabs on who had completed certain tasks, as well as whom she had conferred with and when. Sometimes the tools could be accessed by a variety of stakeholders (e.g., Meg, her students, parents, and other teachers); at other times trackers were for Meg’s eyes only. That was more often the case when the tracking sheet was used to facilitate data analysis. With respect to her NWEA tracker, Meg explained, “It was there so that I could see, ‘Are there patterns that are going to impact how I wanna do my First Fives? Are there patterns that could impact who I might pull for small groups?’” (June). These personalized, teacher-created tools provided Meg additional insight into student progress in a medium and language she valued. “So often, being able to see it just helps [me] see that story a little bit more clearly. And when I can…put it in colors where I need colors and things like that, those things end up being useful” (June 5, 2019).

Gradebooks. Both Meg and Nikki used school-provided gradebook programs to monitor student progress. Rather than treating the gradebook as the authoritative source on a student’s story, these teachers used it as a complementary guide to understanding needs and growth. Both entered formative and summative grades in a consistent manner to facilitate data analysis. Meg explained, “I can see, like, where they were consistently getting a [low] score…and I can also look down and see the average scores for the class, and, like, were there things that people are struggling with overall?” (June 5, 2019). Nikki shared a similar sentiment: “[It’s] for me to see, like, what was this quiz on? Did they, like, totally bomb it, did they mostly get it, or did they totally master it?” (March 1, 2019).
Gradebooks also served as a trusted source of hard data to corroborate teachers’ professional judgment. For example, at several team meetings where teachers were discussing students requiring intervention, gradebooks were consulted to both validate that intervention was necessary and pinpoint which skills or concepts required support. Gradebooks were viewed as reliable records of mastery “that [let] me make sure that what I’m saying about a student is data-based” (June 5, 2019).

Student data binders. During the 2018-2019 school year, Chelsea decided to pilot the use of student data binders in her classroom. When the initiative began, its primary purpose was to help students and Chelsea keep track of hard data. Over the year, however, it developed into a tool for monitoring progress toward academic and non-academic goals, and teaching metacognition. Creating and reviewing the binders helped Chelsea get to know her students and their needs better. Students identified quarter-long, overarching goals tied to their NWEA MAP® reading and math scores, weekly goals rooted in classroom assessment performance, and weekly non-academic goals, while reflecting on their progress and requesting additional support. Chelsea was pleased with the binders’ impact. “Never before could I have told you, like, what each kid’s big goal was for, like, reading or math” (January 3, 2019).

Most of the progress monitoring supported by the binders relied on students’ weekly reflection sheets. At the top, students recorded their “big” NWEA goals. Underneath, they identified their weekly reading and math goals in response to classroom assessment performance. “When I give them tests now, I write down what the skill is on their answer sheet, um, so that then when they get this back, they can see…what skill they’re having trouble with” (March 14, 2019). If students were performing well and could not detect an area of weakness, Chelsea helped them think of challenges they may have faced the previous week. Next to their weekly
goals, students articulated how they would work toward their goals during class activities and at home. Anchor charts reminded students of goal-meeting strategies.

At the bottom of the goal sheet, students named a non-academic goal and shared how, when, and where they would work to meet it. Chelsea believed it was important for students to realize data is more than just numbers, and that goals can be set and knowledge can be gained in all aspects of their lives. The very last prompt on the page gave students an opportunity to request additional support, which they heavily utilized to Chelsea’s delight. “I’ve never had kids be like, ‘I need some more worksheets. I’d like you to give me more work. I would like for you to give me extra practice at these things. I want you to quiz me’” (March 14, 2019). She gave an example of a student requesting more practice directly after finishing a test in lieu of enjoying free time. “To me, that’s what I want from kids. I want them to be super excited about learning. And know how to push themselves” (March 14, 2019).

At the end of the week, students reflected on whether they made progress toward their goals, what worked and what didn’t during the week, and any support they may need to move forward. If Chelsea noticed a student saying they were unable to progress, she conferenced with that student individually or in a small group. Overall, however, Chelsea was surprised to see that students were feeling rather sanguine about their efforts. She said she also felt they were working hard to meet their goals based on their improved testing performance and level of honor roll attainment.

**Responding to student data binders.** As noted above, Chelsea considered herself more familiar with students’ individual learning journeys as a result of binder implementation. “More than anything, it’s made me more aware of those details, so…I can speak to each kid and each kid’s, like, challenges and struggles, because I know more of who they are” (March 14, 2019).
Since she couldn’t always hold nearly 50 weekly goals in her memory, she posted students’ goals as a source of support for herself and accountability for them. When students seemed idle, she could help them find focus by asking questions like, “What about your reading goal? What have you been doing for nonfiction this week? Or what did you say you were gonna do?” (March 14, 2019). At those times and others, Chelsea felt better able to encourage and inquire with students. Using student data binders also positioned her to better meet student needs because students became better at articulating those needs. “Doing the data binder and tracking all that stuff has helped them to be able to verbalize the areas where they’re struggling, and also what they can do to support themselves” (March 14, 2019).

Chelsea’s implementation of student data binders allowed both her and the students to monitor progress, academically and non-academically. The initiative surpassed its original intent to become a meaningful tool for growth and reflection. Chelsea explained, “I thought that the data binder would be more tracking, but what it really has become is more of a collection place and, like, a thought place, which I actually think is really important for the students as well” (March 14, 2019). In tandem with binder use, Chelsea noticed herself becoming more in tune with students’ individual triumphs and struggles, and more targeted in her response to students as a result. She also witnessed students growing in their abilities to identify problems, set goals, and solve problems. She saw them “use all of the different inputs—whether that’s test scores or experiences in the classroom or feedback they’re getting from adults—…and then create out of that, thinking about how they can improve as learners” (March 14, 2019). For all involved, use of the binders contributed to being able to “look at the information you have and draw conclusions from it, and use it to push forward thinking” (March 14, 2019).
Student Feedback

Data Binders

The preceding section detailed how student feedback in data binders helped Chelsea monitor their progress in reading, math, and non-academic areas. The reflection sheet she designed helped students take stock of whether they felt they were meeting their goals. Chelsea reviewed their responses and checked in with those expressing concern about their growth. She also responded to their requests for extra assistance.

Dialogue Tracking

Meg, too, relied on student feedback to monitor progress, but for a different purpose. As mentioned earlier, Meg approached her work through an equity lens. She conducted action research investigating methods for equalizing student status in her classroom in a previous school year, and continued to work toward an egalitarian culture in 2018-2019. One of the methods she identified for measuring equity was a dialogue tracker. The first version she implemented was developed by the middle school math teachers as a team as part of an inquiry into helping students discuss math meaningfully and equitably. The teachers used that tracker to “catch” students contributing and award them points for their efforts. Later, Meg observed small- and whole-group conversations, noted patterns and concerns, and intervened as necessary without assigning discourse grades. In response to feedback from the eighth-grade math teacher indicating students still couldn’t talk to each other productively, Meg developed a new version of the tool during one of our data collection sessions to pilot in one of her classes. This version’s purpose was to help Meg identify teams needing extra interpersonal support so that she could coach them through group work challenges.
The new tool focused on group assessment of group dialogue. Knowing that she could never attend to all the conversations happening in her classroom, Meg decided to allow students to assess their own efforts. She wanted to avoid situations where students might feel, “We were having this really great moment and you missed it. You saw us maybe in a moment of, of a swamp, but, like, there was this really cool thing that happened” (February 4, 2019). The new student-driven tool aimed to force students to work through communication issues, and provide opportunities for Meg to coach students through challenging interactions. Students were asked to reflect on their use of math-based dialogue and rate themselves on several hallmarks of productive math talk that they had composed collectively.

**Responding to dialogue tracker data.** Meg planned to provide written feedback to student dialogue trackers each day. She imagined a praise might sound like, “I really saw Gabrielle had amazing written work today. Make sure that you’re actually looking at what this person did” (February 4, 2019). A push might be, “Cameron never spoke. Something to be aware of” (February 4, 2019). Meg also intended to share an analysis of class-wide strengths and struggles at the end of the week, and to provide tips for improvement. Mostly, Meg hoped to utilize the dialogue tracker as a coaching tool. Shifting the responsibility of documenting dialogue to students would likely enable her to respond to more issues in the moment. Instead of taking copious notes, Meg envisioned herself having more time for “conversation and modelling, and saying, ‘Here, I’m using this language, now I’d like you to use this exact language’” (February 4, 2019) as issues arose. If the trackers indicated little improvement over time, Meg was prepared to investigate other interventions to promote equity in student input and influence.
Individual Conferring and Small Group Work

Chelsea’s and Meg’s tool-generated student conversations represent unique, specific ways to let dialogue inform progress monitoring. More broadly, all the participants in this study gathered student feedback about where they were through individual conferencing and small group conversation. Teachers’ more personal student exchanges revealed students’ assessments and explanations of their own performance.

As has been noted above, Meg used her office hours to facilitate conferencing. During this time, students could be counseled individually and supported in completing school work. Meg tracked office hour attendance and posted the information online. Doing so not only created a record she could analyze for patterns in attendance, but also a tool informing families of how often their student sought help. Making the data public created opportunities for Meg and families to work together in monitoring student progress.

While Chelsea did not have scheduled office hours, it seemed she was meeting with students almost constantly. As she discussed her responses to various types of data, I noticed she often remarked she would speak to students individually or in small groups before moving forward. I once asked how she made time for all this conferring. Her response was, “I sit with kids during lunch and recess and all of my preps. When they’re in art and music, I’ll pull, like, two kids at a time. And then I do my small groups [during reading and math]” (March 14, 2019). All this group work was supported by Chelsea’s full-time instructional assistant, allowing Chelsea to spend more time in one-on-one conversations. As discussed above, Chelsea appreciated hearing from students in their own words how they reasoned through problems, why they felt they were struggling, and how they needed support. Chelsea used all of that
information to tailor her response to student needs. For her, small groups were “where I get the most, like, bang for my buck out of the things I see” (January 26, 2019).

**Collaboration**

Teachers’ interactions with others also helped them monitor progress. Whether chatting with an individual or small group of peers, meeting in formalized teams, or coming together as a school, collaboration efforts provided participating teachers with additional, useful insights, tools, and strategies.

**Collaboration with Individuals and Small Groups**

Touching base with colleagues helped teachers monitor student academic and behavioral progress. An example of academic monitoring through individual collaboration comes from Meg’s search for strategies to encourage student review. She discussed her issue with a colleague, and learned about a recently introduced assignment he felt helped students keep skills fresh. Meg instituted a version of that tool and called it Math Missions. Math Missions helped Meg understand which foundational math skills students had mastered and forgotten. An example of small-group influenced behavioral monitoring comes from Chelsea’s desire to audit actions outside her class. Chelsea had received reports about poor student behavior in specials, so she worked with her students and specials colleagues to devise a system for addressing the issue. Together, they designed a feedback form that was completed by specials teachers at the end of each class and tracked publicly in Chelsea’s classroom. A reward system was devised should behavior improve. This collaboration allowed Chelsea to understand how disciplined students were with others.

A type of collaboration that helped all study participants monitor progress consistently over time was special education partnerships. Meg connected weekly with special education
teachers in grade-level team meetings. Nikki worked with interventionists regularly to support students in reading and math. Chelsea had a one-on-one meeting with a special education teacher once a week. She greatly valued his assistance in interpreting data for students who were pulled out of her classroom. “I have to rely a lot more on what the special education teachers tell me [for special education data interpretation] because….I’m not in their brains in the same way [that I am with the general education students]” (October 16, 2019).

**Collaboration in Teams**

Teachers’ interactions with their teams also contributed to their ability to monitor student progress. All participants were part of professional learning communities (PLC) convening weekly: Meg participated in grade-level team (GLT) meetings, Chelsea met with her grade-level partner and principal, and Nikki led primary grade meetings. All-staff events took place at varying intervals across schools.

**Middle school GLT: Adding perspective for more holistic understanding.** At the GLT I observed for Meg, the teachers had been tasked with identifying students for intervention and possible retention by their administrator. Teachers considered both quantitative and qualitative evidence while crafting their recommendations. Meg contributed to the conversation by discussing students’ math performance and classroom behavior. As other teachers outlined their concerns, she gained a stronger understanding of students’ overall progress.

**K-8 school-wide data meeting: Understanding student and student body performance.** A school-wide data meeting at Nikki’s charter also shed light on how collaboration can help teachers monitor progress. In this instance, an outside expert from a data services company facilitated a conversation about students’ winter NWEA MAP® results. All classes’ data were shared publicly, allowing teachers to follow along as the speaker highlighted
areas of strength and concern. The discussion included predictions about how students’ scores might impact the school’s district rating. The speaker pointed out that most students had not yet reached 50% of their projected growth for the year, helping the teachers understand what kind of progress was necessary over the rest of the semester in order to improve their rating. After that conversation, teachers broke into grade-level teams to identify students most in need of support and begin crafting responses to results. Nikki used the time to support her primary grades team in analyzing and interpreting their data, encouraging them to compare their perception of student performance with NWEA results. Together, they used the school-wide meeting to enhance their understanding of and respond to interim assessment data in the context of students’ classroom performance.

In both instances highlighted, teachers came together to help each other make sense of student progress. Tools like gradebooks, tracking spreadsheets, and reports supported their conversations, and sharpened teachers’ sense of students’ and schools’ performance. The interactions were instrumental in expanding holistic understanding of student needs and capacities.

**Observational Data**

Teachers also rely on their observations of students to assist in monitoring progress. At times, as Nikki pointed out, observational data may be the data best positioned to express what students know and can do. “If we’re going to assess, ‘Can they read?’, like, we should be asking them to read, like, not necessarily answering [paper and pencil] questions” (August 7, 2019).

Because I typically observed and interviewed teachers when students were not present, I had few opportunities to witness how teachers utilized observation for progress monitoring. In two instances in particular, however, I gained insight into how this process worked.
In a summer session where Chelsea reflected on the previous school year, she explained how observations informed her sense of students’ self-management and relationship and decision-making skills. After experiencing many disruptive, time-consuming conflicts between students in 2018-2019, Chelsea wanted to formalize social and emotional learning (SEL) in her classroom moving forward. She planned to have her instructional aide take a more hands-on role during recess, helping students address issues before they spilled into the classroom. Chelsea also hoped to introduce SEL games and activities to help students improve interpersonal problem-solving.

In our final interview, Meg described how she used observations to interrogate the meaning of other types of data that surprised her. The example she provided centered on a student whose performance on a written assignment exceeded her expectations. In order to determine whether she had previously underestimated the student’s abilities, she planned to observe them. “In those moments I just have to do further investigation. I don’t wanna just dismiss it. I also don’t wanna be like, ‘Oh, they seemed like they didn’t know how to do this at all, but clearly they’re good, they’re great’” (June 5, 2019).

Summary

As may be expected, teachers relied on an abundance of data types and sources to monitor student progress during this study. In this chapter, I discussed the numerous achievement data products teachers used to understand performance. These included periodic and personal achievement data like MAP®, BAS, end-of-unit test, student writing, and formative assessment results, as well as other tools like trackers, gradebooks, and binders. I then shared how non-achievement data such as student feedback, collaboration, and observation could to jumpstart consideration of growth. Throughout the chapter, I pointed to teachers’ tendency to
use multiple kinds and types of data at once. Their combination of data sources allowed them to develop deeper, more nuanced understanding of student performance and challenges, with quantitative data often used to determine whether and where problems existed, and qualitative data used to contextualize why and how those challenges arose. Using data for progress monitoring allowed teachers to respond to student needs through tailored and re-imagined instruction, new and updated measurement tools, student grouping, student observation, coaching, conferencing, and referral for services. See Table 5 for a summary of the kinds of data teachers used to monitor student progress in the instances highlighted in this chapter, as well as the responses teachers had to that data use. The data sources anchoring each example of data use appear in bold text.
Table 5. Data Used and Responses Made while Monitoring Student Progress

<table>
<thead>
<tr>
<th>Types of Information Used</th>
<th>Achievement Data</th>
<th>Student Feedback</th>
<th>Collaboration</th>
<th>Observation</th>
<th>Professional Judgment</th>
<th>Responses</th>
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<td><strong>NWEA MAP® scores</strong></td>
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<td>MAP® analysis</td>
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<td><strong>Current BAS results</strong></td>
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<td>Previous BAS results</td>
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<td><strong>End-of-unit test results</strong></td>
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<td><strong>Student writing</strong></td>
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**Responses**
- Stronger emphasis placed on review
- Changes in course structure
- Formed guided reading and strategy groups
- Updated book bins
- Communicated with parents
- Referred students to reading intervention
- Whole and small group re-teaching
- Re-testing
- Changes to instruction
- Observation of specific students
- Emphasized writing conventions in next unit
- Planned for additional formative assessment and conferencing
### Types of Information Used

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<th>Achievement Data</th>
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<th>Collaboration</th>
<th>Observation</th>
<th>Professional Judgment</th>
<th>Responses</th>
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<tbody>
<tr>
<td>Formative assessment</td>
<td>Comments after class</td>
<td>During group work</td>
<td>Knowledge of instruction</td>
<td>Knowledge of students</td>
<td>Observed and conferred with specific students</td>
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<td>Re-taught</td>
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<td>Reviewed</td>
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<td>Student data binders including MAP® and classroom achievement data</td>
<td>Reflection</td>
<td>During group work</td>
<td></td>
<td>Provided students additional practice</td>
<td>Individual and small-group conferencing</td>
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<td>Goals</td>
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<td>Better understanding of student learning trajectories</td>
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<td>Dialogue tracking</td>
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<td>During group work</td>
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<td>Coaching</td>
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<td>Modeling</td>
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<td>Student feedback</td>
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<td>Observation of specific groups and students</td>
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<tr>
<td>Individual and small group conferencing</td>
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<td>Communicated with families</td>
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<td>Tailored instructional responses to individual needs</td>
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<tr>
<td>Vertical, with one peer</td>
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<td>Change in course structure</td>
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<tr>
<td>Horizontal, with multiple peers and students</td>
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<td>New behavior monitoring initiative</td>
<td></td>
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<tr>
<td>Gradebook</td>
<td>Horizontal, in grade-level team</td>
<td>Across classes</td>
<td></td>
<td>Recommendations for intervention and retention</td>
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### Types of Information Used

<table>
<thead>
<tr>
<th>Achievement Data</th>
<th>Student Feedback</th>
<th>Collaboration</th>
<th>Observation</th>
<th>Professional Judgment</th>
<th>Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAP® results</td>
<td></td>
<td>Horizontal and vertical, in whole school and primary grade teams</td>
<td>In classes</td>
<td>Knowledge of district rating system</td>
<td>Identified priority students for intervention</td>
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<tr>
<td>External data specialist</td>
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<td>Student behavior</td>
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<td>Planned for formalized SEL instruction</td>
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</tbody>
</table>
As the previous chapter demonstrates, teachers rely heavily on progress monitoring data to inform their instruction. Understanding what students have and have not mastered and why leads teachers to change and tailor instruction, alter class assignments and structures, and confer with students individually and in small groups. Having already discussed numerous instances of teachers adjusting their instruction in response to achievement data, I now will center additional kinds of data teachers collect and analyze to hone their craft. Examples include teachers considering instructional feedback, observations, and peer input to inform and improve their instruction. Building blocks of teacher professional judgment, including professional development, action research, personal reflection, and knowledge and experience will also be addressed.

**Instructional Feedback**

One of the teachers in the study benefited from instructional coaching, during which she received feedback from her administrator and a former math teacher about her work. Coaching from the administrator was general and focused on Meg’s teaching goals. Coaching from the teacher was targeted at content-specific pedagogy.

**General Coaching**

Meg and her principal tried to meet every two weeks during a prep period for general coaching. Before each session, the principal intended to observe Meg’s classroom. The
principal took notes during the observations and coaching sessions, and then shared them with Meg. The notes often included action steps for Meg based on their discussions. Meg kept these notes handy in her email account so that she could easily reference strategies they had devised to respond to student needs.

In the session I observed, Meg and the principal discussed strengths and challenges related to Meg’s instruction and classroom management. The administrator asked Meg about what she felt was working and what she was noticing. She followed up with probing questions in response to Meg’s replies. When appropriate, the administrator pulled from a recent observation in Meg’s classroom to offer support for her statements, and to provide suggestions to, or ask questions of, Meg.

The discussion was wide ranging. They began by talking through Meg’s shift to multi-day testing, which was inspired by a co-worker. The principal had Meg walk through the details to better understand the strategy’s goals and tenets. Next, they addressed the extent to which Meg’s students were helping each other access and comprehend content, something Meg had been working to improve. The principal told Meg she noticed students expressing less angst about asking for help, a shift she attributed to Meg’s consistent demonstration that answers would not be given and attempts at mastery must be made.

That conversation was followed by a check-in on Meg’s dialogue tracking, which supported her efforts to create an equitable classroom environment. Meg asked the principal to watch for whether she was making different instructional or conversational moves in classes with less parity during the next observation. Student conferencing was discussed next, with the principal congratulating Meg on her strategic approach that involved modeling, and teaching and affirming students, while checking for understanding.
Lastly, the pair talked about student note-taking. Because Meg’s students “created” their textbook in class by collecting prepared materials and taking notes, this practice was of high importance. This was the area where the principal most challenged Meg to try new strategies to ensure student success. Meg felt repeated reminders were getting annoying, so the principal pointed to opportunities to signal to students to take notes based on her recent observation. She also provided an example of the language Meg could use in that signaling.

While this type of session could have been viewed as an intimidating accountability exercise, it instead felt like a welcome opportunity to reflect on Meg’s practice. Meg shared openly about her concerns and allowed the principal’s feedback to inform her work. Items addressed in the coaching log were items Meg discussed with me during our observations and interviews, demonstrating that the instructional feedback she received through general principal coaching helped shape her response to student needs.

**Content Coaching**

In addition to general coaching from her principal, Meg sought input about her practice from a trusted colleague. “It’s been great because she has a math background in a way that my coach, principal, does not,” Meg explained (May 20, 2019). This coaching also involved observation of Meg’s instruction and debriefs, but the activities were less formalized than Meg’s principal coaching. Meg said her content coach often emailed her with questions and resources. Together, they were strategizing about how Meg could apply the Teaching for Robust Understanding (TRU) framework in her classroom. In accordance with her equity goals, Meg used her content coach’s feedback to consider how she might encourage student agency and ownership over math content.
In both cases highlighted, Meg allowed feedback about her instruction to inform her practice. General coaching from her principal was embedded into her school’s schedule and routines, while she elected and arranged for additional content coaching. The general coaching helped Meg reflect on her strengths and weaknesses from her principal’s perspective, and to apply strategies suggested by her principal to meet her stated instructional goals. The content coaching provided Meg with feedback from a former middle school math teacher leader who had become a teacher educator in Meg’s graduate program. Their discussions helped Meg think about how to better create a powerful learning environment for students. These collaborations demonstrated Meg’s willingness to incorporate thought partners into her work.

**Observation**

We already have displayed how teachers’ observations of their students support relationship building and progress monitoring. We also have discussed how observation influences instruction during the progress monitoring process. Additional types of observations helped teachers reflect on and update their practice during this study. Nikki’s experience observing peers within and outside her school reveal how watching someone else work can influence your own methods.

**In-house Observation**

In her role as lead teacher of the primary grades, Nikki spent time observing her school peers to provide feedback about their instruction. In past years, she also observed a kindergarten teacher to learn more about applying Reggio Emilia principles in the classroom, “looking at how students, um, directed their own learning in the classroom, and some of the collaborative projects that she was doing with her students” (August 7, 2019). Nikki said these observations “led me to incorporate more choice time and play in my classroom” (August 7, 2019). They also resulted in
more trips to a nearby nature playground for science instruction, and several collaborative art projects.

**External Observation**

As part of her role on the school’s leadership council, Nikki also arranged for peers to observe at other schools. When she was aware of good practice happening elsewhere, she set about “connecting people with schools or with people that I think would be helpful to whatever it was that they were trying to observe” (August 7, 2019). Nikki was interested in observing reading and writing workshop at one school in particular. The school’s principal had been Nikki’s professor during one of her graduate programs, and Nikki was eager to see the program the principal described with her own eyes. She invited other interested teachers in her school to join her. After their visit, they debriefed about “what we saw and things that we would wanna try, and what we saw as some of the challenges to implementation here” (August 7, 2019). Participants valued the experience, and Nikki reported they were determined to “continue to get out of our bubble as much as possible moving forward” (August 7, 2019).

These opportunities to observe other teachers allowed Nikki to see appealing ideas put into practice. They also empowered her to make changes in her own work that she may not have otherwise made. While she hoped to embark on data-gathering observations more frequently in the future, Nikki was grateful for the time and resources her school provided to make peer observation possible.

**Peer Input**

In addition to collaborating with peers at their and other local schools, participants also reached out to their personal networks and the broader field for input. The best example of personal connections influencing practice came from Chelsea, who knew she could always count
on her mom to share some “oldies but goodies” (May 2, 2019) from her 42-year teaching career. To access information from more distant sources, participants frequented online communities. Chelsea mentioned using tools she found on Teachers Pay Teachers, and Meg was a self-described lurker on Twitter. When I observed her grading a group test, she explained that the answers were written in different colors because of an idea about equity of workload she saw on the platform. Later she explained that an update to her progress checks was also inspired by a teacher’s tweet.

Professional Development

More key to teachers’ evolution, however, was their significant investment in professional development. As mentioned in the introductory chapter, both Meg and Nikki had earned graduate degrees to enhance their teaching. Meg credited her program with helping her approach teaching with an equity lens and make a commitment to critical reflection. Nikki and Chelsea had both earned National Board Certification, and credited the process with building their capacity to evaluate their own practice. When I was working with the teachers, they were reading books, attending workshops, and serving in leadership roles to keep themselves moving forward.

Books

Teachers’ professional development texts focused on pedagogy, leadership, cultural competency, numerous content areas, and specific instructional strategies. In one instance, the book being read was part of a school-wide teacher book club; in all other cases, teachers had sought out books on their own. Nikki was such an avid reader that she had reviewed hundreds of titles on Goodreads; she also easily identified at least 10 books that meaningfully influenced the way she taught reading and writing.
Trainings

In terms of workshops, teachers were participating in school-based training in pursuit of school-wide goals, as well as seeking outside opportunities to attend to personal interests. They each mentioned conferences they had recently attended, with Meg commenting that one had an immediate effect on her instruction. “I just was at a conference last weekend and…revamped my Do Now structure based on that,” she said (February 4, 2019). Rather than using her opening First Five activities primarily for review, she decided to engage students in novel problems with multiple solutions instead. Meg believed this shift would encourage early participation from a wider variety of students and set the tone for a day of productive math learning.

In addition, Nikki attributed updates in her practice to things she had learned at up to week-long trainings at Teachers College over the years. Meg was planning to spend three weeks of her summer at a math camp she had previously attended because of the immense value she placed on the experience:

I find that often my most practice-changing, like, moments of energy are when I’ve had a chance to, like, sit down with math teachers. Whether it’s talking through a text with each other, um, or working through a protocol for analyzing a lesson, or…actually doing a mathematical task and talking about that. It’s having things to compare…and say, “OK, this is where I am, and this is what I’m seeing, and this is what I’d like to incorporate.” (May 20, 2019)

Leadership Roles

These teachers also served in numerous leadership capacities at their schools and in the broader education community. We’ve already mentioned that Nikki served as primary grade lead teacher and described some of the ways that work influenced her practice. In addition, she was leading a study group with other local teachers from a variety of schools to learn more about cognitively-guided math instruction. It was her fourth study group to date, having already
participated in groups about word study, writing workshop, and purposeful play. “I love it,” she said (August 7, 2019). “I…pick a topic that I know enough about that I can, like, facilitate discussion, but there’s also a lot for me to learn” (August 7, 2019). Nikki’s study groups were centered around an anchor text to facilitate reading and discussion. Nikki also brought outside speakers into the groups, and tried to ensure learning would be applied. She made “time for, like, making something right there, so people feel like they accomplish something that they can, like, try the next day” (August 7, 2019). Nikki valued study groups both for the things she learned and the people she met. “It’s really a nice way just to get some perspective and meet and learn from other teachers” (August 7, 2019).

Meg exhibited leadership by hosting graduate-level teaching interns in her classroom. Their presence not only allowed them to grow as professionals, but also fed Meg other perceptions of her pedagogy and effectiveness. Meg encouraged the interns to ask questions about and challenge her practice, and appreciated the opportunity to reason through her choices with them. She explained, “It’s people saying, like, ‘So why did you choose to do this?’ They’re asking me to explain myself, which is definitely a form of reflective feedback” (May 20, 2019). The interns also provided additional feedback to Meg related to her goal of creating an equitable classroom. In addition to the perspectives she gained from her principal and math coach, the students commented, “the way that you talk to students about not, like, putting each other down or making sure that everyone’s voice is heard, like, we hear that. That is valued” (June 5, 2019). While unconvinced that she had fully met her goal, this input did help Meg feel she was growing into an equitable educator.

The many ways in which teachers worked to develop professionally demonstrate their commitment to continuing improvement. The texts and trainings they sought, as well as the
leadership roles they assumed, allowed them to engage in ongoing learning, growth, and change.

A comment from Nikki demonstrates the importance teachers attached to this work:

I’ve definitely learned much more on the job and learned much more, um, through professional reading, professional development, than I did, like, in my teacher preparation programs necessarily. So I would say, like, that on-the-job just, like, cycle of, like, learning, observing, reflecting, and changing, like, has been, like, what has impacted me the most, um, as I make day-to-day decisions. (May 25, 2019)

**Action Research**

Another, perhaps less common, practice these teachers employed to inform and improve their instruction was action research. As was mentioned in the chapter introducing participants, all had completed at least one cycle of action research. Action research enables teachers to investigate a problem of practice by collecting and analyzing data, and designing and applying solutions in their own classrooms and schools. Chelsea, Meg, and Nikki were invited to participate in this study because I assumed teachers with action research experience would be well-equipped to reflect on and share their work.

During the study, only Chelsea was actively engaged in a classroom-based action research project. Meg was conducting action research on a schoolwide program, and Nikki had previously completed her action research cycle. Nikki’s project explored how she might assign homework that simultaneously met student developmental needs, responded to parent requests for at-home practice, avoided the use of worksheet packets, and considered homework through an equity lens. Meg’s previous, class-based inquiry focused on student status by examining student grouping practices and analyzing student discourse. That work continued to impact her practice, as is evidenced in our coverage of her dialogue tracking, random group assignment, equity-based group test administration, and coaching requests.
Chelsea, after having completed a previous action research cycle, was studying her student data binder initiative. As mentioned elsewhere, Chelsea initially thought of the binders as places for students to track data in order to take more ownership of it. After carefully designing and revising binder tools, observing implementation, and capturing student reactions, she still believed binders could improve ownership of data. By the end, however, she credited change in ownership to the student meta-cognition facilitated by the binder, rather than to the tracking activities involved.

Chelsea’s shifts in thinking and practice came as a result of cyclically collecting, analyzing, and applying data, and evaluating results. She made many changes to student binder tools as she took stock of what was and wasn’t working. For example, when students graphed their scores on daily reading and math assignments, Chelsea realized she wasn’t providing students enough information to identify trends in their performance. She then standardized and labeled questions, and updated the tracking tool, so that students might notice whether they commonly erred in specific categories and should, therefore, focus on improving those skills.

Chelsea similarly made adjustments to students’ weekly goal sheets. What began as a multi-page document became a single-sided form. The original took students an hour to complete, and performance did not significantly improve even after Chelsea created a completion “cheat sheet.” Once students could finish the revised forms quickly—and in response to increased understanding of binder use and benefits—she added another single-sided sheet for students to reflect on whether they met their weekly goals and why. Capturing this student feedback taught Chelsea that students were feeling good about their progress, that they enjoyed most every hands-on activity she introduced, and that giving students a voice increased their advocacy for themselves.
Overall, use of student binders helped Chelsea devise a system for getting students to access, analyze, and reflect on their data; set and evaluate goals; and thoughtfully consider their performance. She felt it complemented her overarching goal for students to become “lifelong learners who are curious about the world and seek their own knowledge” (March 14, 2019). The process also helped her combat what she identified as a potentially problematic teaching instinct. “One thing I’ve struggled with in teaching is to learn to not change things quickly. If I have an idea, or I think something should change, like, it’s very tempting to me to just go and do it” (March 14, 2019). By updating binder tools only once a quarter, Chelsea felt she better understood the strengths and challenges of the solutions she had implemented, thereby encouraging her to slow down when things get difficult or messy in the future.

**Personal Reflection**

Teachers in this study also allowed personal reflection to improve and inform their instruction. This data was not generated formally or in accordance with any specified routine; it came as teachers found pockets of time to consider their practice. Nikki explained,

I don’t, like, set aside, you know, a half hour on Monday afternoons to, like, journal or anything like that. I have started meditating more, which, I think, is helpful to just kinda take a step back and be more of an objective observer. But a lot of it is just, like, I’ll be listening to a podcast while I walk my dog. It’s kinda like reflection while I’m doing something else. (May 25, 2019)

For Meg, that something else was often road trips. “I try to drive, you know, a long distance at least once every few weeks. Those are moments where I do a lot of—I would call it rumination as much as reflection” (May 20, 2019).

Chelsea allowed me to observe one of her personal reflection sessions. The school year had ended and she carved out time to think about past strengths and weaknesses. As we casually ate breakfast, she pulled out her laptop to take notes.
So I was thinking I might start by making, like, a chart. Kind of thinking about each area and, like, what I saw as my own or my classroom’s relative strengths, relative weaknesses, then, like, maybe questions I have or things I want to kind of pursue. (June 12, 2019)

Chelsea took time to consider math, reading, science, and social studies instruction and data. In math, she noted that students had made growth in their MAP® scores, but hadn’t consistently met their goals. She decided rather than having students focus intently on their lowest MAP® categories, she would be sure they were practicing across the categories. “During our independent work time, I’m gonna try to do, like, two days of focus work where they’re focusing on their lowest area, and two days a week, like, holistic work where they’re focusing on, like, everything” (June 12, 2019). She was pleased with her attempts to support student fact fluency, and acknowledged that instructional changes rooted in previous success had enabled her to cover more curriculum that year. She planned to continue supporting students in tackling multi-step word problems, to incorporate more review problems into math practice, and to reorder assessment questions so that more complex tasks appeared earlier in the year ahead. All these changes were informed by student achievement data and her observations of students.

In reading, Chelsea noted that students experienced strong growth and attainment on standardized interim assessments. She also felt they grew in their love of independent reading that year. Looking ahead, she wanted to be sure to incorporate read-alouds into her modules again, and to strengthen assessments. Most importantly, she wanted to be explicit about what small group work in reading would entail. Again, she pulled from achievement data, observations, and knowledge of her instruction and the curriculum to plan.

For science and social studies, Chelsea intended to familiarize herself with a new science curriculum, and find ways to share instructional time between the subjects more effectively. She pondered alternating subjects in alignment with literacy modules (e.g., to focus on science during
an animal adaptations unit, and to address social studies when reading about the Revolutionary War). Finding the right balance was important to Chelsea, who felt these subjects often were neglected in her classroom in service of more math and reading instruction and intervention.

In addition to thinking about content areas, Chelsea wrestled with potential structural changes in her practice. We already highlighted her interest in incorporating social and emotional learning into her instruction based on student observations. She talked about wanting to build plenty of conferencing time into her schedule so that she could stop pulling kids during lunch, recess, and specials, as well. She felt the practice, while effective, was disruptive and not fair to students or other teachers.

Chelsea also shared that she would have a new instructional assistant in the year ahead, and hoped to find protected time for official check-ins between them. The new IA was someone Chelsea trusted and considered a friend; she believed they would work very well together. She also knew, however, that racial and cultural divides between teachers and assistants were creating complicated power dynamics at the school, and wanted a space where they could collaborate and address any issues.

Finally, Chelsea envisioned instituting parent events throughout the year. The idea was born out of the interpersonal conflicts recently introduced into her classroom by technology. “This was the year that cell phones came to fourth grade in a terrible way,” she said (June 12, 2019). She was hoping connecting with parents about these concerns might help them create shared norms and expectations, and improve student relations.

These personal deliberations by teachers illustrate the role reflection can play in informing instruction. Chelsea’s thinking and planning was informed by achievement data,
student observations, and knowledge about her instruction and the curriculum, again pointing to the many ways teachers combine data sources to make decisions.

**Knowledge and Experience**

Lastly, participating teachers drew from their own knowledge and experience to guide practice. Mandinach and Gummer (2016) suggest various forms of teacher knowledge are integral to teachers’ data use. Specifically, they identify Shulman’s (1987) seven areas of teacher knowledge as influential to data literacy and use: content knowledge, curriculum knowledge, knowledge of learners and their characteristics, general pedagogical knowledge, pedagogical content knowledge, knowledge of educational contexts, and knowledge of educational ends, purposes, and values. Examples of teachers using these kinds of knowledge were addressed in the chapter about monitoring student progress, and some of those examples also included evidence that teachers used their knowledge to inform their instruction.

In addition to those instances, Chelsea and Meg provided several examples of how their knowledge and experience played primary roles in shaping their work. First, they explained how they relied on students’ background knowledge—which they ascertained through their knowledge of content and curriculum, formative assessment, and student observation and conferencing—to guide them as they introduced new concepts and skills. For example, Chelsea knew students already had worked with money in math and therefore used pennies, dimes, and dollars to introduce them to working with decimals.

Second, participants demonstrated how their knowledge of students’ development informed their work. Meg was aware that abstraction remained challenging for seventh-grade learners, so she devised ways to make concepts more tangible and concrete. When working with probability, she helped students make diagrams, visualizations, and fractions; when covering
geometry, she brought three-dimensional forms to life through the use of a shape museum offering hands-on introductions to unfamiliar figures.

Third, both Chelsea and Meg shared that curriculum knowledge, testing schedules, student test performance, and experience influenced the way they sequenced units of study. Chelsea mentioned moving a metric measurement unit earlier in the year in math because she often was unable to cover it before testing. She and her grade-level partner decided to cover metric measurement immediately after standard measurement rather than placing two unrelated units between them. Similarly, Meg chose to cover statistics and probability early in the year. Her students typically scored lowest in statistics and probability on their spring NWEA MAP® tests, and statistics and probability were new concepts to her learners, so she questioned the logic of covering those topics late in the school year as the curriculum suggested. Instead, she introduced them early in the year and reinforced them throughout the year.

Summary

In this chapter we have explored the kinds of data teachers used to improve and inform their instruction. After already detailing the role achievement data plays in guiding teaching, we touched on how instructional feedback, observation, peer input, professional development, action research, personal reflection, and knowledge and experience could inform teacher practice. Seeing their work through others’ eyes and experiencing others’ approaches helped teachers tweak and shift their instruction in accordance with personal goals and recommended practice. Seeking peer input allowed them to consider outside perspectives when making decisions. The books, trainings, and leadership roles they tackled for professional development challenged teachers to examine and adjust their methods. Action research encouraged intimate investigation of problems of practice, while personal reflection allowed for informal consideration of what
should come next. Those decisions also were informed by teachers’ knowledge and experience, which shape teachers’ identities and actions. All these data sources helped teachers make changes in practice in response to student needs, and informed their teaching philosophy. See Table 6 for a summary of the kinds of data teachers used to inform and improve their instruction in the instances highlighted in this chapter, as well as the responses teachers had to that data use. The data sources anchoring each example of data use appear in bold text.
Table 6. Data Used in addition to Achievement Data to Inform and Improve Instruction

<table>
<thead>
<tr>
<th>Types of Information Used</th>
<th>Responses</th>
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<tbody>
<tr>
<td><strong>Instructional Feedback</strong></td>
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<tr>
<td><strong>General, administrator coaching</strong></td>
<td>Action steps created and monitored (e.g., efforts to improve student note-taking)</td>
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<tr>
<td>Observation</td>
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<tr>
<td>Administrator</td>
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<tr>
<td>observation of teacher instruction</td>
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<tr>
<td><strong>Observation</strong></td>
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<tr>
<td><strong>Content coaching</strong></td>
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<tr>
<td>Peer observation of teacher instruction</td>
<td>Application of framework to increase student agency and ownership</td>
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<tr>
<td><strong>Of peer teacher with Reggio Emilia expertise</strong></td>
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<tr>
<td>From personal network and online communities</td>
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<tr>
<td>New instructional strategies, activities, classroom procedures, and teaching tools (e.g., worksheets and assessments)</td>
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<tr>
<td><strong>Professional development</strong></td>
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<tr>
<td>(e.g., books, trainings, and leadership roles)</td>
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<tr>
<td>New teaching tools</td>
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<tr>
<td>Broader professional networks</td>
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<tr>
<td>Retention of effective strategies</td>
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</table>
### Types of Information Used

<table>
<thead>
<tr>
<th>Instructional Feedback</th>
<th>Observation</th>
<th>Peer Input</th>
<th>Professional Judgment</th>
<th>Responses</th>
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</thead>
<tbody>
<tr>
<td>Action research (which includes a variety of data sources)</td>
<td>Change in homework protocol</td>
<td>Change in student grouping</td>
<td>Analysis of student discourse</td>
<td>Student ownership of data</td>
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<tr>
<td></td>
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<td></td>
<td>Student meta-cognition</td>
<td>Student agency</td>
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<td></td>
<td>Increased data gathering prior to making change</td>
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<tr>
<td>Of students in whole and small group instruction</td>
<td>Personal reflection (incorporating achievement data and knowledge of curriculum and instruction)</td>
<td>Changes to assignments, assessments, and individual practice</td>
<td>Change in instructional time allocation by subject</td>
<td>Student conferencing and teacher assistant meetings embedded in teacher schedule</td>
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<td></td>
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<td></td>
<td>New parent outreach efforts</td>
<td>Retention of effective strategies</td>
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<td></td>
<td></td>
<td></td>
<td>Re-introduction of successful strategies from the past</td>
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</tr>
<tr>
<td>Of students in whole and small group instruction</td>
<td>Knowledge and experience (Student background knowledge gleaned from content knowledge, knowledge of curriculum, student conferencing, and formative assessment)</td>
<td>Incorporation of known concepts and skills in introduction of new concepts and skills</td>
<td></td>
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## Types of Information Used

<table>
<thead>
<tr>
<th>Instructional Feedback</th>
<th>Observation</th>
<th>Peer Input</th>
<th>Professional Judgment</th>
<th>Responses</th>
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</thead>
<tbody>
<tr>
<td><strong>Knowledge and experience</strong></td>
<td>Translated abstract ideas into concrete instructional strategies</td>
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<td></td>
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<tr>
<td>(Knowledge of student development)</td>
<td></td>
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<td></td>
</tr>
<tr>
<td><strong>Knowledge and experience</strong></td>
<td>Change in sequence of units</td>
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</tr>
<tr>
<td>(Knowledge of the curriculum and testing schedules, past student performance, and experience)</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>
CHAPTER SEVEN

CONCLUSION

This study was born out of a desire to better understand teacher data use. After learning the practice’s history, framing, and goals, I analyzed the extent to which it was documented to increase student achievement. That analysis produced equivocal results, but revealed that data use was more often effective when it involved multiple kinds of data and data use strategies. It also suggested data use was less often effective with minority, low-income, urban, and rural students.

With little detailed guidance available to teachers about what effective data use looks like, I designed a collective, instrumental case study to closely examine teacher practice. The study examined the data use of three teachers who worked with urban, minority, low-income students and had data use expertise. Its goal was to more intimately understand how teachers make sense of data to inform decisions. Through think-alouds, observations, and interviews, I learned about the kinds of data participants used to support various aspects of their practice, and how they combined data sources to solve problems.

Contextualizing Findings

All of the work observed in this study took place within classroom, school, and district contexts. Data use literature tells us three kinds of factors active in these contexts influence data use success (Hoogland et al., 2016). Assessment factors include the data, systems, and tools available to teachers. Context factors relate to leadership, culture, data use facilitation via time
and resources, factors external to the school, and professional development. Teacher factors include data use collaboration, knowledge and skills, and attitudes.

**Assessment and Context Factors Influencing Data Use**

No teacher is likely to work in an environment where all data use facilitators are present (Datnow & Hubbard, 2015; Datnow & Hubbard, 2016; Ingram et al., 2004; Marsh, 2012; Means et al., 2009), but study participants were supported by a variety of assessment and context factors through their district and schools. They had access to assessment systems and tools, their principals participated in data use, and time was built into their weekly schedules for team meetings and professional development. In some instances, teachers were observed and enabled to observe others. In all instances, teachers received messages from their district that data and achievement mattered. In fact, local media outlets reported that several other charters were closed or reprimanded due to poor performance during this study. While the presence of these factors did not uniformly encourage data use among participating teachers, it is important to note their presence when considering findings.

**Teacher Factors Influencing Data Use**

Perhaps the most influential factors to bear in mind when considering my findings, however, are teacher factors. Having recruited all participants based on their involvement in an action research fellowship program, it is fair to assert I worked with teachers motivated to reflect on their practice and grow. Indeed, spending time with these teachers suggested they were open to collaboration and feedback. They demonstrated knowledge and skills in the areas of content, pedagogy, assessment, and instruction. Each described many ways in which she worked to continuously improve her practice: These teachers had earned graduate degrees and board
certification, participated in professional development and action research, and engaged in personal reflection. They revealed themselves to be passionate, life-long learners.

They also valued data. While communicating some misgivings about the role of standardized test results in contemporary education, these teachers thoughtfully considered and responded to the many data sources available to them. They even created additional data collection tools to meet teaching and learning needs in their classrooms. At times anxious or frustrated, participants often analyzed and interpreted data with confidence and made concrete plans to respond to what they learned. They also took time to reflect on their data-informed actions and adjust their moves and strategies when warranted. For them, data informed many vital teaching functions. See Table 7 for a summary of the assessment, context, and teacher factors influencing data use in this study.
### Table 7. Factors Influencing Data Use in this Study

<table>
<thead>
<tr>
<th>Assessment Factors</th>
<th>Context Factors</th>
<th>Teacher Factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data, systems, and tools</td>
<td>Leadership</td>
<td>Collaboration</td>
</tr>
<tr>
<td>NWEA MAP® assessments</td>
<td>Data use facilitation, modeling, and support</td>
<td>In grade-level, leadership, and all-school teams</td>
</tr>
<tr>
<td>Fountas &amp; Pinnell BAS assessments</td>
<td>Distributed decision making</td>
<td>Informally with individuals and small groups</td>
</tr>
<tr>
<td>State assessments</td>
<td>Instructional feedback</td>
<td></td>
</tr>
<tr>
<td>Curriculum-provided assessments</td>
<td>Culture</td>
<td>Knowledge and skills</td>
</tr>
<tr>
<td>Teacher-created assessments</td>
<td>Norms and routines supporting data use</td>
<td>Content knowledge</td>
</tr>
<tr>
<td>Data reports and tools</td>
<td>Reflective feedback cycles</td>
<td>Pedagogical knowledge</td>
</tr>
<tr>
<td>Data use protocol</td>
<td>Scheduled collaboration</td>
<td>Pedagogical content knowledge</td>
</tr>
<tr>
<td>Time and resources</td>
<td>Professional development</td>
<td>Data use skills (e.g., finding averages, identifying outliers, and collecting, analyzing, and interpreting data)</td>
</tr>
<tr>
<td>Early release of students allowing for teacher collaboration</td>
<td>Built into school day</td>
<td>Reflective capacity</td>
</tr>
<tr>
<td>Team meetings during prep periods and after school</td>
<td>External factors</td>
<td>Attitudes and beliefs</td>
</tr>
<tr>
<td>District assessment requirements</td>
<td>District rating practices</td>
<td>Value and trust data</td>
</tr>
<tr>
<td>Data use confidence</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Findings Summary

With the benefit of assessment, context, and teacher factors supporting their work, participants used a variety of types of data for three main purposes. They often used multiple
data types and sources at once, and used certain kinds of data for certain purposes. These habits indicate participants’ ability to approach data use like mixed methods researchers.

**Types of Data Used**

While data use often is framed as the consideration and application of achievement data (Datnow & Hubbard, 2015; Faria et al., 2012; Hardy, 2015; Harshman & Yezierski, 2017; Jacobs et al., 2009; Jimerson, 2013; Means et al., 2009), participants took a broader view. As several data use scholars suggest (Bernhardt, 2004; Coburn & Turner, 2011; Datnow et al., 2012; Gummer & Mandinach, 2015; Marsh, 2012; Spillane & Miele, 2007), these teachers used a variety of data types to inform their work. Achievement data—including standardized interim assessments, benchmark assessments, formative and summative classroom assessments, and student work—featured prominently in many teacher inquiries, but input from students, parents, and peers; observations of students and peers; instructional feedback; information gained through collaboration; and professional judgment played important supporting roles. (As a reminder, professional judgment is the knowledge and experience teachers apply in their practice. It is rooted in teachers’ education, training, professional development, personal reflection, values, attitudes, and beliefs).

**Matching Data Types to Use Purposes**

I observed participants using data primarily to build relationships with students, monitor student progress, and inform and improve their instruction. Input from students, parents, and peers (often obtained through planned collaboration), as well as observations of students, helped teachers build rapport with their students and get to know them personally. Achievement data was centered when monitoring student progress, although student observations, peer collaboration, and professional judgment also helped teachers understand and respond to student
needs. To inform and improve their instruction, teachers again relied heavily on student achievement data. Understanding what students knew and could do helped participants decide when to re-teach, re-assess, conference, observe, make a referral, or devise a new approach. Also supporting instructional change were peer input (often through collaboration), observation of peers, instructional feedback, professional development, action research, and personal reflection. Table 8 demonstrates the kinds of data teachers applied to various problems of practice in the examples shared in the results chapters.

Table 8. Types of Data Used by Data Use Purpose

<table>
<thead>
<tr>
<th>Types of Data Used</th>
<th>Build Relationships</th>
<th>Monitor Progress</th>
<th>Inform Instruction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Achievement Data</td>
<td></td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Student Input</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Parent Input</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Peer Input</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Student Observation</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Peer Observation</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Instructional Feedback</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Peer Collaboration</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Professional Judgment</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
</tbody>
</table>

**Balancing Multiple Data Sources**

As Table 8 implies, it was rare to witness participants using one type of data in isolation during this study. More often, teachers privileged one piece of information while attempting to refine its meaning using a secondary source or sources. For example, teachers often tried to solve problems using achievement data, which tended to help them identify student
misconceptions and challenges. When the causes of struggles were contained in achievement
data itself (e.g., when a computational issue was discovered in a student’s math work),
participants could tailor responses using achievement data alone. When an explanation was not
obvious, teachers often applied their knowledge of students, knowledge of their instruction, input
from others, and content and pedagogical knowledge to help them craft responses to student
needs.

**Following the Rules of Research**

The work just described mirrors approaches I take in my own practice. In fact, I noticed
teachers behaving like researchers throughout this study. While they all received action research
coaching and training from a retired professor, it is still noteworthy that they followed cardinal
rules of research in their data use practice. These participants used quantitative evidence to
identify problems and qualitative evidence to comprehend them (Mertens, 2010). They
combined quantitative and qualitative data to better understand issues and respond to students
(Greene, 2007). At times, they worked to triangulate data across multiple measures (e.g., by
considering performance across time), multiple methods (e.g., by comparing their classroom
observations to student quiz performance), and multiple perspectives (e.g., by inviting feedback
from coaches) (Lincoln & Guba, 1986).

This approach to data use honors the idea of critical multiplism. Critical multiplism
avoids ascribing truth to individual inquiries and data types, and promotes varied question
posing, data sources, analysis, and interpretation (Shadish, 1993). In order to arrive at a more
robust understanding, critical multiplism calls on practitioners to package data and strategies that
intentionally offset each other’s vulnerabilities.
Participants in this study used both hard and soft data to strengthen their understanding of students and their practice. They valued “hard” data for its detached assessment of whether students were understanding concepts, building skills, and applying what they had learned. They relied primarily on formative and summative classroom assessments, as well as BAS results, to make sense of student progress. Simultaneously, teachers utilized the “soft” data they collected through observation and dialogue to create stronger relationships and target responses. By examining student and peer behavior, considering others’ opinions and approaches, drawing from their own knowledge and experience, and seeking feedback from students, parents, coaches, and peers, they placed achievement data in context and better understood student performance and behavior.

**Implications for Research**

The comprehensive data use practiced by these participants tells us more about what is possible when teachers are prepared and invested. Discussion of their work contributes to ongoing data use conversations and suggests next steps for inquiry. More specifically, study findings support assertions already made by leading data use scholars, encourage additional study of teachers’ data use, and promote expansion of tools used to measure data use.

**Validating Existing Frames**

Within the literature, a range of data and data use frameworks is represented. Two of the frameworks that approached data use innovatively are reinforced by the findings of this study.

**Data use as sensemaking.** Datnow et al. (2012) advanced a sensemaking and co-construction data use perspective in contrast to a technical-rational approach. Participating teachers’ data use adhered more closely to the sense-making and co-construction style they described. For example, despite all working in the same district, teachers in this study used data
uniquely. Data use looked different in each teacher context and even between teachers in observed meetings, which challenges the technical-rational expectation that a policy or practice will have one interpretation. The role of context in the differences between teacher practices was also highlighted by this study. In the discussion of factors influencing data use above, it is clear tools, structures, and leadership at schools shaped the data and resources available to teachers, which influenced their data use. A technical-rational version of data use would downplay the importance of context in implementation and foresee standardized implementation. Finally, teachers’ use of outside input, collaboration, and professional judgment in their work contradicts the technical-rational assumption that data use would follow a top-down, hierarchical scheme. Instead, each teacher relied on interactions with her environment to define and practice data use in her own style. The practices of teachers in this study suggest data use is indeed a sensemaking and co-construction endeavor.

**Data literacy for teachers.** The careful and comprehensive use of data by participants also bolstered the argument for developing data literacy for teachers as defined by Mandinach and Gummer (2016). They categorized the knowledge and skills comprising data literacy into five components: identify problems and frame questions, use data, transform data into information, transform information into a decision, and evaluate outcomes. They also detailed the dispositions, or habits of mind, teachers need to use data. Participants wielded much of the knowledge, skills, and dispositions they deemed instrumental for data use.

In the problems and questions domain, teachers excelled at knowing students well enough to identify challenges and concerns. Their use of observation and dialogue with students, peers, and parents fostered contextual understandings that strengthened inquiry. Teachers also displayed numerous data use skills, including the abilities to generate data, match different types
of data to appropriate uses, and harness multiple measures and types of data to make decisions. In the areas of transforming data into information and information into decisions, participants explained in detail how they analyzed data and used it to inform their instruction. They also evaluated the outcomes of their data use through ongoing reflection and progress monitoring. As noted above in the discussion of teacher factors facilitating data use, participants strongly exhibited the values and attitudes identified to support data use. The teachers profiled in this study can serve as real-life examples of the kind of data use possible when teachers are data literate.

**Encouraging Additional Inquiry**

While this work contributes to the data use knowledge base, further investigation certainly is warranted to add additional depth and dimension. Specifically, I recommend additional data use micro-process studies with different data collection strategies, as well as additional studies of comprehensive data use practiced by teachers serving marginalized students.

**Altering the data collection schedule.** I visited each participant approximately once a month for a semester, and gained a sense of teachers’ data use practice in general. In order to gain more in-depth understanding of various data use scenarios, researchers could intensely explore teacher data use during particular units or modules. Collecting data more often within a narrower window of time might enable closer tracking of data use application and capture of iterative data use cycles. The gaps between my visits made following up on plans and strategies difficult because evidence of teacher thinking and practice was no longer available. If future participants were in the habit of writing out daily lesson plans or journaling about their decisions,
time may be less of an issue. Otherwise, seeing teachers more often within a limited timeframe could generate better evidence of data use responses.

**Considering different methods.** Think aloud observation-interviews taking place after school, on weekends, and during prep periods dominated my data collection. As the study progressed, one participant suggested I also observe her classroom instruction. She felt much of her data use happened in-the-moment in response to student questions, behavior, and performance. After watching her lead a guided reading session, I agreed with her assertion and considered how classroom observation may enhance this work. The utility of observing teachers conferring with students individually and in small groups became salient as I realized so much of teachers’ differentiated responses to data took place in those scenarios. While teachers would not be able to think aloud about their choices during instruction and conferencing, observing this work could contribute to our understanding of teacher data use. Instruction might even be video recorded so that researchers and participants could review teacher practice together, while teachers explained what prompted their moves.

**Exploring the relative influence of data use factors.** The literature review conducted to explore the relationship between data use and student achievement, as well as the results of this study, suggest that comprehensive data use may positively influence student outcomes regardless of student and school characteristics. Recall that the literature review findings implied that data use was more positively tied to student achievement when it involved multiple types of data and/or data strategies, but less influential at schools serving low-income and/or minority students in urban or rural settings. Interestingly, among studies where comprehensive data use was practiced with marginalized populations, results still were slightly more likely to be positive.
Findings from this study of teachers serving low-income, minority students in urban settings also insinuate that positive student outcomes are possible for marginalized populations when data use is comprehensive, assessment and context factors support data use, and teachers possess productive data use knowledge, skills, and attitudes. While I cannot provide statistical evidence that these teachers’ use of multiple data types and data use strategies increased student achievement, I did provide examples of how participants’ comprehensive approach led to nuanced understanding of their practice, as well as knowledge of who students were, what they could do, and how best to respond to their needs.

Moving forward, it could be beneficial to compare the influence of factors impacting data use outcomes. Better understanding the relative contribution of each could help the field design more effective data use training and tools, and lead to more consistently positive impacts of data use for all students.

**Developing New Tools**

In addition to additional studies, this work prompts a call for additional or amended quantitative tools for understanding data use. I adapted the Teacher Data Use Survey (Wayman et al., 2016) to gain insight into the types of data available to participants, their use of various types of data, their attitude toward data, and the extent to which they collaborated in their data use. Because the original tool asked teachers only to report on the availability and use of four types of achievement data (i.e., state, periodic, local, and personal), I added questions about professional judgment. Moving forward, data use tools also could inquire into the availability, use, and usefulness of instructional feedback, peer and student observations, and input from students, parents, and peers, since these forms of data substantially factored into participant data use. In addition, teachers could be asked to identify the kinds of data they often use together.
Lastly, better understanding of teachers’ data use knowledge and skills could be attained if we asked about their data use education and training. If implemented broadly, tools like these would help us understand the extent to which teachers in general are practicing like participants. They might also shed light on the resources and supports still required to encourage comprehensive data use.

**Implications for Practice**

In addition to implications for research, this study has implications for practice.

Participating teachers were able to use multiple sources of data for a variety of purposes in service of student and personal growth. To enable others to replicate their actions, we can provide training and support. In addition to teaching teachers about assessment and related statistics, we can prepare them to engage in reflective inquiry and practice that mirrors mixed methods research and evaluation.

**Developing Data Use Skills**

In order to use data comprehensively and effectively, teachers must understand what data can tell us; how to ask questions of, collect, analyze, and interpret data; how to translate data into action; and how to evaluate their practice.

Participants in this study successfully used quantitative data to answer whether and if questions, and qualitative data to explore why and how. This sometimes meant they used data other than achievement data to respond to student needs. When teachers understand the strengths of varying kinds of information, they can be empowered to employ their professional judgment and other “soft” data during data use. Achievement data can tell us a lot about what a student knows and can do, and inform instructional moves. Input from students, instructional feedback, observations, and professional judgment also can serve those purposes, while helping
build relationships with students and triangulating and contextualizing “hard” data. Comprehensively discussing the kinds of data available to teachers and their most appropriate and fruitful applications is warranted.

Teachers in this study also knew how to work with their data. They knew what kinds of problems they could solve with the data available to them, and even created their own tools when existing ones didn’t tell them what they needed to know. Once data was collected, they had strategies for making sense of the information. They were able to identify outliers and detect patterns within assessment responses and across data sources. Participants built these skills through training, observation of others, and use and adaptation of school-provided protocols. Still, teachers did not always have access to or a thorough understanding of data reports and tools. They sometimes struggled to interpret data when they diverged. Therefore, training and support can bolster teacher data use if designed to help practitioners understand the questions data can answer, the resources available to make sense of data, and their options for responding to data that don’t tell a cohesive story.

Another data use skill demonstrated by participants was translating data into action. Often these teachers addressed limited student misunderstandings of content through small groups, conferencing, and re-teaching. When many kids failed to grasp a concept or skill, participants considered changing their approach. They often relied on collaboration to identify potential new directions. Online communities, coaching, and observation of others contributed to their ideation. Providing these and other resources can help teachers cover curricula in fresh ways that consider student interests, strengths, and challenges.

Participants also were skilled at evaluating their responses to data. Opportunities to evaluate practice came formally (e.g., during grade-level meetings and coaching sessions) and
informally (e.g., during walks). Their action research training supported them in closely examining their own practice, enabling the collection and analysis of data to diagnose classroom dynamics. These skills can be employed by teachers in nearly any setting, making action research training and data use routines valuable investments during teacher preparation, continuing education, and daily practice.

**Creating Data Use Environments**

As teachers work to develop these skills, we can nurture data use facilitators within their contexts. Leadership, particularly at the principal level, can model and guide comprehensive data use practice, while communicating the mission and vision of data work. Schools can build trust among teachers and administrators by framing data use as a tool for growth, and not just accountability. They can provide access to quality and timely assessment systems and tools and data use protocols. They also can begin or continue making time for collaboration around data, and connecting teachers within and across schools to improve data use practice. Creating opportunities for teachers to be observed, observe others, and debrief may be especially useful.

**Limitations**

I hope the trustworthiness of my study encourages its application in these and other productive ways. The four tenets of trustworthiness for qualitative studies parallel the construct of validity used to measure the goodness of quantitative inquiry. Trustworthiness’s tenets of credibility, transferability, dependability, and confirmability roughly correspond to internal validity, external validity, reliability, and objectivity, respectively. I recognize two threats to credibility and one threat to transferability in my work.
Think-aloud proponents van Someren et al. (1994) noted two potential pitfalls of the method that may apply to my work: People are not always able to verbalize all their thoughts, and it can be difficult to verbalize decision making that has become routine. While participants were very forthcoming about their processes, it would be impossible to capture all their thinking, especially because we are at times unable to articulate the specific foundations of a decision made. In addition, it is possible being observed influenced participants to behave in uncharacteristic fashions (Mertens, 2010). While most data collection sessions seemed part of established routines, teachers may have felt the need to “do something” with data simply because they were being studied. If important thinking was missed or reactivity was in play, the credibility of my study suffers because my findings may not fully represent the data and match reality (Lincoln & Guba, 1986; Merriam, 2009).

Threat to Transferability: Narrow Sampling

Despite efforts to recruit participants through a variety of outreach efforts, I only was able to work with teachers who had taken part in one specific action research fellowship. As a result, this was a study of three White women of similar ages teaching elementary subjects and middle school math at urban charter schools. I would have liked to include participants with more varied personal and school identities, grade levels, and subjects to further expand our understanding of how teachers use data and increase the study’s usefulness. Doing so may have allowed a more diverse contingency of readers to locate themselves in this work and apply its findings, thereby increasing naturalistic generalization (Stake, 1995) and transferability (Lincoln & Guba, 1986).
Conclusion

This inquiry revealed how assessment, context, and teacher factors influenced the data use of three teachers serving marginalized student populations. It also shared details of participants’ data use. In these cases, data use was comprehensive in nature, incorporating multiple data types and data use strategies. Participants considered a variety of hard and soft data points with professional judgment for three primary purposes: building relationships with students, monitoring student progress, and informing and improving their instruction. The work reflected a sensemaking approach to data use (Datnow et al., 2012), followed many of the rules of mixed-methods research (Greene, 2007), and demonstrated the importance of developing data literacy for teachers (Mandinach & Gummer, 2016). Additional inquiry, as well as changes in data use measurement and practice, are suggested by study results.
APPENDIX A

STUDY METHODOLOGY
The purpose of this study was to explore teacher practice for recommendations to improve data use definitions, frameworks, professional development, policies, and practice. Because there is divergence between the data teachers actually use (i.e., achievement data, student demographics and behavioral data, organizational context, and professional judgment) and the data they typically are required to use (i.e., standardized test scores), my study examined:

- how teachers with data use expertise make sense of data sources to inform their curricular and instructional decisions;
  - the kinds of data teachers rely on to solve a variety of educational challenges; and
  - how teachers balance the use of professional judgment with the use of other data sources.

Sensemaking theory guided my inquiry because its tenets are reflected in data use practice evidence.

Here, I detail the paradigmatic underpinnings of my study, as well as its methodology, and sampling, participants and settings, and data collection and analysis strategies. I close by sharing how I worked to ensure a trustworthy study while acknowledging the limitations of my design.

**Paradigmatic Influences**

The paradigmatic leanings of a researcher inform her research designs. Paradigms can be thought of as worldviews (Mertens, 2010) and, in this instance, pragmatic and constructivist assumptions guide my work. Regarding ontology—or the “nature of reality” (Mertens, 2010, p. 11)—I believe there is no one, single reality to be discovered, but that multiple realities are created as we interact with each other and our environment (Lincoln, Lynham, & Guba, 2011). From my perspective, the closest we may come to truth is to approach consensus from across our
multiple realities for transitory lengths of time. Regarding epistemology—or the “nature of knowledge” (Mertens, 2011, p. 11)—I believe our context, who we are, and what we have experienced cannot be separated from what we think we know; that is, I do not believe in objective knowledge (Lincoln et al., 2011). Based on these constructivist assumptions, I view my role in any inquiry as a subjective facilitator and co-creator of knowledge (Lincoln et al., 2011). I practice reflexivity in order to become as aware as possible of how my values and experiences may color my work (Merriam, 2009). As a pragmatist, I ultimately will consider this inquiry ethical and valuable if it generates trustworthy knowledge capable of improving teacher decision making in a practically meaningful way (Mertens, 2010).

**Methodology**

Pragmatists like me believe that we are free to explore research problems and questions in any appropriate way capable of meeting inquiry aims (Mertens, 2010). We also feel the specific purpose of any inquiry should dictate its methodology. Because this inquiry is meant to enable better understanding of how teachers with decision making expertise use data, a qualitative methodology was used. Qualitative research enabled me to focus on teachers’ decision making processes, and yielded detailed information about the phenomenon of data use (Merriam, 2009; Mertens, 2010). More specifically, I embarked on a collective, instrumental case study so that I could capture concrete evidence of this complex, real-life task and, hopefully, positively influence teacher practice (Merriam, 2009; Stake, 1995).

Case study, in general, is a tool for understanding the complexity of a particular person, place, program, policy, organization, system, or phenomenon (Merriam, 2009; Stake, 1995; Thomas, 2011). It does not aim to describe all members of a population in general, but to provide intimate knowledge of a particular case or cases (Mabry, 2009). That intimate
knowledge typically is generated in real-life (i.e., naturalistic) settings, rendering case study findings fertile ground for locating solutions to problems of practice (Merriam, 2009).

In this instance, I was interested in better understanding teacher data use. As such, my cases are bound in several ways (Stake, 1995). First, I sought to observe a specific kind of teacher: those who are considered data use experts. Second, rather than study teacher practice wholesale, I collected data specifically during instances of data use. This meant that I observed and informally interviewed teachers alone and in teams. Third, I observed each participating teacher several times over the course of a school year in order to capture a wide variety of data use episodes. Fourth, I conducted data collection in the settings where teachers did their work. In this instance, I focused on urban school settings serving low-income and minority populations. Empirical literature examining the relationship between data use and student achievement suggests that data use is less likely to succeed in these environments (Henderson, Petrosino, Guckenburg, & Hamilton, 2007; Henderson, Petrosino, Guckenburg, & Hamilton, 2008; Herman, Yamashiro, Lefowitz, & Trusela, 2008; Quint, Sepanik, & Smith, 2008; West, Morton, & Herlihy, 2016), making effective teachers in these situations especially information-rich participants.

My case study may be categorized as instrumental and collective. It is considered instrumental because the teachers I chose to study are instrumental in enhancing understanding of teacher data use (Stake, 1995). It is considered collective because I chose to study more than one teacher (Stake, 1995); those teachers’ stories and experiences collectively inform understanding of teacher data use. I studied multiple teachers because gaining the level of access required to produce the deep, multi-faceted understanding I sought would have proven difficult
to obtain from one individual. My several participants were able to offer limited, but repeated
opportunities for study that, together, capture the complexity of exemplary teacher data use.

**Sampling and Recruitment**

To find teachers skilled in data use, I engaged in nonprobability, purposive sampling
(Merriam, 2009). This sampling strategy was appropriate due to the nature of the population
from which I had to sample. Population parameters could not be ascertained because it was
impossible to know in advance which teachers might meet the study’s inclusion criteria;
therefore, I was not able to engage in simple, stratified, or cluster random sampling (Mertens,
2010). Instead, I had to seek out participants in a purposeful manner (Merriam, 2009).

My participants were selected not by chance, but through careful consideration of their
potential to meaningfully contribute to the inquiry (Stake, 1995). I sought participants who
could be identified as data use leaders; that is, I looked for teachers known to integrate multiple
sources of information (e.g., achievement and student data, organizational context data, and
professional judgment) to make sound educational decisions. To locate these participants, I
sought school leader and teacher educator recommendations, as well as information about award
and fellowship programs addressing data use to recruit information-rich teachers (Patton, 2002).
In this way I was able to locate members of a hard-to-define group and select particularly erudite
participants for in-depth study. See Figure 1 for a diagram of the sampling strategy.
School-level Recruitment

Schools serving low-income, marginalized populations in local urban and suburban areas that were known to facilitate data use and cite it as part of their mission, vision, and/or improvement strategy were queried for teacher participant recommendations. School leaders (i.e., mostly principals, but some assistant principals) were asked to provide my contact information to educators they believed met the inclusion criteria outlined above. Introductory and follow-up emails were sent to every school leader targeted.

In order to identify schools to contact, I relied on 5Essentials Survey scores. Schools in the local district administer the survey annually. The 5Essentials Survey asks students and teachers to reflect on their school’s instruction, environment, leaders, teachers, and families (UChicago Impact, n.d.). Schools identified as strong in 3-5 of these essentials are ten times more likely to significantly improve student learning. I began by identifying schools within the local district that were labeled as well-organized or organized for improvement, the highest two categories of scores on the 5Essentials Survey overall. I then looked for schools scoring in the two highest categories of scores on the collaborative teachers essential, with at least 80% of teachers responding. Within the collaborative teachers essential, I then identified schools that were identified by their teachers as strong or very strong in collaborative practices (i.e.,
observing other teachers and working with peers to analyze student data, and develop materials and instructional strategies). One-hundred fifty-nine district elementary, middle, and high schools were identified using 5Essentials scores.

Wishing to be more targeted in my recruiting, I then visited the website of each identified school to determine whether data use was identified as part of the school’s mission, vision, and/or professional development or improvement strategy. I also noted whether the school served a low-income, minoritized student population. Twenty-nine of the original 159 schools met both of these criteria. Because the local district rejected my application to work with its teachers, however, I only was able to reach out to the 14 local charter schools on that list. Three charter school leaders indicated that they would share my study information with teachers, and one school invited me to introduce my work at a teacher meeting. One teacher eventually contacted me about participation, but did not enroll in the study following an in-person introductory screening session.

In order to broaden my search, I began looking for promising schools in the suburbs surrounding my city. Using the process highlighted above, I identified 54 suburban schools with high overall, collaborative teachers, and collaborative practices 5Essentials Survey scores, with at least 80% of teachers responding. Nine of those schools demonstrated commitment to data use in their mission, vision, and/or professional development or improvement strategies, and served low-income, minoritized student populations. Four of those school leaders communicated that they would share study information with teachers, but no teachers contacted me about participation.

With no participants identified from schools meeting all my inclusion criteria, I then sent information to an additional 33 district charter and suburban schools that scored well on the
Essentials Survey and served my target student population. I revised my study materials before this second round of invitations, hoping that a revised look and feel would be more productive. Indeed, eight school leaders indicated that the revised material was shared with teachers but, again, no participants came from this outreach effort.

**Teacher Educator Referrals**

As I engaged in school outreach, I also consulted staff and faculty at my university for participant and school leader referrals. I asked teacher educators to share study information with students who met study inclusion criteria themselves, or school leaders who might be able to identify such teachers. I received eight school leader referrals through this sampling approach. One referred principal was interested in partnering, but could not pursue study participation once the local district rejected my research application. Seven parochial schools were identified as potential partners after the local Catholic schools office approved my study, but only one school leader indicated a willingness to share study information, and no teachers contacted me.

**Award and Fellowship Recipient Outreach**

The most fruitful sampling approach for me involved locating award and fellowship programs promoting data use excellence and contacting local teachers who had received those awards and fellowships. I identified six teachers recently acknowledged by two programs, five of whom indicated interest in participation. One teacher had to decline following the district rejection of my research application, and one ended communication after expressing initial interest. Three of these teachers eventually became my participant partners.

**Participant Screening**

Before committing to the study, teachers took part in informational screenings. Two teachers chose to connect via phone and two met with me in person. A Teacher Background
Information questionnaire and several questions from a Teacher Data Use Survey (see Appendix B) guided these conversations, which lasted 20-45 minutes. I offered to arrange a brief shadowing experience to help interested teachers ascertain whether they were prepared to commit to working with me, but none of them were interested. One screened teacher did not commit to the study, as noted above. The other three screened teachers signed an informed consent form and forwarded letters of cooperation to their administrators following their screening.

**Participants and Settings**

The three teachers participating in this study—Meg, Chelsea, and Nikki (all names are pseudonyms)—were White women working in charter schools serving low-income, minoritized students in different neighborhoods of a large Midwestern city. Meg taught middle school math; Chelsea and Nikki were elementary grade generalists. Meg was in her fifth year of teaching, Chelsea was in her thirteenth year, and Nikki was in her fourteenth year. Meg and Nikki had master’s degrees; Meg’s focused on urban teaching, and Nikki’s was in curriculum and instruction. Chelsea and Nikki were National Board Certified Teachers who had held leadership positions at their schools. They also had both taught in more than one school. Chelsea served briefly as a preschool teacher at a religiously-affiliated campus, then taught a variety of elementary grades at a public school. She had been at her current charter for eight years. Nikki taught at Catholic schools before joining her charter. Meg only had taught at the charter school where she was employed. All three had engaged in at least one action research study investigating issues of interest in their own classrooms. More details about participants are available in the following chapters. Table 2 in Chapter 3 provides a summary of participant characteristics.
As noted above, all participants taught at charter schools in the same city, within and yet largely independent from the same school district. All the schools had been in operation for 15-20 years. They enjoyed lower rates of student mobility than the district at large and, while their students were consistently truant, their absenteeism rates were about half of those of their racially-defined peers in the district and state. All the schools served low-income students and the district as a whole had less than two-thirds of the financial resources projected as necessary to meet its needs.

Despite these similarities, the schools served different student populations in different areas of the city, and differed in size, grade levels, structure, mission, and history. Meg and Chelsea’s schools served Black students almost exclusively, while the student population at Nikki’s school was mostly Latinx, with nearly half of students considered emerging bilinguals. Chelsea’s school served more than double the percentage of students experiencing homelessness than other schools in the district, and about five times that of schools statewide. Chelsea and Nikki’s schools taught nearly 500 elementary and middle grade students, while Meg’s served roughly 650 middle and high school students. Chelsea and Nikki’s schools shared several other similarities: they both were stand-alone schools with extended school years that admitted students through blind lotteries. Meg’s school was part of a charter network that prioritized admitting students from its surrounding neighborhood.

Academically, proficiency measures (calculated using standardized test scores) considered the scores in English language arts and math at Chelsea’s school far above and above district and state averages, with science scores below the district average and far below the state average. All scores at Meg’s school were far below district and state averages, while scores at Nikki’s school were below or far below district and state averages except in science, where
scores were higher than the district. Student growth (also measured by standardized test performance) ranged from below to above average across schools, tests, and subjects.

School environments also differed. The schools responding to the 5Essentials Survey were not considered organized or well-organized for improving student learning. Nikki’s school had a health and wellness focus, Chelsea’s was aimed intently at reducing racial achievement gaps, and Meg’s promoted college completion and cultural competency. Table 3 in Chapter 3 provides a summary of school characteristics.

Data Collection

The qualitative nature of this inquiry informed my selection of a variety of qualitative data collection methods. In particular, I engaged in teacher background information collection, think aloud observation-interviews, observations, follow-up interviews, and document analysis. In all these activities, I served in the capacity of researcher-as-instrument (Merriam, 2009). Data collection activities primarily occurred during the 2018-2019 school year. See Table 9 for a data collection summary.

Table 9. Data Collection Summary

<table>
<thead>
<tr>
<th></th>
<th>Meg</th>
<th>Chelsea</th>
<th>Nikki</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teacher Background Questionnaire</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Teacher Data Use Survey</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Think aloud observation-interviews</td>
<td>2 (4.5 hours)</td>
<td>4 (5.5 hours)</td>
<td>3 (2 hours)</td>
</tr>
<tr>
<td>Observations</td>
<td>2 (2.25 hours)</td>
<td>1 (1 hour)</td>
<td>2 (5.5 hours)</td>
</tr>
<tr>
<td>Interviews</td>
<td>2 (3 hours)</td>
<td>1 (1.5 hours)</td>
<td>1 (1 hour)</td>
</tr>
<tr>
<td>Documents</td>
<td>56</td>
<td>38</td>
<td>30</td>
</tr>
</tbody>
</table>
**Teacher Background Information**

I used two tools to collect teacher background information, which enabled rich description of the sample. Both of these tools were introduced in the discussion of screening above. The first was a questionnaire I designed to learn more about participating teachers in general (see Appendix B). Questions addressed teachers’ education and training, years of teaching experience, and subject-matter expertise. The second instrument I administered is a modified version of the Teacher Data Use Survey (see Appendix B). Questions not answered during screening were administered immediately preceding follow-up interviews. The original tool was developed by U. S. data use experts for schools wishing to better understand how teachers feel about and use data (Wayman, Wilkerson, Cho, Mandinach, & Supovitz, 2016). It is intended to capture a snapshot of data use practice that can inform school planning for data use support (e.g., through professional development, technology, or organizational structures). The tool measures teachers’ participation in inquiry cycles, competence to use data, attitudes toward data, and trust in collaboration, as well as the availability of data use organizational supports. It asks teachers about their use of state, periodic (e.g., interim), local (e.g., district-developed or common), and personal (e.g., teacher-made) assessment data. Because it does not inquire into all the kinds of information teachers are reported to use in their data use, I added questions about student data, organizational culture, and professional judgement. In a pilot study including 47 teachers in an urban district, the Cronbach alpha for each original scale was 0.85 or higher, indicating high reliability.

**Think Aloud Observation-interviews**

Attempting to capture the decision making processes of teachers is a challenging proposition given that much of the work involved is cognitive in nature (van Someren, Barnard,
& Sandberg, 1994). In an attempt to draw out teachers’ thinking and reasoning, I conducted 20-135 minute in-person think aloud observation-interviews. The sessions were audio recorded to enable transcription and accurate data interpretation, and I took fieldnotes during each session. I conducted a series of at least four think aloud observation-interviews and/or observations with each participant throughout the 2018-2019 school year. I had a goal of conducting at least five think alouds with each participant in order to capture a variety of data use activities focused on a variety of instructional and curricular challenges. See the protocol in Appendix B.

The think aloud method calls on participants to articulate their thoughts as they work to solve a problem (van Someren et al., 1994). In this case, teachers were asked to share what they were thinking as they engaged in a variety of data use activities (e.g., paper grading, lesson planning, and standardized test result review). While I provided a list of potential scenarios to guide participants’ selection of data collection timeframes, the teachers’ real-world priorities determined what was captured. During the think aloud observation-interviews, I listened and watched for cues regarding which kinds of data teachers use to make decisions, how teachers interpret various kinds of data, and which data they privilege for use in a variety of tasks. I consider this method a combination of observation and interview because, while the majority of the task required me to observe and take note of teacher behavior and dialogue, I probed teacher processes as necessary and helpful (e.g., if a teacher was working without thinking aloud for an extended period, or if I had questions about a decision’s rationale). This method enabled in-the-moment data collection that complements existing interview- and survey-based data use studies focusing on teachers’ recollections of past experience (e.g., Datnow, Park, & Kennedy-Lewis, 2012; Faria et al., 2012; Kerr, Marsh, Ikemoto, Darilet, & Barney, 2006; Means, Padilla, DeBarger, & Bakia, 2009; Vanlommel, Vanhoof, & Van Petegem, 2016). It also answered
Little’s (2012) call for additional teacher micro-process studies to capture what teachers do in actual daily practice.

**Observations**

In several instances, it was more appropriate for me to observe a teacher working without a think-aloud component. For example, I observed all teachers participating in team and school-wide meetings without asking them to think aloud. In one instance, I also observed a teacher during instructional time. An amendment was approved by the IRB prior to that observation, and the participating teacher signed an updated consent form in response to the change in data collection format.

**Document Analysis**

In addition to observing and interviewing participants, I collected documents and artifacts related to participant teachers’ decision making and data use (Merriam, 2009). These items included teacher team meeting agendas, photographs (of materials and participants, not students), teacher-created tools and notes, and other articles that spoke to data use practice or context. No personally identifiable information restricted by the Family Educational Rights and Privacy Act (FERPA) was collected (U. S. Department of Education Family Policy Compliance Office, 2018). These pieces of evidence further define teachers’ contexts, enhance understanding of data use activities, and point to practice occurring outside data collection windows. See the protocol in Appendix B.

**Follow-up Interviews**

As think aloud observation-interview sessions came to a close, I scheduled 60-90 minute follow-up, semi-structured interviews with participants, which took place in the summer and fall
of 2019. Follow-up interviews were conducted in person. They were audio recorded and I took notes during the conversations. See the protocol in Appendix B.

Follow-up interviews allowed participants to provide feedback regarding my initial analysis of their think aloud and observation sessions, and enabled me to dig deeper into participants’ data use practice. I encouraged teachers to share any factual or inferential errors made in the summary documents I shared with them. I also provided time for them to add any additional context or nuance they deemed missing. With no concerns shared, we then tackled questions that arose during data collection sessions that remained unanswered. I asked teachers to fill in any gaps I perceived in their think aloud dialogue and probed for additional detail. I also inquired into how their practice responded to the decision(s) made during our sessions, the results of their actions based on those decisions, and their rationale for the interpretations and decisions made. Last, we discussed participants’ data use education, experience, and practice, with special attention paid to their use of professional judgment. The protocols guiding the discussions were semi-structured, meaning that while I had topics and probes prepared for the interviews, conversations followed participants’ responses and were tailored to each teacher (Merriam, 2009). These follow-up interviews provided context for, and further explained, participating teachers’ data use processes.

**Researcher as Instrument**

As I engaged in the aforementioned methods of data collection, it is important to remember that I, too, served as a data collection instrument in this study. As the constructivist paradigm asserts, I cannot be separated from the knowledge I help to produce. It is, therefore, necessary to share more about myself so that readers may become familiar with the subjectivities
that influenced my interpretations. Most relevant to this inquiry are my experiences and beliefs
related to education, decision making, data use, and credible evidence (see Chapter 1).

Summary

By collecting teacher background information; engaging in think aloud observation-
interviews, observations, document analysis, and follow-up interviews; and practicing
reflexivity, I generated data capable of providing readers vicarious experience that can inform
their practice. Together, these qualitative data collection methods enable in-depth understanding
of teacher data use.

Data Analysis and Interpretation

In order to transform raw data into the in-depth understanding and vicarious experience
case study can produce, I engaged in data analysis and interpretation. This occurred as an
iterative process, as I made meaning during and after data collection; of each data source; within
and across cases; in response to participant and critical friend feedback; in light of my reactions
to the process; and throughout the entire study (Merriam, 2009). The tools that enabled this
work include NVivo (a qualitative data analysis software program), audio recordings,
transcriptions, journal entries, memos, fieldnotes, and data collection protocols.

Thorough data preparation supported my work. After interviews and relevant portions of
observation-interviews were transcribed, fieldnotes were finalized, and observation and
document analysis protocols were completed, those data sources were uploaded into NVivo. I
also uploaded journal entries [which tracked my reactions to and decisions made about the study
(Merriam, 2009)], memos [which recorded analytical insights and provided contextual
information (Merriam, 2009)], teacher background information questionnaires, Teacher Data Use
Surveys, summaries of teacher background questionnaires and Data Use Surveys, documents and photographs, and data used by teachers during data collection sessions.

As they were uploaded, all data sources were coded in NVivo. Codes are short descriptions or interpretations of pieces of data that allow researchers to locate ideas and detect patterns within their data set (Merriam, 2009). Throughout the study I engaged in open, \textit{a priori}, and axial coding (Merriam, 2009). Open coding occurs as a researcher inductively analyzes data; open codes are emergent. \textit{A priori} coding occurs as data is labeled with predetermined categories; in this study, I looked for evidence of the types of data teachers use, the portions of the data cycle most often enacted, the data use facilitators and barriers present at each school, teacher sensemaking, and the outcomes of data use. Axial coding occurs as individual codes are grouped into categories; both open and \textit{a priori} codes can be grouped together during axial coding. Codes and categories help researchers consolidate, reduce, and interpret their data to create themes and report findings.

This kind of coding and theming is known as thematic analysis. Thematic analysis “…involves the identification of emerging patterns and categories from iterative reviews of the dataset, a process which marshals evidence for developing and warranting findings” (Mabry, 2009, p. 218). Patterns and categories may be reached through both direct interpretation and categorical aggregation (Stake, 1995). These modes of analysis occur, respectively, in the moment as data collection is happening, and across time as similar incidents arise across different participants or data collection sessions. The work required me to refine, substantiate, and try to disprove initial analyses as I pursued trustworthy assertions (Stake, 1995). Merriam (2009, p. 176) describes it as “…a complex process that involves moving back and forth between concrete bits of data and abstract concepts, between inductive and deductive reasoning, between
description and interpretation.” Ultimately, thematic analysis rendered assertions that honor the multiple, and perhaps contradictory, realities of the teacher data use experiences displayed and relayed by participants (Stake, 1995).

Engaging in the data preparation, coding, and theming activities characteristic of qualitative, thematic data analysis allowed for exploration of the data in search of answers to my research questions. Data sources were considered multiple times, as I analyzed participant dialogue, behaviors, and reflections in the context of the background information and documents collected. Themes were crafted within in each case, as well as across the collective cases. I worked to challenge first impressions captured through journaling, memoing, and initial analysis, and push myself to disprove my own theories throughout the analysis process (Stake, 1995). As a result, my findings should enable readers to engage in their own process of analysis, deciding whether my assertions are believable and could be applied in their own settings.

**Ensuring a Trustworthy Study**

Whether or not readers permit this study to inform their practice will depend, in part, on the trustworthiness of my work. Lincoln and Guba (1986) outlined four tenets of trustworthiness for qualitative studies. While trustworthiness parallels the construct of validity used to measure the goodness of quantitative inquiry, it is uniquely responsive to the constructivist foundation of qualitative research. For those acquainted with quantitative research’s validity measures, however, it may be helpful to note that the trustworthiness tenets of credibility, transferability, dependability, and confirmability roughly correspond to internal validity, external validity, reliability, and objectivity, respectively.
Credibility

The credibility of a qualitative study is determined by the extent to which its findings represent its data and match reality (Lincoln & Guba, 1986; Merriam, 2009). To ensure credibility, researchers can engage in prolonged engagement, reflexivity, triangulation, negative case analysis, member checking, and peer review. Following several teachers over the course of a school year, and conducting multiple data collection sessions with each teacher, should ensure that I sufficiently connected with participants. This prolonged engagement allowed me to stay in the field until no new information was being gathered (i.e., saturation) (Merriam, 2009). Reaching saturation guards against reaching conclusions rooted in limited, incomplete data.

By acknowledging and disclosing my experiences and beliefs related to education, decision making, data use, and credible evidence above, I demonstrated a commitment to engaging in reflexivity. Reflexivity is a practice through which a researcher continuously surfaces and addresses her biases, assumptions, and experiences in order to examine their influence on her work (Merriam, 2009). As previously mentioned, I kept a journal while conducting my study to capture my reactions to participants, their actions and comments, as well as thoughts and feelings I developed about my topic, decisions, and interpretations. By recording these thoughts and feelings, I worked to reduce and/or appropriately acknowledge my positionality’s influence on the findings so that participants’ experiences were privileged and readers were informed about how assertions were crafted. Hopefully transparency about how my identity shapes assertions increases the work’s credibility.

Of course who I am did not serve as the substantive focus of my results. Triangulation across participants, data sources, methods, and time help demonstrate that findings represent the data (Lincoln & Guba, 1986; Merriam, 2009). My study’s design enabled comparison of data
segments within and across cases; between questionnaires, surveys, interview transcripts, documents, and fieldnotes; between observations, interviews, and document analyses; and along the timeline of the school year. Codes, themes, interpretations, and findings emerging in one segment of the data were checked against all other segments to ascertain their salience and prevalence. Some interpretations arising in numerous segments became assertions through categorical aggregation, while direct interpretations at times underscored the importance of ideas arising less often (Stake, 1995). Providing readers with information about the nature and quantity of data segments supporting a claim should demonstrate that participant experiences, rather than my beliefs, have dominated analysis and interpretation.

Participants helped further enhance the credibility of my study by responding to member checks (Lincoln & Guba, 1986; Merriam, 2009; Stake, 1995). Informal member checks were conducted throughout the study. After each session, I sent transcripts and/or fieldnotes and session summaries to participants via email. They responded at their convenience with any questions, concerns, or additional information they deemed important. At no time did a participant express concern with my account of events or interpretations of their work. Formal member checks took place after results were written. At that time, I presented participants with drafts of my work where their work was discussed. Again, no concerns were raised. Explaining how participants shaped and/or validated my interpretations should assure readers that I have appropriately represented their realities.

In addition to gathering participants’ reactions to my analysis, I sought the insights of a critical friend. This “intellectual watchdog” (Rallis & Rossman, 2009) had classroom teaching and qualitative research experience. Their job was to ask difficult questions about the choices and meaning I made. For example, after initial observations and follow-up interviews, and
before findings were finalized, my critical friend coded a sample of fieldnotes, transcripts, and documents. Together we compared our analyses, discussed any discrepancies, and attempted to reach consensus about what the data meant. The input gathered during this peer review process provided a stronger sense that those with different beliefs and experiences, and distance from the inquiry, would identify the same patterns, themes, and assertions in my data as I did.

**Transferability**

The generalizability of this study’s findings help determine its usefulness and impact. Because qualitative research is rooted in a constructivist paradigm that advances the idea of multiple realities, there is no expectation that findings from a study like mine will be universally relevant or representative; instead, qualitative researchers are encouraged to provide thick, rich description of their work so that readers may decide whether what they have learned is applicable in their own context (Lincoln & Guba, 1986; Lincoln et al., 2011; Merriam, 2009; Stake, 1995).

Thick, rich description of my work was enabled by my methodology (because case study allows for in-depth exploration), as well as the audio recordings, transcriptions, fieldnotes, and documents created and collected during the study. The details captured by these data sources helped me fully describe participants, their settings, and their processes. I pulled quotes from teachers to substantiate and characterize my claims, and contextualized those words within relevant physical, social, cultural, economic, political, and historical realities (Lincoln et al., 2011; Merriam, 2009; Stake, 1995).

Thorough and nuanced reporting of my findings should allow for vicarious experience and naturalistic generalization for readers (Stake, 1995). Vicarious experience is possible when participants’ words and actions are so completely and clearly communicated that a reader feels as
if they were there. When description in the study reflects a reader’s reality, naturalistic generalizations may form. With this case, I hope readers will view participant teachers’ experience as so similar to their own work that the findings of my study are relevant in their context. In this way, readers themselves will weigh in on the trustworthiness of my results.

**Dependability and Confirmability**

Outsiders also are more likely to accept assertions as trustworthy when they are dependable and confirmable. Dependable findings are those that others would agree are consistent with your data (Merriam, 2009), while confirmable findings are those clearly not created through researcher imagination alone (Mertens, 2010). Both dependability and confirmability are promoted through the triangulation, peer review, and reflexivity practices detailed above, as well as the development of an audit trail (Merriam, 2009). An audit trail provides a detailed account of how a study’s data was collected, how codes were generated, and how themes evolved. The journaling and memoing activities I undertook capture this information as I recorded the rationale for decisions I made about recruiting, sampling, data collection, and data analysis and interpretation. These study artifacts should support others’ conclusions that my assertions flow from my data and are worthy of their consideration.

**Summary**

Just as inquirers and the inquired-into work together to create knowledge (Lincoln et al., 2011), all of my study’s stakeholders will participate in determining the trustworthiness of my work. I, in my roles of inquirer and researcher-as-instrument, practiced reflexivity, triangulation, thick description, journaling, and memoing. I strove to be transparent about how and why I conducted my study and reached my conclusions. Participants promoted trustworthiness by engaging in member checks, and commenting on the authenticity of my interpretations. A
critical friend contributed by conducting a peer review of my operational and analytical decision making. Ultimately, readers will reach the final verdict as they decide whether to apply my findings in their lives. Together, these actions taken by a variety of players communicate the trustworthiness of my study.

**Study Limitations**

Although I designed my study with great care—taking into consideration the assumptions of the constructivist and pragmatic paradigms; the tenets of qualitative research and case study; the strengths and appropriateness of my decisions regarding sampling, data collection, and data analysis; and the practices that promote trustworthiness—it still was limited. The primary area in which it may have fell short of an ideal inquiry is method weakness.

Limitations attributed to the think aloud method threaten my study. Proponents of the method, van Someren and colleagues (1994), concede that people are not always able to verbalize all their thoughts; it is likely gaps in the data occur as cognitive processes proceed without being articulated. They also point out that it can be difficult for people to verbalize decision making that has become routine, and that some people are better at verbalizing their thoughts than others. Their final warning relates to the fact that translating cognitive processes into words may alter the natural flow of participants’ decision making. Critics of the think aloud method add that talking about decision making may weaken people’s ability to solve problems well (Schooler, Ohlsson, & Brooks, 1993). These shortcomings may have undermined the method’s ability to generate the rich, instructive data I hoped to share.

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2 While many may assume that a lack of broad generalization would be the first limitation mentioned for a qualitative study, I do not include it here. As highlighted above, this work is informed by a constructivist assumption that there is no single truth that can be predicted or controlled (Lincoln et al., 2011). Therefore, my study does not seek to surface one solution that can be applied to everyone, but rather to share in-depth accounts from multiple perspectives that may be consulted as readers see fit. To count non-generalizable findings as a limitation of this study would be inappropriate because generalizable findings are not sought.
It is my hope that, by identifying the potential limitations of my study, I was able to work toward minimizing them. It is important to note, however, that despite my best efforts, it is not possible for my work to be without weakness. In any inquiry, researchers must weigh the strengths and challenges associated with each of their decisions and attempt to craft a strong design capable of meeting their aims. Given the support provided for the choices I have made, I believe I have crafted an inquiry that could inform data use practice.

Conclusion

I decided to focus my dissertation on exploring how data use could be improved after learning how the modern educational accountability movement birthed data use practice that takes place in unsupportive contexts, does not reflect data use frames, and produces equivocal results. In this chapter I detailed how constructivist and pragmatic assumptions led me to design a qualitative, instrumental, collective case study examining teachers’ decision making. By engaging in purposive sampling, I located teachers with data use expertise capable of responding to my research questions. Through think aloud observation-interviews, observations, follow-up interviews, and document analysis I generated data explaining how teachers balance a variety of sources while making decisions. Thematic analysis allowed me to make assertions about teachers’ data use, which could inform future training and practice. The design outlined above is capable of promoting trustworthiness, while minimizing limitations. It is my hope that this study will contribute to the field’s understanding of teachers’ data use practice, while supporting teachers in using a variety of data sources to make the best possible decisions for their students.
APPENDIX B

DATA COLLECTION TOOLS
Teacher Background Information Questionnaire

Participant ID:
School:
District:
State:
Grade(s) taught
    Currently:
    In the past:
Subject(s) taught
    Currently:
    In the past:

<table>
<thead>
<tr>
<th>Education</th>
<th>Degree</th>
<th>Major</th>
<th>School</th>
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<tr>
<td></td>
<td>Bachelors:</td>
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<tr>
<td></td>
<td>Masters:</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Doctoral:</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Years of experience:
Licenses and certifications:
Data use training and experience:
Referred by:
This Teacher Data Use Survey\(^3\) is meant to further acquaint me with your data use practice. Completing it is completely voluntary. You may choose not to participate at all, to stop at any time, or to skip any question(s) you choose. Not completing the survey does not disqualify you from participating in the study.

It takes about 15–20 minutes to complete the full instrument. Responses will remain confidential, as your name will not be attached to your results (unless you choose to forego anonymity). There are no foreseeable risks involved in participating in this survey beyond those experienced in everyday life. If you have any questions or concerns, please contact Jana Grabarek at jgrabarek@luc.edu or (574) 386-6948. Thanks for your participation!

*The following questions ask about various forms of data that you may use in your work.*

1. Are the following forms of data available to you? (Screening question)

<table>
<thead>
<tr>
<th>Form of data</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>State (standardized state assessments)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>e.g., PARCC, ISAT, ISTEP</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Periodic (commercially available periodically administered assessments)</td>
<td></td>
<td></td>
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<tr>
<td>e.g., NWEA MAP, DIBELS, ANet</td>
<td></td>
<td></td>
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<tr>
<td>Local (district-developed assessments)</td>
<td></td>
<td></td>
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<tr>
<td>e.g., common assessments, end-of-course exams</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Personal (classroom-based assessments)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>e.g., quizzes, homework, portfolios, end-of-unit tests, writing assignments</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*If you indicated “no” to all options in question 1, skip to question 10. If you responded “yes” to any option, please proceed to question 2.*

---

\(^3\) The original Teacher Data Use Survey was prepared for the Institute of Education Sciences (IES) under Contract ED-IES-12-C-0005 by Regional Educational Laboratory Appalachia administered by CNA. See:

2. Teachers use all kinds of information (i.e., data) to help plan for instruction that meets student learning needs. How frequently do you use the following forms of data? (Screening question)

<table>
<thead>
<tr>
<th>Form of data</th>
<th>Do not use</th>
<th>Less than once a month</th>
<th>Once or twice a month</th>
<th>Weekly or almost weekly</th>
<th>A few times a week</th>
<th>Daily</th>
</tr>
</thead>
<tbody>
<tr>
<td>State</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Periodic</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Local</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Personal</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Professional judgment</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(your own knowledge and experiences)</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

3. If you marked the “other” option above, please specify the form of data here:

4. Now, how useful are the following forms of data to your practice?

<table>
<thead>
<tr>
<th>Form of data</th>
<th>Not useful</th>
<th>Somewhat useful</th>
<th>Useful</th>
<th>Very useful</th>
</tr>
</thead>
<tbody>
<tr>
<td>State</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Periodic</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Local</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Personal</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Professional judgment</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

5. If you marked the “other” option above, please specify the form of data here:

*If you indicated that state data is not available to you in question 1, OR if you indicated that you do not use state data in question 2, please go to question 7.*
6. These questions ask about state data. In a typical month, how often do you do the following?

<table>
<thead>
<tr>
<th>Action</th>
<th>Do not use</th>
<th>Less than once a month</th>
<th>Once or twice a month</th>
<th>Weekly or almost weekly</th>
<th>A few times a week</th>
<th>Daily</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use state data to identify instructional content to use in class.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Use state data to tailor instruction to individual students’ needs.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Use state data to develop recommendations for additional instructional support.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Use state data to form small groups of students for targeted instruction.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Discuss state data with a parent or guardian.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Discuss state data with a student.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Meet with a specialist (e.g., instructional coach or data coach) about state data.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Meet with another teacher about state data.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


*If you indicated that periodic data is “not available” to you in question 1, OR if you indicated that you “do not use” periodic data in question 2, please go to question 8.*
7. These questions ask about periodic data. In a typical month, how often do you do the following?

<table>
<thead>
<tr>
<th>Action</th>
<th>Do not use</th>
<th>Less than once a month</th>
<th>Once or twice a month</th>
<th>Weekly or almost weekly</th>
<th>A few times a week</th>
<th>Daily</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use periodic data to identify instructional content to use in class.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Use periodic data to tailor instruction to individual students’ needs.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Use periodic data to develop recommendations for additional instructional support.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Use periodic data to form small groups of students for targeted instruction.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Discuss periodic data with a parent or guardian.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Discuss periodic data with a student.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Meet with a specialist (e.g., instructional coach or data coach) about periodic data.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Meet with another teacher about periodic data.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


*If you indicated that local data is “not available” to you in question 1, OR if you indicated that you “do not use” local data in question 2, please go to question 9.*
8. These questions ask about local data. In a typical month, how often do you do the following?

<table>
<thead>
<tr>
<th>Action</th>
<th>Do not use</th>
<th>Less than once a month</th>
<th>Once or twice a month</th>
<th>Weekly or almost weekly</th>
<th>A few times a week</th>
<th>Daily</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use local data to identify instructional content to use in class.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Use local data to tailor instruction to individual students’ needs.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Use local data to develop recommendations for additional instructional support.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Use local data to form small groups of students for targeted instruction.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Discuss local data with a parent or guardian.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Discuss local data with a student.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Meet with a specialist (e.g., instructional coach or data coach) about local data.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Meet with another teacher about local data.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


*If you indicated that personal data is “not available” to you in question 1, OR if you indicated that you “do not use” personal data in question 2, please go to question 10.*
9. These questions ask about personal data. In a typical month, how often do you do the following?

<table>
<thead>
<tr>
<th>Action</th>
<th>Do not use</th>
<th>Less than once a month</th>
<th>Once or twice a month</th>
<th>Weekly or almost weekly</th>
<th>A few times a week</th>
<th>Daily</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use personal data to identify instructional content to use in class.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Use personal data to tailor instruction to individual students’ needs.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Use personal data to develop recommendations for additional instructional support.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Use personal data to form small groups of students for targeted instruction.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Discuss personal data with a parent or guardian.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Discuss personal data with a student.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Meet with a specialist (e.g., instructional coach or data coach) about personal data.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Meet with another teacher about personal data.</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

10. These questions ask about your professional judgment (i.e., your own experiences and knowledge). In a typical month, how often do you do the following?

<table>
<thead>
<tr>
<th>Action</th>
<th>Do not use</th>
<th>Less than once a month</th>
<th>Once or twice a month</th>
<th>Weekly or almost weekly</th>
<th>A few times a week</th>
<th>Daily</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use your professional judgment to identify instructional content to use in class.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Use your professional judgment to tailor instruction to individual students’ needs.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Use your professional judgment to develop recommendations for additional instructional support.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Use your professional judgment to form small groups of students for targeted instruction.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Discuss your professional judgment with a parent or guardian.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Discuss your professional judgment with a student.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Discuss your professional judgment with a specialist (e.g., instructional coach or data coach).</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Discuss your professional judgment with another teacher.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The remainder of this survey asks general questions about the use of data to inform your education practice. For the rest of this survey, please consider only the following when you are asked about “data”:
- State achievement tests.
- Periodic assessments.
- Locally developed assessments.
- Personally developed assessments.
11. These questions ask about supports for using data. Please indicate how much you agree or disagree with the following statements:

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Agree</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>I am adequately supported in the effective use of data.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I am adequately prepared to use data.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>There is someone who answers my questions about using data.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>There is someone who helps me change my practice (e.g., my teaching) based on data.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>My district provides enough professional development about data use.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>My district’s professional development is useful for learning about data use.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

12. These questions ask about your attitudes and opinions regarding data. Please indicate how much you agree or disagree with the following statements:

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Agree</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data use is not required to achieve positive student outcomes.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Data help teachers plan instruction.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Data offer information about students that was not already known.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Data help teachers know what concepts students are learning.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Data help teachers identify learning goals for students.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Using data can narrow curriculum and instruction in counterproductive ways.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>My own professional judgment is the most important piece of data I use.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Students benefit when teacher instruction is informed by data.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I think it is important to use data to inform education practice.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I like to use data.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Data use carries more risks than rewards.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I find data useful.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Using data reduces bias in my decision making.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Using data helps me be a better teacher.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

13. These questions ask how your principal and assistant principal(s) support you in using data. Principals and assistant principals will not be able to see your answers. Please indicate how much you agree or disagree with the following statements:

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Agree</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>My principal or assistant principal(s) encourages data use as a tool to support effective teaching.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>My principal or assistant principal(s) creates many opportunities for teachers to use data.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>My principal or assistant principal(s) has made sure teachers have plenty of training for data use.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>My principal or assistant principal(s) is a good example of an effective data user.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>My principal or assistant principal(s) discusses data with me.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>My principal or assistant principal(s) creates protected time for using data.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

14. Your school or district may give you programs, systems, and other technology to help you access and use student data. The following questions ask about these tools. Please indicate how much you agree or disagree with the following statements:

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Agree</th>
<th>Strongly agree</th>
<th>N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>I have the proper technology to efficiently examine data.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The computer systems in my district provide me access to lots of data.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The computer systems (for data use) in my district are easy to use.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The computer systems in my district allow me to examine various types of data at once (e.g., attendance, achievement, demographics).</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The computer systems in my district generate displays (e.g., reports, graphs, tables) that are useful to me.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


15. These questions ask about your attitudes toward your own use of data. Please indicate how much you agree or disagree with the following statements: (Screening question)

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Agree</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>I am good at using data to diagnose student learning needs.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I am good at adjusting instruction based on data.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I am good at using data to plan lessons.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I am good at using data to set student learning goals.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The following questions ask about your work in collaborative teams.

16. How often do you have scheduled meetings to work in collaborative team(s)? (Check only one.)

- □ Less than once a month.
- □ Once or twice a month.
- □ Weekly or almost weekly.
- □ A few times a week.
- □ I do not have scheduled meetings to work in collaborative teams.

If you answered “I do not have scheduled meetings to work in collaborative teams” in question 15, please go to question 19.

17. As you think about your collaborative team(s), please indicate how much you agree or disagree with the following statements:

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Agree</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Members of my team trust each other.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>It’s ok to discuss feelings and worries with other members of my team.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Members of my team respect colleagues who lead school improvement efforts.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Members of my team respect those colleagues who are experts in their craft.</td>
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<tr>
<td>My principal or assistant principal(s) fosters a trusting environment for discussing data in teams.</td>
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</tbody>
</table>

18. How often do you and your collaborative team(s) do the following?

<table>
<thead>
<tr>
<th>Action</th>
<th>Never</th>
<th>Sometimes</th>
<th>Often</th>
<th>A lot</th>
</tr>
</thead>
<tbody>
<tr>
<td>We approach an issue by looking at data.</td>
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<tr>
<td>We discuss our preconceived beliefs about an issue.</td>
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<tr>
<td>We identify questions that we will seek to answer using data.</td>
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<tr>
<td>We explore data by looking for patterns and trends.</td>
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<tr>
<td>We draw conclusions based on data.</td>
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<tr>
<td>We identify additional data to offer a clearer picture of the issue.</td>
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<tr>
<td>We use data to make links between instruction and student outcomes.</td>
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<tr>
<td>When we consider changes in practice, we predict possible student outcomes.</td>
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<tr>
<td>We revisit predictions made in previous meetings.</td>
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<tr>
<td>We identify actionable solutions based on our conclusions.</td>
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</tbody>
</table>

19. What else would you like to share about your data use?
Think Aloud Observation-interview Protocol

Participant ID:
Date:   Time:
Location description and diagram:

Problem being solved:
- Grading
- Instructional planning (e.g., pacing, differentiation, reteaching)
- Curricular planning
- Student grouping (e.g., small groups or class rosters)
- Reflection
- Policy change
- Intervention
- Other:

Data used:
- Achievement data:
- Student data:
- Organizational context:
- Personal judgment:
- Other:

Describe the process:

Observer impressions:

Possible prompts
- What do you expect the data will tell you? What are your expectations based on?
- What do you expect your solution will be? Why do you think this solution will improve student outcomes?
- What does the data tell you?
- Why do you think you’re seeing these results? Any links to curriculum, instruction?
- What additional information, if any, would you like to review before making a decision about how to proceed? Why do you think that information would be beneficial?
- Did the data confirm or contradict your expectations?
  - If confirm, do you still plan to implement your expected solution? If not, why?
  - If contradict, does this change your expected solution? If so, how?
  - If changed solution, what about the data made you decide to change course?
Document Analysis Protocol

Participant ID:

Kind of document:
- [ ] Mission/vision
- [ ] CIWP
- [ ] Manual/training material
- [ ] Photo
- [ ] Action plan
- [ ] Data worksheet
- [ ] Teacher evaluation
- [ ] Agenda
- [ ] Achievement data
- [ ] Student data
- [ ] Organizational context
- [ ] Other:

Date:   Title:
Author:   Audience:
Purpose:

Key topics:

Observer impressions:
Follow-up Interview Protocol

Member check
- Is my characterization of your process fair?
- Is it factually accurate?
- Have them clarify any gaps in the data where it appears they were thinking something they didn’t articulate.
- Is the process described in your think aloud data typical of the way you make decisions?
  - If so/not, why/how?
  - What is your go-to process?
  - What did these instances leave out that you usually do?

Teacher Data Use Survey follow-up
- Which specific tools in various categories are the most useful?
- What do you use different tools for? What do you learn from each?
- How do you combine/balance data sources to make decisions?

Potential data use inquiry topics
- Data use training, education and experience
- Change in data use over time, by context
- Role, presence of factors known to influence data use success (teacher, assessment, and context factors)
- Level of data use implementation fidelity (personally, school-wide)
- Best way to ascertain student needs
- How to make instructional decisions
- Balancing professional judgment with other data sources
- Addressing bias in professional judgment
- Revamping teacher training to improve data use
REFERENCE LIST


VITA

Dr. Grabarek completed undergraduate studies in communication at Purdue University. Her early career involved connecting a series of very different organizations with their customers, communities, the media, and policymakers.

While earning a master’s degree in urban education at Indiana University–Purdue University Indianapolis, Dr. Grabarek learned that her interest in research and evaluation could help her meaningfully contribute to the field of education.

During doctoral study, she has supported and led program evaluations of teacher professional development programs, studies of teacher data use, and courses on research methods. Material from this dissertation has been submitted for publication as a peer-reviewed journal article, and will contribute to the creation of a practitioner guide to comprehensive data use.

Dr. Grabarek belongs to the American Evaluation Association and American Educational Research Association, and has presented at these organizations’ annual meetings.