

How School Leaders Support Teacher Data Use:
A Case Study of How School Leaders in New York State Support
Teachers' Use of State, School, and Classroom Data

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Abstract

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Due to educational policy, data use in schools is a widespread method of school improvement, yet results remain inconsistent. Across the literature, the school leader is a key determinant of the effectiveness of data use. This study sought to shed light on the role of the school leader in data use through a mixed methods case study. The study included two PreK-2nd grade schools from a school district in Long Island, New York. I administered a survey on data use attitudes and practices to both principals and teachers. I also conducted interviews with both principals and two teachers from each school. And I observed four Professional Learning Communities (PLCs) meetings. Analysis of survey results was conducted through a *t*-test and ANOVA, and coding was used to analyze the transcripts from interviews and observations.

Results revealed that both teachers and principals reported feeling high levels of support for data use. Teachers perceived formative data the most useful to their practice, rating it higher than interim or summative data. Collaborative teacher time was used for data use, but the method employed varied from the traditional inquiry cycle described in the literature. Based on these findings, I propose a new model of data use, the Do, Know, Now model, which reflects observed data use both in this study and another. In the Do, Know, Now model, teachers (Do) use existing data to identify a problem, (Know) leverage teacher expertise to consider solutions, and (Now)

select a solution for immediate implementation. The Do, Know, Now model accommodates the constraints of everyday life in schools and may be explained by a satisficing decision-making model wherein the decider stops searching once a good enough solution has been found. The development of a data use model reflective of actual practice is significant for school leaders who seek to use data use to improve student outcomes. By understanding the model teachers are using, school leaders can provide better support. For example, principals may invest in high-quality ready-to-use materials for teachers to select from.

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J. A. G.

Dedication

To my princess, Julia, my protector, Watson, and my partner, Justin.

I love you to the moon and back.

Chapter 1: Introduction

Background

Data use in schools has continued to gain popularity due to educational policy such that the use of data as part of instructional reform is now an expectation (Cosner, 2014). While educational policy has created a focus on data use, some studies question whether data use has an impact on student outcomes. A two-year randomized controlled experiment showed that treatment schools that received weekly support from a data coach showed no difference in data usage, adjustment to instruction, or student achievement in reading or math (Gleason et al., 2019). In contrast, there are several studies that substantiate the impact of data use on student outcomes (Carlson et al., 2017; Chatterji et al., 2009; Faria et al., 2014). What remains unclear, then, is what exactly differentiates effective data use from ineffective data use.

Across studies, research has demonstrated that the school leader is a key determinant in data use success. The school leader can be instrumental in schoolwide data use (Cosner, 2014) or can be a primary barrier in teachers not using data (Wayman et al., 2012a). Leadership practices that foster data use include establishing and reinforcing a data use agenda, buffering teachers from outside disruptions, developing distributed leadership for data use (Cosner, 2011), allocating collaborative time, ensuring access to data, and using meeting protocols (Boudett et al., 2013; Gerzon, 2015). There are myriad variables that impact a leader's ability to support data use, including setting, teacher needs, leader experience, and leader-teacher relationships (Marsh & Farwell, 2015). The findings on school leader influence on data use are limited. While there is significant research on data use at large, there is inadequate work focused on the

essential role leaders play (Levin & Datnow, 2012), and much of what does exist is only conceptual (Cosner, 2014).

Problem Statement

Due to American educational policy, data use will continue to be central in schools, yet the literature has yet to provide consistent guidance on how school leaders can support data use that results in school improvement. Given the emphasis on evidence-informed improvement, school leaders' support of data use deserves more attention to ensure that efforts help students instead of having no effect or even harming them. More research is needed to understand the important role leaders play in data use and how their support is received and implemented by teachers.

Purpose of the Study

This study sought to describe how school leaders are currently supporting data use and how that support is received by teachers. Given that “data use for school improvement is a complex process” (Schildkamp, 2019, p.269), this study sheds light on school leadership's support of data use. While there is some existing research, it is limited, such as focused on teachers instead of leaders, focused on a specific data use intervention, or only quantitative without rich qualitative data. This study adds to the literature as an-depth case study involving a survey, interviews, and observations to describe how school leaders support data use in schools, how teachers receive that support, and how data use is implemented.

Research Questions

The overarching question for this study was: *How do school leaders in New York State support teachers' use of state, school, and classroom data?* To further understand this question, I focused on five sub-questions:

1. To what extent do school leaders report supporting data use?
2. To what extent do teachers perceive leader support of data use?
3. Which data use organizational supports from school leaders are most significant?
4. How, if at all, is collaborative teacher meeting time used for data use?
5. Which types of assessments (state, school, or classroom) do teachers perceive the best and use most frequently?

Significance of the Study

The emphasis on data use in education is continuing to increase as more data sources are available (Mandinach & Gummer, 2016), yet evidence that it results in improvement is inconsistent (Gleason et al., 2019). School leaders set conditions that can facilitate or encumber effective data use (Cosner, 2014; Wayman et al., 2012a). This study adds to the literature on data use by describing how school leaders are currently supporting data use in schools and how that support is received and implemented by teachers.

In this study, I found that principals reported giving support for data use and teachers reported receiving support for data use. Additionally, I found that teachers preferred to use formative data over interim or summative data to inform their practice. Lastly, I found that the data use model in practice at schools was different from the data use frameworks. For example, conceptual data use frameworks suggest making a hypothesis about the problem being studied is key; however, the data use meetings observed did not show evidence of teachers asking why students were having a problem. Overall, the data use observed diverged from theoretical inquiry cycles in two significant ways: there was no creation of a hypothesis to test, and there was no evidence of teachers cycling back to the problem after trying an intervention. Based on these findings, I propose a new data use model, the Do, Know, Now model, which outlines the steps I

observed as well as those documented in another recent data use study (Garner et al., 2017).

Teachers (Do) use existing data to identify a problem, then (Know) leverage teacher expertise to consider potential solutions, and finally (Now) select a solution to be implemented immediately. I suggest that the Do, Know, Now model may be operating under a satisficing decision-making theory where the decider can efficiently decide by stopping the search once an adequate option, based on the decider's own set criteria, has been found. This process may be ideal for the time constraints present in schools.

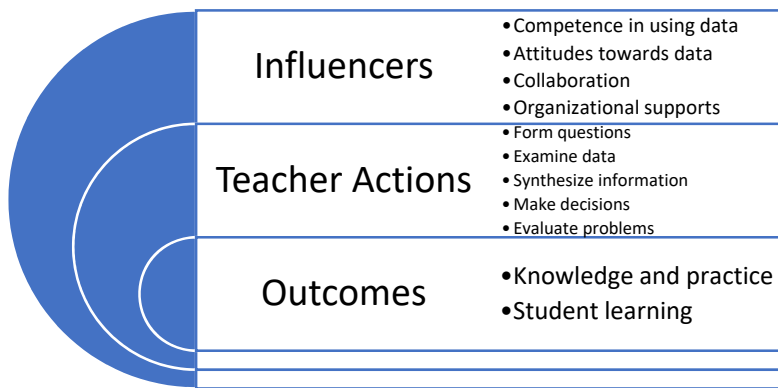
This study makes contributions to both theory and practice. The study moves the research of data use forward by reevaluating previous data use frameworks and proposing a new model that may be more predictive of actual data use in schools. Principals can use the findings to better support data use in their schools. In my proposed Do, Know, Now model, teachers want ready-to-use solutions that can be implemented immediately. There is a range of quality in ready-to-use solutions, such as pre-boxed materials that may not be adjusted to local contexts versus adaptive materials that can adjust the level and modality down to individual student needs. To improve outcomes of data use, leaders could invest in high-quality instructional materials for their teachers to pick from to ease the data use process and help ensure better outcomes for students. The study also has research and policy implications. While measurement scientists readily agree to the notion of assessing for learning through formative assessments, policymakers hold on to old notions of assessment of learning through summative assessments (Rice & Gordon, 2014). This study revealed that educators prefer formative data to inform their instruction over summative data, which they felt did not provide an accurate portrait of student learning or provide actionable information. This finding may help convince shifts in policy on assessment

and data use for learning. The potential effects from this study could allow for improved use of data, which has the potential to lead to greater student outcomes.

Conceptual Framework

In this study, I used the Data Use to Improve Student Learning Model (Figure 1) (Wayman et al., 2016). Within this framework, I specifically focused on the data use influencers (competence in using data, attitudes towards data, collaboration, and organizational supports), as those are aspects that school leaders can impact. I used this conceptual framework as the underpinnings of the administration of the Teacher Data Use Survey (TDUS) (Wayman et al., 2016), the observation of teacher collaboration meetings, and the interviews with school leaders and teachers.

Figure 1. *Data Use to Improve Student Learning Model*



Note. Source: Wayman et al., 2016.

Limitations

Given the constraints of time and a single researcher, this study only utilized two schools, which is a small sample size. The study included similar schools from the same district to avoid additional variables; however, that also makes results less generalizable. As is typical for surveys, I had a low response rate and did not reach the recommended survey sample sizes for a

confidence level of 95% and a margin of error of 5% (Pazzaglia et al., 2016). During collaborative teacher meetings, some teachers were more dominant participants (Creswell, 2007) that could have altered the agenda of the meeting.

It is also important to acknowledge my own bias and positionality as a researcher. Throughout my tenure in education, I have used data to improve student outcomes. In my first role as a bilingual middle school teacher in the South Bronx, I leveraged formative reading assessments to appropriately challenge my students and accelerate their reading growth. When I transitioned to work as an assistant principal, I coached teachers on the use of data, leading individual teachers to greatly improve their students' outcomes and increasing our school's performance. Later, as a charter network Senior Director of Curriculum and Instruction, I facilitated data use at scale across our network team and each school. The data practices I instituted led to great increases in student growth and achievement. While I have seen evidence-informed practices be able to have a tremendous impact on student outcomes, I have also observed frequent misuse of data to the detriment to students. Under pressure of accountability testing, I have observed school leaders allocate teacher time toward a narrow group of bubble students they hope to be able to push over the proficiency threshold. I have also seen the modification of instruction to mirror the test. In addition to my prior experience, I acknowledge that I currently work at a non-profit that specializes in Measures of Academic Progress (MAP), a student growth assessment tool. Lastly, I am currently a doctoral student in Teachers College's Urban Education Leaders Program. The program offers coursework directly related to the use of data in schools. I recognize that my positionality may have impacted my methods, analysis, and perceived implications.

Definitions

Assessment – An evaluation of student learning including state assessments, district and school assessments, curriculum-based assessments, and classroom assessments (Hamilton et al., 2009).

Data – In this study, data will be defined broadly as “information that is collected and organized to represent some aspect of schools” (Schildkamp et al., 2013, p. 10). Data will include quantitative data such as attendance or test scores and qualitative data such as observations.

Data Literacy – Having the knowledge to understand data and the skills to analyze it to infer conclusions from it.

Data Use – The act of “teachers, principals, and administrators systematically collecting and analyzing various types of data, including demographic, administrative, process, perceptual, and achievement data, to guide a range of decisions to help improve the success of students and schools” (Hamilton et al., 2009, p.46).

Formative Assessment – Assessment used to provide feedback to both students and teachers on progress toward learning goals and inform ongoing instruction, such as a learning activity during a unit of study (Hamilton et al., 2009).

High-Stakes Testing or Accountability Testing – In this study, these terms will be used interchangeably. They will be defined as mandated standardized testing in reading and math that directly influences school rewards or consequences.

Inquiry Cycles – A cycle of analyzing data, developing hypotheses about instructional practice, formulating and implementing an action plan to improve learning, and analyzing data to evaluate progress and inform next steps (Hamilton et al., 2009).

Negative Data Use – Data misuse or abuse. For example, teachers misinterpreting data and then applying an incorrect intervention (data misuse) or purposely manipulating data, such as cheating on tests (data abuse) (Schildkamp et al., 2013).

Neutral Data Use – Data is analyzed but does not lead to action or change in teacher practice. For example, showing bar graphs of school data with no follow-up.

Positive Data Use – Data use to improve teaching and learning. For example, teachers analyzing student performance on a classroom assessment, determining students’ areas of strength and improvement, and then adjusting the planned instruction to leverage their strengths and bolster their weaknesses.

School Improvement – Using “decisions to help improve the success of students and schools” (Mandinach & Gummer, 2016, p. 14).

School Leader – In this study, school leader will exclusively be the school principal.

Standardized Tests – A form of summative assessment that allows one to see if students are meeting set criteria, such as the Common Core standards (Benjamin & Pashler, 2015).

Summative Assessment – Assessment used to evaluate what the student knows at a set time and determine mastery of what has been taught, such as an end-of-unit assessment (Hamilton et al., 2009).

Chapter 2: Literature Review

Introduction

This literature review describes the history and context of data use in schools and the existing research. Section 1 will cover the background on data use, section 2 will review different data use models, section 3 will synthesize research on the impact of data use on teaching and learning, and section 4 will review data use enablers and barriers. Given the extensive body of literature on data use, this review will narrow its focus to prominent researchers in the field as well as studies focused on school leader implementation of data use. Following the review of prior research is a framework for this study. The section concludes with the research questions I attempted to answer in this study.

Section 1: Background on Data Use

History of Data Use

Data use was first conceptualized within the scientific community. The benefits of systemically using data to improve were later adapted and used successfully in the business industry. Based on a scientific method of data use, in the 1950s, W. Edwards Deming developed the Plan Do Study Act (PDSA) method, which was popularly used with car manufacturers (Murawski & Lochner, 2017). Each aspect of PDSA is intended to work together to lead to better results. *Plan* involves outlining the intended goals and a process to achieve them, *Do* entails enacting the plan and collecting data, *Study* requires comparing actual results with expected results and analyzing disparities between the two, and *Act* includes determining steps to correct for the differences between expected and actual results (Murawski & Lochner, 2017).

The data use systems appropriate for the business world could not be applied directly to schools. For instance, while a car manufacturer can consider adjusting their input, such as materials used, schools cannot ethically adjust their inputs, schoolchildren. However, PDSA has inspired many data use protocols for the educational setting. In keeping with PDSA's emphasis on data use for improvement, two popular school data use models, Data Wise (Boudett et al., 2013) and Data Teams (Schildkamp et al., 2016), both that argue data-driven decision-making involves many feedback loops to achieve better results. While the models of school data use resemble data use frameworks in science and business, efficacy of data use for improvement in education has been harder to quantify than in these other settings. For example, while the business world may unequivocally state improved outcomes, such as decreased expenditures, measuring teaching and student learning is a more complicated endeavor. This literature review will seek to describe what research has been conducted thus far to show the effectiveness of school data use and what gaps remain.

Learning Measurement Epistemologies

A foundational part of school data use is understanding the history of different theories around the measurement of learning. There are three major theoretical approaches to measuring the mind: positivist philosophy, classic test theory, and postmodern theory of measurement (Dixon-Román & Gergen, 2013). Developed in the 19th century, positivist philosophy places a premium on quantitative data and a belief that everything is measurable (Dixon-Román & Gergen, 2013). Applying the scientific method to the human mind, positivist theory contends that universal truths can be established through the assignment of numerals to objects or events according to rules (Dixon-Román & Gergen, 2013). Standardized tests are an example of a positivist school measurement. Standardized tests assume there is one correct answer to each

question and students can be assigned a number correct as their score or value on the assessment. Classic test theory, developed in 1888, builds off positivist theory and states that observed scores are the result of true scores and errors (Dixon-Román & Gergen, 2013). A further development of classic test theory, item response theory, analyzes test item difficulty and examinee ability (Nering & Ostini, 2010). Adaptive computerized tests are an example of an item response theory measurement. Adaptive tests adjust as students test based on their responses and report a score with a margin of error assuming the student could do plus or minus a certain amount if they were to test again. Finally, postmodern theory of measurement, developed in the 1990s, deviates from the purely quantitative notion of measurement and instead establishes two characteristics: the need to understand the important concepts in the learning area and the need to determine what must be observed to determine student learning in this area (Dixon-Román & Gergen, 2013). Performance tasks are an example of a postmodern measurement. In a performance task, students demonstrate learning and are evaluated compared to the key understandings of the area of study. Of the three learning measurement epistemologies, educational policy has centered in the positivist frame, promoting the idea that there is a true measurement of the mind. The next section will review the background of the rise of accountability educational policies.

Educational Policy Context

The practice of accountability testing began gaining popularity after the publication of *A Nation at Risk*, which rang the alarm about the inadequacy of American student performance (Giersch, 2016). Following the publication of the report, states began raising graduation requirements and using state-wide assessments (Au, 2013). Nationally, the report also spurred action. One of President George W. Bush's first acts was to work on linking Title I funding to student test scores (Au, 2013). Accountability testing was further institutionalized during the

reauthorization of the 1965 Elementary and Secondary Education Act (ESEA) as No Child Left Behind (NCLB) in 2002 and as Every Student Succeeds Act (ESSA) in 2015. While ESSA was framed as a reform of NCLB, it places the same emphasis on standardized testing: “States are still held accountable for testing requirements, reporting data, and sanctioning underperformance” (Saultz et al., p. 20). While accountability testing has stressed the importance of data for school leaders, it has also caused leaders to narrow their definition of what counts as data (Roegman et al., 2018). The next section will review different data sources, their design and purpose, and their advantages and disadvantages.

Data Sources

Defining data broadly as “information that is collected and organized to represent some aspect of schools” (Schildkamp et al., 2013, p. 10), schools have many varied sources of data. Data can be considered across four main categories: context data, such as a school culture survey; input data, such as student demographics; process data, such as classroom observations; and outcome data, such as test results (Schildkamp et al., 2013). Assessment, or evidence of student learning, has two large domains—summative assessment and formative assessment. Summative assessment is used to evaluate what the student knows at a set time and determine mastery of what has been taught, such as an end-of-unit assessment (Hamilton et al., 2009). Formative assessment is used to provide feedback to both students and teachers on progress toward learning goals and inform ongoing instruction, such as a learning activity during a unit of study (Hamilton et al., 2009). In the following subsections, I will review three of the most popular data sources in schools: accountability tests, classroom data, and non-academic data. For each data source, I will describe its design, intended purpose, use in schools, and impact on student learning.

Accountability Testing

Due to educational policies such as NCLB, accountability testing is frequently used in schools as a primary data source. The general format of high-stakes tests is as standardized tests, which are designed to measure the effectiveness of instruction (William, 2010). Standardized tests allow one to see if students are meeting set criteria, such as those set forth by the Common Core standards (Benjamin & Pashler, 2015). Standardized tests fall under the category of summative assessments and are intended to gauge mastery of predetermined material. In this regard, standardized tests can also allow for student self-reflection, helping the learner see what they do and do not know from what was taught (Benjamin & Pashler, 2015). When used for accountability purposes, standardized tests are intended to provide an equal measure by which to compare schools' performance.

One example of using standardized tests for performance comparison is for fair school funding. The accountability era allowed fair school funding to shift from an equity argument, which was subjective and difficult to argue to the courts, to an adequacy argument, which was considered more objective (Policy Brief: School Funding, 2000). An equity argument relies on defining what is fair, which can be disagreed over, while an adequacy argument hinges on what is sufficient to reach predetermined benchmarks, such as state standards (Policy Brief: School Funding, 2000). Previously, an adequacy argument was hard to make because there was no way to compare student outcomes from one school to another. When yearly accountability testing began, suddenly there was an apples-to-apples comparison that allowed school districts to argue for adequate funding. Under the adequacy argument, the state has set standards of success as measured by the state tests and must provide adequate funding to meet these standards (Policy Brief: School Funding, 2000). In *Campaign for Fiscal Equity et al. v. State of New York et al.*

(2016), New York City schools successfully used the adequacy argument to demand increased funding for schools.

The example of fair school funding demonstrates the power of standardized tests when used within their intended purpose; however, they are often overstretched to be used for additional purposes outside of their design or as a sole measure of student success. Ladson-Billings (2009) describes an ideal school in which standardized tests are but one measure in a school's portrait of achievement:

As a testament to the success of Robeson Elementary School, its students score above the national norm on standardized tests, but Robeson does not make a fuss over its test score performance. The school community knows that in a caring, supportive environment where all of the children are made to feel special, test scores are but one of the marks of accomplishment that can be expected. (p. 155)

Multiple measures of student attainment are important to help ensure validity. While standardized tests are used as an objective measure of student learning, some literature questions their soundness. There is evidence that 50-80% of student performance can be attributed to outside factors, such as whether the child ate breakfast or who proctored the test (Au, 2013). Beyond testing subjectivity, there is also evidence of scoring imprecision and manipulation, including testing companies like Pearson incentivizing scorers to rush and mandating that results mirror the previous year's (Au, 2013).

A frequent misunderstanding of accountability testing is that it will, in of itself, improve instruction. Standardized tests provide a snapshot of student mastery of past content, not a forward-looking guide for future learning. As such, without additional data sources like formative assessments, they do not provide actionable information for school improvement. The inability of using accountability tests alone to raise achievement is a well-documented problem. Based on a study looking at the relationship between high-stakes testing policies and achievement using the National Assessment for Education Progress (NAEP) results, few policies

showed any relationship to improvement in scores (Marchant et al., 2006). Since the enactment of NCLB, the gap between White and Black male high school graduation rates remains wide, with data showing it as high as 31% higher for White students (Thompson & Allen, 2012). NAEP similarly shows only a small decrease in the Black-White achievement gap on reading and math scores since NCLB (Thompson & Allen, 2012). In contradiction to its aims, NCLB has increased student disengagement and school dropout: “Studies suggest that an emphasis on test scores only contributes to leaving more students behind” (Giersch, 2016, p. 914). Where there are claimed result increases, there is evidence of deception in the numbers, such as underreported dropout rates, teacher cheating and assistance on the test, adjustments of cut scores, and exclusionary practices removing students from testing (Vasquez & Nichols, 2013). Across 18 states that asserted gains on their high-stakes high school tests, no comparative increases were made on the SAT, ACT, Advanced Placement (AP), or NAEP, suggesting score inflation on the state standardized tests (Huddleston, 2014).

High-stakes tests are also not ideal to promote teacher professional development. When accountability assessments are used as a method of promoting teacher growth, it “reduces teaching and learning to a process of test-remediate, test-remediate, test-remediate which impoverishes teaching and provides little professional development or judgement for teachers” (Horsford et al., 2019, p. 142). Educators are also not invested in using standardized tests as a form of instructional improvement. In a study of over 40,000 public school teachers, most said standardized testing is not a good measure of student learning, while 89% said that curriculum that goes beyond content needed for the tests has a deep impact on students (Thompson & Allen, 2012). Further, when used as part of teacher evaluation, a focus on accountability testing can

cause teachers to choose inequitable solutions such as remediation instead of instructional improvement (Garner et al., 2017).

Classroom Data

While evidence suggests accountability testing is not ideal to inform instruction, research has shown potential for using contextualized school data for formative purposes. In a two-year case study, middle school teachers conducted inquiry cycles based on student classwork and reflected that they significantly improved their instruction and created lessons that were more responsive to their students, rigorous, and integrated across the various aspects of literacy (Pella, 2012). Similarly, a study found that using the Proximal Assessment for Learner Diagnosis (PALD), a classroom assessment, coupled with a three-step data use process (error analysis, mediation, and practice), led to improved teacher assessment practices, better attitude toward assessing, and increased student achievement (Chatterji et al., 2009). More recently, a study showed that two-thirds of teachers reported using interim assessments to inform their instruction (Jennings & Jennings, 2020). Unlike accountability tests, which provide evaluative information, classroom data can provide important feedback for both students and teachers to inform ongoing instruction.

The next section will consider non-academic data sources and their uses.

Non-Academic Data

While not as frequently considered, in addition to various forms of academic data, teachers and school leaders have access to non-academic evidence that can be used for school data use. Non-academic data, such as information on students' families, behavior, and attitudes, have recently gotten more attention due to an increased focus on social emotional learning, grit, and students' feelings toward school (Reeves et al., 2021). A recent study reviewing use of

non-academic data found that teachers most frequently analyzed attendance, learning processes, and behavior (Reeves et al., 2021). However, the study also showed that teachers' priority data point is classroom academic data (Reeves et al., 2021). Distinct from standardized tests or classroom data, non-academic data can provide excellent supplemental information on students, culture, and context. Regardless of which data sources are used, it is important to understand what constitutes data use.

The next section will provide background on data use terminology and ethical data usage.

Defining Data Use

Data Use Terminology

Across the literature, there are many varied terms under the umbrella of data use. Popular terminology includes *data-driven decision-making* (Mandinach & Gummer, 2016), *data-based decision-making* (Prenger & Schildkamp, 2018), and *inquiry cycles* (Boudett et al., 2018). While each term has a particular emphasis, such as collaboration and investigation in inquiry cycles (Boudett et al., 2018), they all stress the same aspects of an iterative process where data is collected, analyzed, and acted on to address a problem. As the underlying methods are analogous, in this study I will use the term *data use* (Wayman et al., 2016) to encompass all these related terms. I will define data use using the Institute of Education Sciences guide on

Using Student Achievement Data to Support Instructional Decision Making:

teachers, principals, and administrators systematically collecting and analyzing various types of data, including demographic, administrative, process, perceptual, and achievement data, to guide a range of decisions to help improve the success of students and schools. (Hamilton et al., 2009, p.46)

I will use the term *data use* as it aligns to the conceptual framework of this study and encompasses any use of data to inform educational decisions to improve teaching and learning.

Ethical Data Use

An additional important definition within data use is ethical data use, an area that demands attention, as many educators are not aware of the proper privacy protections needed for student data as well as what constitutes responsible use of data (Mandinach & Gummer, 2016). In this study, data use to improve teaching and learning will be considered positive data use. An example of this type of instrumental data use (Schildkamp et al., 2013) is teachers analyzing student performance on a classroom assessment, determining students' areas of strength and improvement, and then adjusting the planned instruction to leverage their strengths and bolster their weaknesses. A more neutral use of data use would be conceptual (Schildkamp et al., 2013), in which school data is analyzed but does not lead to action or change in teacher practice. While this may serve as a stepping-stone for future instrumental data use, on its own, it will not improve student outcomes. Lastly, negative data use includes either misuse or abuse of data. An example of data misuse would be teachers misinterpreting data and then applying an incorrect intervention (Schildkamp et al., 2013). Data abuse is a more intentional negative use of data in which data is purposively manipulated, such as cheating on tests (Schildkamp et al., 2013). Given an overview of data sources and general data use, the next section will delve deeper into specific data use frameworks and common trends across them.

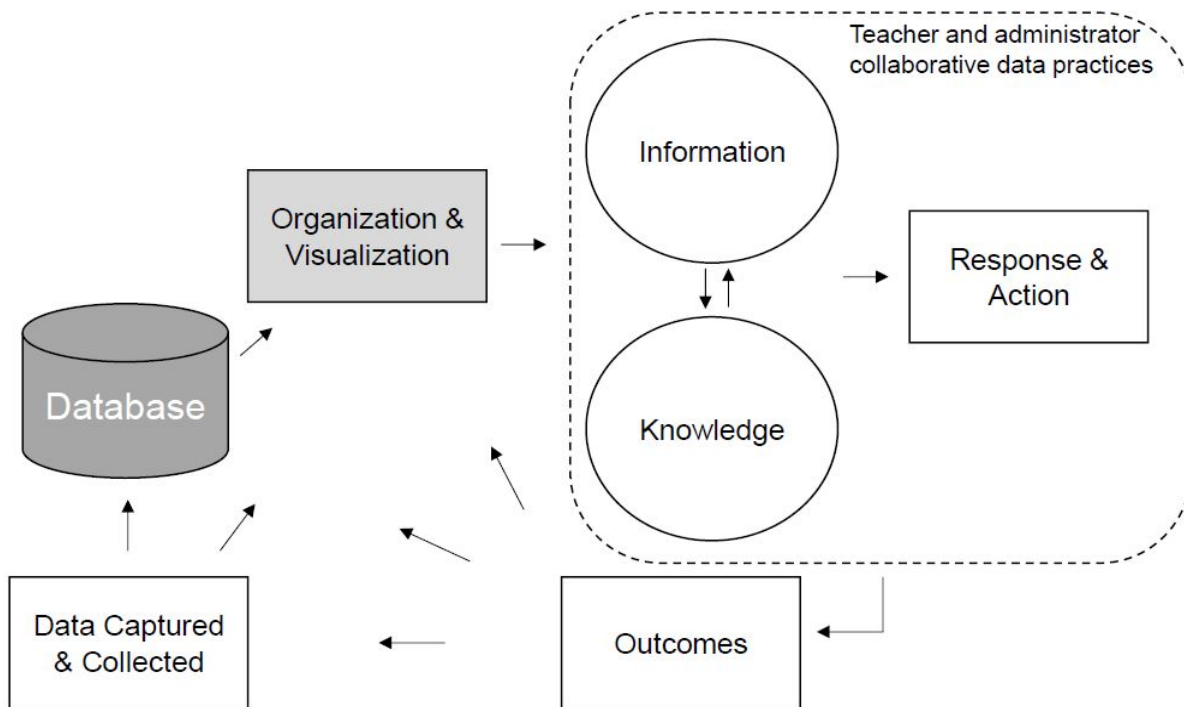
Section 2: Data Use Models

School data use has been distilled down into proposed processes with the goal of improving teaching and learning. Starting with the classroom level, data use expands out to the full school: "A school-level feedback system extends the insights from the classroom to the school as a learning organization" (Halverson, 2010, p. 132). In a school feedback system, key classroom learning is identified, formative assessment of student learning is collected and

analyzed, and adjustments are made to improve teaching and learning (Halverson, 2010).

Figure 2 shows a data use logic model based on the idea that data is collected and analyzed to inform instructional improvement. The following section will narrow in on teacher and administrator collaborative data practices by reviewing various models of data use for learning.

Figure 2. *Logic Model of Data Use in Schools*



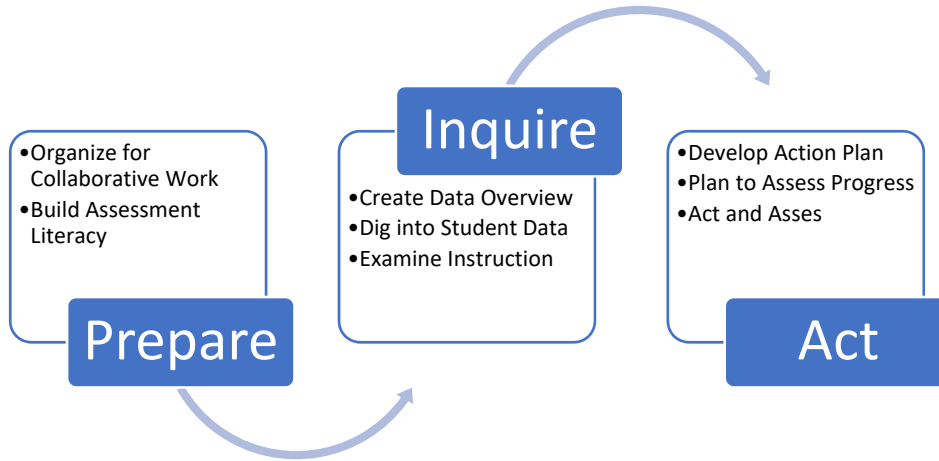
Source: Bowers, 2021b.

The Data Wise Improvement Process

Data Wise (Boudett et al., 2013) is a commonly used framework among practitioners. The Data Wise Improvement Process (Figure 3) is an eight-step data inquiry process: organizing for collaborative work, building assessment literacy, creating a data overview, digging into the data, examining instruction, developing an action plan, planning to assess progress, and acting and assessing (Boudett et al., 2013). Data Wise includes many anecdotes explaining its optimal

use in schools; however, the length and in-depth nature of all eight steps can make it unmanageable for many school leaders to implement.

Figure 3. *The Data Wise Improvement Process*



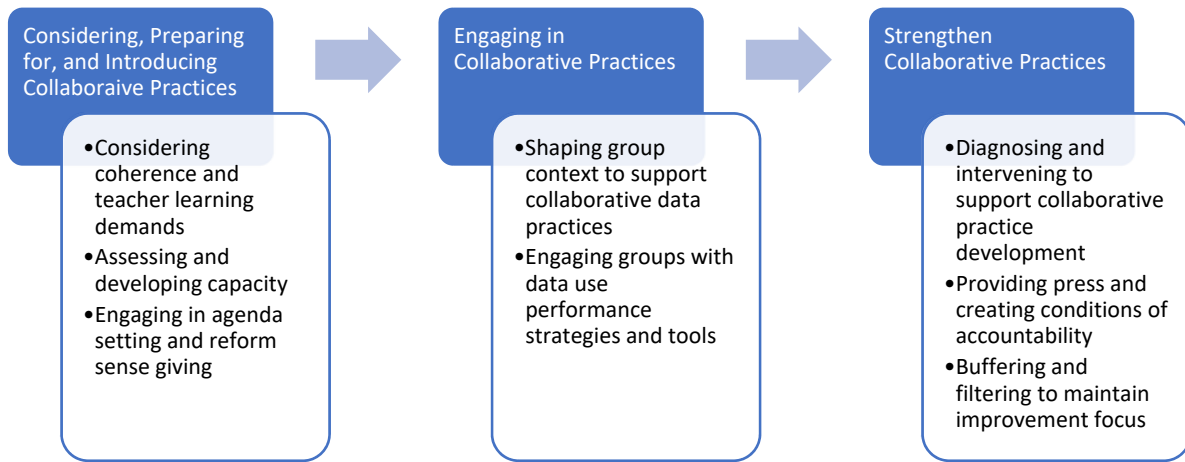
Source: Boudett et al., 2013.

Phased-Based Model of School Leadership for Collaborative School Data Practices

Whereas Data Wise (Boudett et al., 2013) is based on a review of practitioners, Cosner (2014) proposed a three-phase conceptual framework (Figure 4) based on the literature and theory. Based on existing research, Cosner proposed a three-phase and eight-domain process for school leaders to cultivate collaborative data practices. The first phase is considering, preparing for, and introducing collaborative data practices and is comprised of three subdomains of considering coherence and teacher learning demands, assessing and developing capacity, and engaging in agenda setting and reform sense giving. The next phase is engaging in collaborative practices and requires two subdomains of shaping group context to support collaborative data practices and engaging groups with data use performance strategies and tools. Finally, after engagement, school leaders should strengthen collaborative data use by diagnosing and intervening to support collaborative practice development, providing press and creating

conditions of accountability, and buffering and filtering to maintain improvement focus. As with Data Wise (Boudett et al., 2013), the number of steps and intricacies within each make this framework unwieldy. Further, as noted by Cosner (2014), it is only a conceptual framework and it has not been empirically tested yet.

Figure 4. *Phased-Based Model of School Leadership for Collaborative School Data Practices*



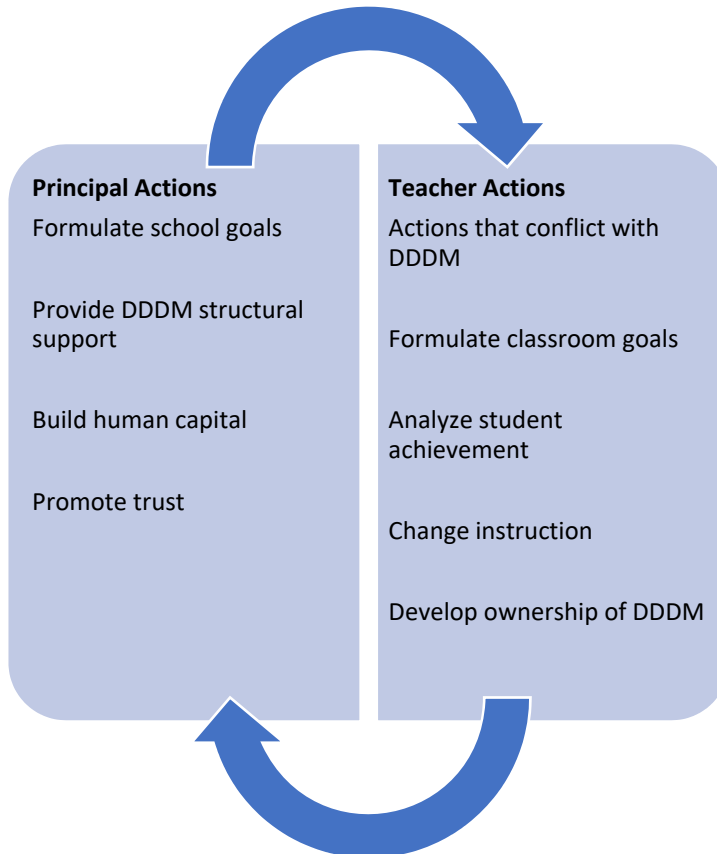
Source: Cosner, 2014.

Principal Leadership for Data-Driven Decision Making Model

Levin and Datnow (2012) propose a more streamlined option that identifies four key principal actions for data use in schools. Using data from a case study of a high-performing school, they outline a framework for how school leaders can influence data use: formulating goals contextualized to the community, providing structures that support data-driven decision-making, building human capital, and creating an environment of trust and collaboration around data use (Levin & Datnow, 2012). A key focus in their framework is the interconnectedness of school data use across the various contexts of state officials, district administrators, principals,

teachers, and students. Figure 5 outlines the four key principal actions for school data use and how they interplay with subsequent teacher data use.

Figure 5. *Principal and Teacher Actions in Data-Driven Decision Making (DDDM)*



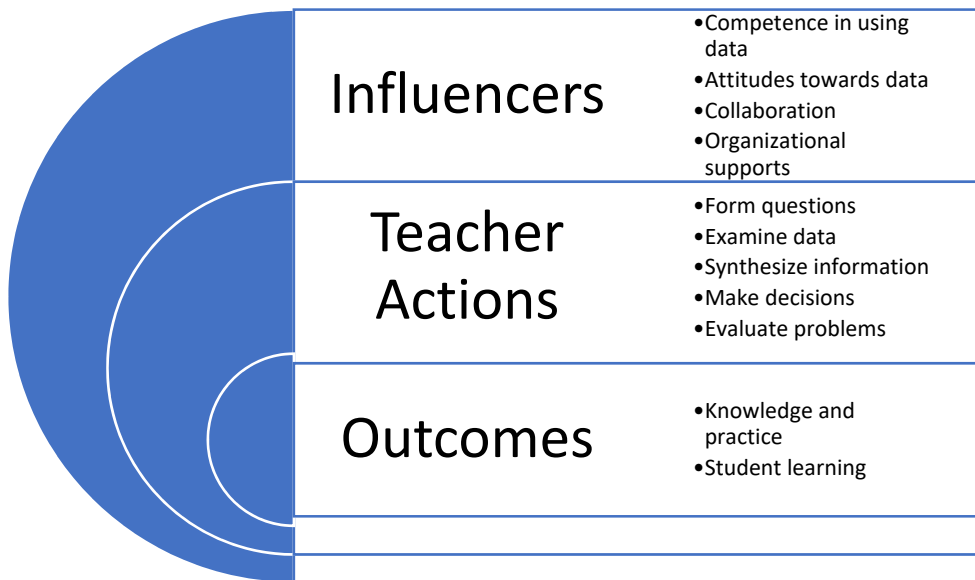
Source: Levin & Datnow, 2012.

In the figure, actions are listed in order of most amount of activity to least. While the principal leadership for data-driven decision making model itself is simplistic, the complexities outlined in the larger context of district, teacher, and student co-construction of data use make this model difficult to implement. Further, the framework is based solely on a single case study from a high school (Levin & Datnow, 2012), leaving questions as to its efficacy or generalizability.

Data Use to Improve Student Learning Model (Teacher Data Use Survey)

Wayman et al. (2016) proposed a model based on creating a data-informed school characterized by educators who believe data can inform their practice, positive attitudes toward data, and leader supports for data use. The model is based on a panel of researchers who focused on data use and the practical realities of implementing it in schools. The conceptual framework (Figure 6) describes teachers as the central data users and attributes their use or nonuse of data as part of a larger system comprised of competence in using data, attitudes toward data, collaboration with other teachers, and organizational supports (Wayman et al., 2016). This model was leveraged to create the Teacher Data Use Survey (TDUS), which allows schools and districts to assess their staff across these central components of school data use. There have been multiple studies validating the TDUS (National Center for Education Evaluation and Regional Assistance at IES, 2021).

Figure 6. *Data Use to Improve Student Learning Model*



Source: Wayman et al., 2016.

The next section will review how data use frameworks overlay with the larger literature on school leadership.

Intersection of Data Use Models and School Leadership Theories

Across data use frameworks, a consistent assertion is that the school leader is pivotal to data use success. This claim is not surprising, given that in a large-scale study on learning impact, “leadership was second only to teaching among in-school factors that affect student learning” (Grissom et al., 2021, p.ix). Not only can school leadership assist student outcomes, but evidence also suggests school improvement does not occur in the absence of quality leadership (Hitt & Meyers, 2018). A recent study revealed that the organizational structures set by a school’s leadership are tied to whether a school succeeds or fails (Jarl et al., 2021). Aspects of a strong school culture set by the school leader, such as a consistent focus on student learning, teacher collaboration, and shared ownership, were important influencers on positive student outcomes (Jarl et al., 2021). In comparison, struggling schools were characterized by frequent school leader turnover, teachers working in isolation, and a lack of focus on student learning (Jarl et al., 2021).

There are various theories, each with their own emphasis, on the most effective educational leadership model. For example, instructional leadership focuses on teaching and learning through supervisory actions, such as framing school goals and supervising and evaluating instruction (Hitt & Tucker, 2016). In comparison, shared instructional leadership maintains a focus on curriculum, instruction, and assessment, but positions the leader as a collaborator with teachers through action research and a community of learners (Hitt & Tucker, 2016). Distributed leadership does not center on instruction but instead emphasizes broad participation by teachers, parents, and community to enhance commitment to the organization,

share in decisions being made, and work being accomplished (Hitt & Meyers, 2018). Also, without a singular focus on instruction, transformational leadership focuses on developing the capacity of the organization through a commitment to collective goals and the larger good (Hitt & Tucker, 2016). Lastly, leadership for learning strives to combine instructional leadership with human resource elements such as teacher satisfaction, commitment, and retention (Boyce & Bowers, 2018).

While it is tempting to align to just one of the existing theories, impact studies suggest that there is no silver bullet for leadership frameworks. Instead, each situation and context requires specific practices, often combining multiple models or shifting models over time. For example, a three-year study showed that the greatest effect was not from one single leadership framework but from integrating transformational and instructional leadership, which led to a small but direct impact on student outcomes (Day et al., 2016). Similarly, a review of turn-around schools suggests that leadership models should transition over time from controlled leadership, with only the principal or a select group making decisions at first, to distributed leadership once the school is stabilized (Hitt & Meyers, 2018).

Data use is nested under this larger context of school leadership. Data use places an emphasis on major leader actions seen in all the frameworks around developing a vision, fostering collaboration and continual inquiry for improvement. For example, the Data Use to Improve Student Learning Model (Wayman et al., 2016) names collaboration as an essential prerequisite to successful teacher data use, while shared instructional leadership outlines collaboration on curriculum, instruction, and assessment as the primary lever of teacher growth (Hitt & Tucker, 2016). It is important not to view data use as separate and apart, but instead as an integrated value add to any leadership model.

Summary

While there are several school data use frameworks, common themes emerge across them. First, they all agree that given educational policy, school data use for improvement is now a necessity: “The expectation that educators will use data in the service of school improvement and planning is a major feature of national and local reform agendas” (Levin & Datnow, 2012, p. 179). All the data use models suggest a cyclical process of collecting data, analyzing it, acting, and assessing consistent with the original PDSA improvement cycle. As well, they outline consistent data use enablers or barriers, including collaboration, data literacy, common understandings, data mindsets, and time. They all contend that the school leader is essential for successful data use: “school leaders as key developers of collaborative data practices” (Cosner, 2014, p. 691).

The mitigating influence of the school leader on teacher data use is consistent with general studies on school improvement and the connection to principal leadership (Hallinger, 2018). However, despite the clear connection between school leader actions and data use, all the models describe a gap in research outlining exactly how this is best achieved: “Most prior studies, however, have not fleshed out how the principal functions as a key agent in influencing other key players in data use” (Levin & Datnow, 2012, p. 179). In this study, I sought to add to the school leadership for data use conversation by providing both quantitative data, through the TDUS, and qualitative data, through observations and interviews, on how school leaders are currently supporting data use in their schools and how that support is perceived and implemented by teachers.

Section 3: School Data Use to Improve Teaching and Learning

Impact of Data Use

Data use in schools has been studied extensively, but results about whether it impacts teacher practice and student outcomes remain inconsistent. Table 1 summarizes significant studies of the relationship between data use and student achievement. Studies include various grades, urban and suburban schools, various data use interventions, and mixed study designs.

Table 1. *Summary of Studies on the Impact of School Data Use*

Study	Methodology	Sample	Intervention	Key Findings
Achievement Network's Investing in Innovation Expansion: Impacts on Educator Practice and Student Achievement (West et al., 2016)	Randomized controlled experiment Duration: 2 years Data collected: student performance data and school leader and teacher surveys	119 schools Grades: 3-8 Locations: Boston, Chelsea, Springfield (MA), Jefferson Parish (LA) and Chicago (IL).	Achievement Network (ANet) components: -quarterly ELA and math interim assessments -data reports -coaching of school leaders -network of peer school collaboration	No impact of ANet on student achievement in reading or math Intervention school leaders and teachers reported using data to inform instruction more frequently than control schools
Classroom Assessment for Student Learning: Impact on Elementary School Mathematics in the Central Region (Randel et al., 2011)	Randomized controlled experiment Duration: 1 year Data collected: student achievement data, teacher and student surveys, teacher CASL logs	67 schools Grades: 4-5 Location: Colorado	Classroom Assessment for Student Learning (CASL) components: -CASL text -DVDs -ancillary books -implementation handbook	Statistically significant impact of CASL on student achievement Intervention teachers reported higher knowledge of classroom assessment than control teachers

Table 1 (continued)

Study	Methodology	Sample	Intervention	Key Findings
Learning to Learn From Data: Benchmarks and Instructional Communities (Blanc et al., 2010)	Duration: 3 years Data collected: interviews with district and support staff, case study analysis of 5 schools	10 “low performing” schools Grades: 3-8 Location: Philadelphia	-Benchmark assessments every 6 weeks -data sensemaking to inform instruction	When school leaders used interim assessments as part of a well-established data improvement cycle, they did contribute to instructional improvement Using data successfully was not the norm and required determined effort on the part of the school leader
A Multistate District-Level Cluster Randomized Trial of the Impact of Data-Driven Reform on Reading and Mathematics Achievement (Carlson et al., 2017)	Randomized controlled experiment Duration: 1 year Data collected: student achievement data	538 schools in districts with large numbers of low-performing schools Locations: Pennsylvania, Alabama, Arizona, Ohio, Indiana, Mississippi, and Tennessee	Johns Hopkins Center for Data-Driven Reform in Education (CDDRE) components: -quarterly benchmark assessments -district and school leader training on data-driven reform	Statistically significant districtwide improvement in student mathematics achievement and positive but not statistically significant improvement in student reading achievement
Replicating the Relationship Between Teachers’ Data Use and Student Achievement: The Urban Data Study and the Data Dashboard Usage Study (Faria et al., 2014)	Randomized controlled experiment Duration: 1 year Data collected: teacher and principal surveys, student achievement data, web log data	193 schools in 4 mid-large urban districts Grades: 4, 5, 7, and 8 Schools had been using interim assessments and planned to continue and had a data management system in place	None for the study. Perceptions and practices of data use happening in each district were studied.	Attention to data in the classroom was significantly positively related to student achievement Teacher perceptions of data use barriers predicted lower elementary mathematics student achievement

Table 1 (continued)

Study	Methodology	Sample	Intervention	Key Findings
<p>Does Teacher Data Use Lead to Improved Student Achievement? A review of the Empirical Evidence (Grabareck & Kallemeyn, 2020)</p>	<p>Meta-analysis of 39 quantitative, qualitative and mixed methods studies</p>	<p>Varied</p>	<p>Varied</p>	<p>38% of studies showed a positive relationship between data use and student achievement</p> <p>Studies showing a positive impact on student achievement showed stronger incorporation of ongoing professional development, comprehensive data use interventions, multiple sources of data, and the intention to use the data for continuous student improvement</p> <p>No differences were evident from school levels, subject areas, or study design</p>
<p>Evaluation of Support for Using Student Data to Inform Teachers' Instruction (Gleason et al., 2019)</p>	<p>Random assignment study Duration: 1.5 years Data collection: coaching logs, interviews, focus groups, student achievement data</p>	<p>102 schools in 12 medium to large economically disadvantaged districts Grades: 4 and 5</p>	<p>Professional development program components: -part-time data use coach</p>	<p>No significant effect on data-related activities, teacher data use, change in teacher practice, or student achievement</p>
<p>Longitudinal Effects of Teacher Use of a Computer Data System on Student Achievement (Wayman et al., 2017a)</p>	<p>Quantitative research design Duration: 2 years Data collection: data system click logs, student achievement data</p>	<p>1 urban school district</p>	<p>None. Observation of teachers use of data system</p>	<p>Significant relationship between teachers' data system interactions and student achievement in elementary reading but none for elementary math, junior high math, or junior high reading</p>
<p>Attending to Data: Exploring the Use of Attendance Data Within the Datafied School (Selwyn et al., 2021)</p>	<p>Qualitative studies Duration: 3 years Data collected: observations, document analysis, staff interviews, informal conversations</p>	<p>3 Australian secondary schools in Melbourne</p>	<p>None. Observation of school's anticipatory accounts of data use, analytical enactments, and administrative concerns of data use</p>	<p>Staff described wanting to use attendance data to know their students well while actual use was primarily purely attendance as an accountability metric</p> <p>Concerns included limited access to data, poor data infrastructure and inconsistent reporting</p>

Research Showing Efficacy

Multiple studies have shown student achievement improvement based on data-driven decision-making. A recent review of 39 qualitative, quantitative, and mixed methods studies revealed that 38% of the studies showed a positive relationship between data use and student achievement, while the remainder showed mixed relationships (11%) or no relationships (36%) (Grabareck & Kallemeyn, 2020). Carlson et al. (2017) showed statistically significant improvement in student math achievement and positive, but not statistically significant, improvement in student reading achievement, from schools using a data-driven initiative from the Johns Hopkins Center for Data-Driven Reform in Education (CDDRE). The study included over 500 schools within 59 districts and 7 states, with treatment districts implementing a quarterly benchmark assessment and receiving district and school leader training on data use from a CDDRE consultant for one year. The study proposed a few possible explanations for the increase in student outcomes, including students getting more practice on assessment taking, teachers being exposed to assessment content that they then integrated into instruction, and teachers gaining more knowledge on students' areas of weakness. While the study did not articulate a hypothesis as to the difference in math and reading results, the discrepancy may be explained by the fact that math assessments often have similar content to test, while reading assessments can vary based on the texts used and repeated exposure may not have helped students practice or teachers prepare them better. An update of the Urban Data Study (UDS), an American Institutes for Research and the Council for the Great City Schools experiment, found that teachers' focus on data relates to higher student achievement and conversely teachers' perception of barriers to using data connects to lower student achievement (Faria et al., 2014). A randomized controlled experiment measuring the impact of Classroom Assessment for Student

Learning (CASL) showed a statistically significant impact on student achievement (Randel et al., 2011). Data use has also shown influential patterns, for instance the use of early warning systems to predict and prevent student dropouts (Bowers, 2021a). Across studies that had a positive relationship between data use and student outcomes, a consistent finding was the need for a comprehensive data use plan, including multiple data sources, ongoing professional development, and an intention to use the data to improve learning for all students (Grabareck & Kallemeyn 2020).

Research Showing No Impact

While several studies showed successful implementation of data use, other studies showed no impact. The National Center for Education Evaluation and Regional Assistance conducted a two-year randomized controlled experiment of 102 demographically diverse schools across eight states reviewing if data-driven support of principals and teachers would lead to more use of data, change in instructional practices, and increased student achievement (Gleason et al., 2019). While treatment schools received weekly meetings with a data coach, the findings showed that the intervention did not result in any difference in data usage, adjustment to instruction, or student achievement in reading or math (Gleason et al., 2019). A study reviewing the effect of teacher use of a computer data system on student achievement found no significant relationship for elementary math, junior math, or junior reading (Wayman et al., 2017a). A two-year randomized controlled study measuring the impact of schools using interim assessments, data reports, and coaching from the Achievement Network found no impact on student achievement in reading or math (West et al., 2016). A further complication is that many studies rely solely on self-reported data, such as teacher surveys, which frequently do not match actual behavior. A case study on the use of attendance data showed that, while educators professed interest in

attendance data for school improvement, it was most frequently used to affirm what was already being done rather than to drive a new course (Selwyn et al., 2021).

Summary

A synthesis of the studies reveals that data use does have the potential to improve teaching and learning, but that the endeavor is complex and not easily distilled or replicated. It is important to note that no significant impact is a vague finding that should not necessarily lead to disregarding an intervention:

Absence of evidence, while important, is not the same as evidence of absence. One of the things this review [of data use studies] cannot say is that this dimension of the field—collecting, presenting, and making decisions with data—is unimportant. (Piety, 2019, p. 417)

Further research is needed to understand the underlying conditions school leaders can cultivate to support teacher data use. For example, a three-year case study showed that only when school leaders used interim assessments as part of a well-established data improvement cycle did they contribute to instructional improvement (Blanc et al., 2010). The study showed that using data successfully was not the norm and required determined effort on the part of the school leader (Blanc et al., 2010). Many of the studies conducted are quantitative and do not provide this extra layer of information to reveal deeper understanding of why school data use is effective or not in improving teaching and learning. Most studies also only review a specific intervention, giving a narrow view of data use. In this study, I reviewed a mix of quantitative survey data and qualitative observation and interview data to get a holistic picture of how school leaders are supporting teacher data use and how that support is perceived and implemented by teachers.

Section 4: School Data Use Influencers

The conceptual framework underpinning the TDUS (Wayman et al., 2016) outlines four main influencers to teacher data use: competence in using data, attitudes toward data,

collaboration, and organizational supports. Further evidence of this framework comes from a recent study on Nassau County (New York) teachers' use of data and of the district's data dashboard, which found that the primary data use influencers were teacher capacity, access to data, and leadership support (Bowers et al., 2019b). An example of the impact of these factors can be seen with standardized tests, which, as reviewed earlier, are not easily used to improve teaching and learning. Teachers are resistant to use accountability testing data because results are often delayed (organizational supports) and difficult to access through data management systems (organizational supports), require quantitative analysis skills (competence in using data), and teachers do not believe they assist them in making instructional changes (attitudes toward data) (Young, 2006). In this section, I will review each of the key data use influencers.

Competence in Using Data

One of the key influencers of data use is teachers' competence in using data, often referred to as *data literacy*. The skills and knowledge of data literacy allow teachers to gain an understanding of assessment principles to be able to make sense of data (Boudett et al., 2013). Data literacy is an essential prerequisite before educators can analyze data (Bowers et al., 2014); however, current teacher education preparation programs frequently do not include sufficient data literacy development (Bowers, 2017). Therefore, it is incumbent on school leaders to ensure data literacy is integrated into the professional learning in their building (Wayman et al., 2017b).

Attitudes Toward Data

Another key factor that impacts data use is teachers' attitudes toward data—their data mindset. An exploratory case study of data teams at a college of teacher education in the Netherlands found that belief in data use was one of the primary influencers of the depth of data conversations (Bolhuis et al., 2016). A quantitative study on how teachers' psychological factors

contribute to data use found that perceived control of data use, attitude regarding the benefits and consequences of data use, and intention to use data positively all significantly impacted data use (Pregner & Schildkamp, 2018). Internal strain can occur when there is a disconnect between educators' personal values and external pressures for data use, such as accountability testing (Kılıçoğlu, 2019). The school leader plays an important role in the messaging around assessments and their purpose, which can shape teachers' attitudes toward data.

Collaboration

Data use is best conducted through teacher collaboration. Research strongly suggests that data use should not be conducted alone: "Effective DBDM [data-based decision-making] does not happen in isolation; educators (teachers, support staff, school leaders) need to collaborate in the use of data" (Hoogland et al., 2016, p. 380). *Data Wise* identifies "organizing for collaborative work" as the first step in data-driven instruction (Boudett et al., 2013). In addition to being a part of an essential component of data use, collaboration is a general best practice in adult learning. In the following subsection, I will discuss the intersection of data use collaboration and collaboration as part of teacher development.

Intersection of Data Use and Professional Development

Data use, and its essential components such as collaboration, is a form of professional development (PD). Collaboration is regarded as one of the most effective methods of conducting PD. For example, teaming is one of the four pillar practices in adult learning (Drago-Severson, 2012). An international study comparing student results from the International Mathematics and Science Study (TIMSS) to teacher questionnaire responses revealed that teacher collaboration had the greatest positive impact on student results (Clavel et al., 2016). Similarly, a survey of 300 teachers showed that collaboration contributes to teaching quality (Ismail et al., 2018).

However, effectiveness of teacher PD through collaboration is nuanced. A review of 28 K-12 PD studies from 1975 to 2016 showed that many of the long-held beliefs about effective PD, such as an emphasis on the use of professional learning communities, may not be as consistently effective as previously thought but instead only successful under the right conditions (Kennedy, 2016). Many additional variables, such as teacher motivation, whether the PD is mandated, and competing school priorities, played a role in the ultimate results gained from PD (Kennedy, 2016).

An important component of successful collaboration is the content and structure used. Planning should focus on what knowledge students need, criteria to assess students, use of data to inform instruction, and increasing understanding of best practices (DuFour, 2007). A common misstep with teacher collaboration is that the time can often veer from academics to talk about housekeeping or student behavior with no clear action steps (Dever, 2013). In a large-scale examination of collaborative time usage across schools in the U.S., teachers reported spending most time discussing concerns about student work and behavior and planning special activities and very little time on academic planning (Lomascolo & Angelle, 2017). To move collaboration from basic conversations to strategic planning, meetings need a specific purpose, protocols, and procedures (Hargreaves & O'Connor, 2018), as having a set planning protocol increases instructional collaboration (Cravens et al., 2017).

Effective school leadership is also a prerequisite for teacher collaboration. A case study of two high-performing schools showed that for planning time to be effective, it had to be aligned to an understood larger school vision and coupled with strong school leadership (Cook & Faulkner, 2010). Similarly, a mixed method study showed that for collaboration to have a big impact on teacher practice, the school also had to have good leadership practices and community

building (Graham, 2007). Examples include setting collaboration norms and using schoolwide meeting agendas, both of which help set the tone for how educators should work together (Boudett et al., 2018).

Organizational Supports

Organizational supports is perhaps the broadest data use influencer category and can encompass a range of areas, such as vision and resource allocation. For example, the school leaders' ability to frame data-driven decision-making as focused on student learning needs and collective goals increases effectiveness (Park et al., 2012). Similarly, an exploratory case reviewing data use in an urban high school found that the leaders' ability to frame data use as a method to improve student learning through sustained collaborative effort was an essential component of the data implementation (Park et al., 2012). Another important part of organizational supports is dedicating sufficient time for data use. The American Institutes for Research and the Council of the Great City Schools conducted a large-scale study involving surveys and case studies on current data practices in urban districts and found that districts had data systems in place and staff committed to improving student achievement; however, barriers, such as time, resulted in varying degrees of investment (Heppen et al., 2011).

School Leader Role in Data Use

Overlaying competence in using data, attitudes toward data, collaboration, and organizational supports is the principal, who plays an essential role in data use success (Cosner, 2014; Levin & Datnow, 2012). Results from a three-year mixed method experiment showed that a leader's ability to diagnose a school's needs was essential to instructional achievement and improvement (Day et al., 2016). Without the principal's investment, school data use will not develop at a school:

Our experience working with schools has shown us that unless school leaders – principals in particular – are willing to champion the cause of analyzing data regularly and using the results to make decisions for the school, data work will not become a meaningful part of schoolwide reform. (Boudett et al., 2013, p. 18)

By demonstrating their own commitment to data use, school leaders elevate its importance to the community: “Leaders’ hands-on engagement in the work likely imbues it with value important to sustaining the learning of other staff” (Honig, 2017, p. 966). A qualitative case study of Philadelphia elementary schools using an interim assessment for data-driven reform found that school leadership was essential to integrate interim data into feedback systems and develop the skills and knowledge required to make them effective (Blanc et al., 2010). In this study, I reviewed how school leaders support teacher data use to further understand this essential influence over the effectiveness of data use for school improvement.

Summary

Teachers’ effective use of data to improve teaching and learning is heavily influenced by four main areas: competence in using data, attitudes toward data, collaboration, and organizational supports. The school leader has an essential role in fostering each of these areas to encourage effective teacher data use. The literature has shown that the mere existence of data does not create school improvement. Data requires interpretation to be used: “Data cannot speak for themselves, so they must be *made* to speak” (Crooks, 2019, p. 485). Staff are not naturally curious and often simply use data to confirm what is already being done (Selwyn et al., 2021). Leaders’ utilization of the four main influencers of data use can shape the purpose and direction of teachers’ data use toward helping or hindering improved instruction and student outcomes. In poor cases it can be used for data surveillance or the use of data to monitor and control (Crooks, 2019). For example, a study revealed that when data was used to monitor mandated student college applications, students subverted the system by submitting gibberish applications,

showing that, contrary to appearances, practices had not changed and students were not improving (Crooks, 2019). Similarly, a review of teacher PD studies revealed that, while minutes in PD is generally thought to correlate to impact on teaching and student achievement, a more refined look showed that a large amount of mandated PD minutes did not translate into better student results, while a relatively small amount of PD minutes done in a setting where teachers were intrinsically motivated was successful (Kennedy, 2016). To galvanize teachers to act on data in a way that changes teacher practice and improves student outcomes, principals need to make sure that teachers feel supported, capable, and motivated to change.

Theoretical Framework

While some argue there is no theory of action behind data use, there are several existing conceptual frameworks and models of inquiry that outline the key components of data use (Mandinach & Schildkamp, 2020). As summarized in the literature review, there are consistent themes across data use frameworks. Data use can be synthesized as data action planning by fostering collaboration (Hoogland et al., 2016), building assessment literacy (Bowers et al., 2014), creating common understandings (Wayman et al., 2012b), investigating, acting, and assessing. This study will utilize the conceptual framework (Figure 6, see p. 23) of the TDUS (Wayman et al., 2016), which outlines four data use influencers and five teacher data use actions that lead to increased teacher knowledge and practice and ultimately improved student learning. Within this framework, this study will focus on the data use influencers that school leaders can support: competence in using data, attitudes toward data, collaboration, and organizational supports. I have chosen this framework because it explicitly names student learning as the goal of data use. I also elected this framework because it has been extensively studied and is aligned to the TDUS survey I administered to triangulate data.

Research Questions

The overarching question for this study was: *How do school leaders in New York State support teachers' use of state, school, and classroom data?* To further understand this question, I focused on five sub-questions:

1. To what extent do school leaders report supporting data use?
2. To what extent do teachers perceive leader support of data use?
3. Which data use organizational supports from school leaders are most significant?
4. How, if at all, is collaborative teacher meeting time used for data use?
5. Which types of assessments (state, school, or classroom) do teachers perceive the best and use most frequently?

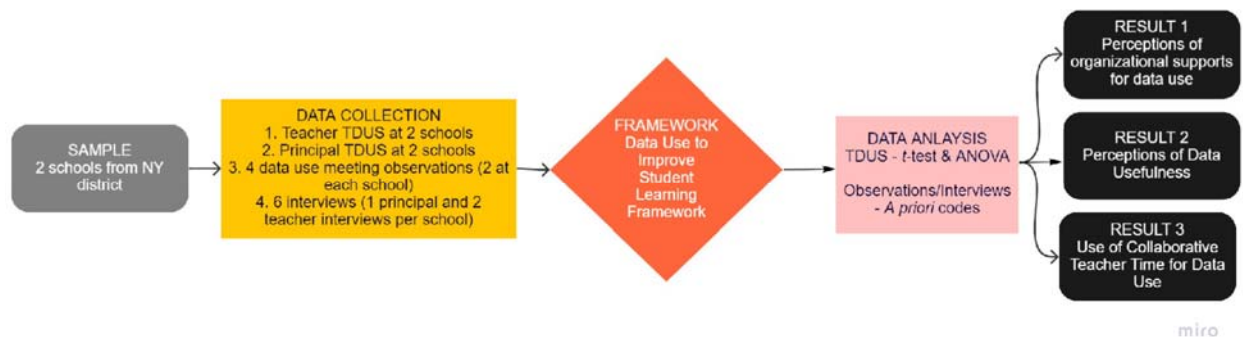
Chapter 3: Methodology

A strong methodology fully describes the research design and is appropriate to the research questions; it includes the variables, sample selection process, instruments and purpose for each, validity strategies, and limitations (Roberts & Hyatt, 2018). In keeping with this outline, in this section I will include enough detail that the study could be replicated and describe the ways in which the study is limited and what I did to increase validity.

Research Design

In the study, I conducted a case study with two schools in New York State, triangulating three sources of data—the Teacher Data Use Survey (TDUS) (Wayman et al., 2016), observations, and interviews—to describe how data is being supported and used in schools. Both schools were PreK-2nd grade schools from the same district with similar student demographics and school ratings to help control for outside variables and focus on data use. The unit of analysis was teachers and school leaders. The case study was time-bound (Creswell, 2013) during the 2021-2022 school year. The study used pseudonyms for the district, schools, and participants. Data was collected via Qualtrics (TDUS) and audio recordings (observations and interviews) and was stored safely on a password-protected device. Following the study, school leaders will receive an overview of their school’s TDUS survey results, including visual representations and a short summary report (Appendix A) on key trends in their results using a TDUS dashboard template (Bowers & Zhang, 2017). Figure 7 provides an overview of the methodology, including the sample, data collection, framework, data analysis, and findings. The subsequent sections will elaborate in more detail on each of these components of the study.

Figure 7. *Framework for the Study*



Sample Selection Process

I utilized criterion sampling (Schreiber & Asner-Self, 2011). Based on previous studies (Table 1), schools have primarily been studied at two ends of the spectrum—low-performing or high-performing. My study included a typically performing district that was close to the state average on the New York State (NYS) English Language Arts (ELA) test. Additionally, most studies have been in urban districts. I studied a suburban district. To use this criterion, I recruited schools from current partners of NWEA, a research-based, not-for-profit organization that supports students and educators.

I am currently the Coordinator, School Improvement at NWEA, where my main responsibility is developing school leader workshops. This study does not relate to my role at NWEA. All work on the study was completed outside of work hours. In instances in which work hours were required (for instance, observing a school during the school day), I used paid time off (PTO) to ensure no study components were completed during the workday. The study did not utilize schools' Measures of Academic Progress (MAP) Growth data. During interviews, the study did not ask participants about NWEA or MAP Growth. If participants volunteered information about NWEA or MAP Growth during interviews or observations, it was included only within the context in which it was shared. Case study schools were recruited from NWEA

partners solely for the purpose of finding willing participant schools, not because of their use of MAP Growth or partnership with NWEA. I was given support to conduct my study from my supervisor, the NWEA legal department, and the NWEA IRB, who determined they did not need to approve the study given the work study separation.

The NWEA Account Manager for Long Island, New York suggested two longstanding partner districts that had multiple participating schools and were willing to discuss participation in my study. The Account Manager sent an email introduction to both assistant superintendents. I then reached out to schedule a phone call with the district leaders to discuss the scope of the study and their interest in participating. One assistant superintendent discussed the study with his board, who determined they could not participate at this time. The other assistant superintendent brought the study to his principal leadership meeting. He determined that his district was willing to participate and that principals could choose to opt in. One principal immediately reached out to me expressing interest in participating in the study. Given she was the principal of one of two PreK-2nd grade schools in the district, I then reached out to the other PreK-2nd grade principal to see if she might also be willing to participate. She also agreed.

Data Collection and Analysis

TDUS

In March-May 2022, I administered the TDUS (Wayman et al., 2016) online via Qualtrics using the school administrator version (Appendix B) and teacher version (Appendix C). The principal version was emailed directly from me to the two principals. The teacher version was emailed by the principals to their teachers. I wrote in the listed assessments for State data, Periodic data, Local data, and Personal data on the survey based on recommendations from the principals. Appropriate informed consent forms (Creswell, 2007)

(Appendix D), inclusive of a description of the nature and scope of the study, were obtained from all survey participants. The survey took each participant approximately 15-25 minutes to complete. Outside of identifying the school, which was replaced with a pseudonym, the survey was entirely anonymous. After schools completed the survey, I ran a *t*-test and an analysis of variance (ANOVA), which are ideal to measure the significance of group differences (Mertler & Reinhart, 2017). A *t*-test measures if there is a statistically significant difference between two groups (Schreiber & Asner-Self, 2011). I used the *t*-test for each school to answer if school leader and teacher answers were statistically significantly different regarding the leader's support of data use. A *t*-test can be run as a single sample or two-sample independent *t*-test. A single sample is ideal if you know one set of values and the other population is unknown or the sample size is too small (Abbott, 2016). In a single sample *t*-test case, you can compare your sample set to the average from a population sample set. In comparison, a two-sample *t*-test compares two independent samples to determine if they are likely to be similar or different from one another (Abbott, 2016). In my study, I had two samples—the teachers and principals—and could run a two-sample *t*-test to compare them. However, I had a small sample size, only one principal from each school. A larger sample size allows for better estimation (Abbott, 2016). To add additional generalizability to my analysis, I ran single sample *t*-tests comparing my samples to the population mean of the recent TDUS study in Nebraska (National Center for Education Evaluation and Regional Assistance at IES, 2021). I also ran an ANOVA to analyze the difference of means between groups (Schreiber & Asner-Self, 2011). I used an ANOVA to analyze the difference of mean answers across the different types of data: summative, interim, and formative. I ran an ANOVA for each school and only analyzed teacher responses, removing principal respondents.

***t*-test and ANOVA Assumptions.** Both the *t*-test and the ANOVA assume normality, linearity, and homoscedasticity (Mertler & Reinhart, 2017). A *t*-test assumes the two comparison groups have the same degree of variability, the two groups have an equal number of subjects, and the groups are similar on all other variables except the dependent variable (Carroll & Carroll, 2003). Although considering these assumptions is important, *t*-tests are robust and still provide strong data, even when assumptions are not fully met (Carroll & Carroll, 2003). As with a *t*-test, an ANOVA assumes homogeneity of variance, equal group sizes, and normal distribution. Like the *t*-test, ANOVA is a robust statistic that can be used even if assumptions are somewhat violated (Carroll & Carroll, 2003).

Addressing Assumptions. When I ran the *t*-test, I needed to address that the comparison groups did not have an equal number of subjects since at each school only one principal took the TDUS as compared to many teachers. To avoid this assumption violation, I ran a single sample *t*-test comparing the sample mean to a set population mean. Given that I did not have the TDUS population mean of the New York State district of my study, I used the population mean of the recent TDUS study in Nebraska (National Center for Education Evaluation and Regional Assistance at IES, 2021) as my known value for the single sample *t*-test. To address the groups being similar outside of the dependent variable, I recruited schools that were similar including being from the same district, offering the same grades, having similar student achievement, and comparable student demographics.

I additionally ran data screening before conducting analysis to check the fit between the data set and the assumptions. I used SPSS, a program that assists with checking for and correcting plausible data, incomplete data, data outliers, and assumptions. I ran a skewness coefficient and kurtosis test on SPSS to confirm the sample was appropriately close to a normal

distribution (Mertler & Reinhart, 2017). I additionally checked that no survey respondents' answers appeared to be outliers, such as rating everything as infrequent or strongly disagree. Missing data is a risk with any data collection, but particularly with survey administration where response rates tend to be low (Nathenson & Supovitz, 2019). I attempted to increase survey response rates by having messaging come directly from the principal instead of myself.

Power. Another consideration for multivariate statistics is statistical power analysis, which compares the relationship between sample size, significance criterion, effect size, and statistical power (Cohen, 1992). The interdependence of these factors allows researchers to ascertain what sample size (N) is needed to achieve a specific power. Significance criterion (α), the risk of erroneously rejecting the null hypothesis, is generally set at .05 (Cohen, 1992). Power, the probability of correctly rejecting the null hypothesis, is typically set at .80, allowing for a reasonable sample size while controlling for risk (Cohen, 1992). Finally, effect size (ES), which determines the strength of the relationship between two variables, ranges on an index but can be categorized along a continuum of small effect size, which is minor but not trivial, medium, which is apparent to a thorough observer, and large, which is bigger (Cohen, 1992). For both the *t*-test and ANOVA assuming $\alpha = .05$ and power of .80, I would have needed $N = 26$ to detect a large ES, $N = 64$ to detect a medium ES, and $N = 393$ to detect a small ES (Cohen, 1992). Given my small teacher sample size, I am not able to state a significant ES.

Observations

The study also included four 45-minute data use meeting observations, two at each school, April-May of 2022. I worked with the grade team lead to identify observation times, given the parameters of a regularly scheduled time where teachers meet to collaborate. Appropriate informed consent forms (Creswell, 2007) (Appendix E), inclusive of a description of

the nature and scope of the study and audio recording consent, were obtained from all observation participants. I observed two different professional learning communities (PLCs) at each school site. I utilized nonparticipant observations (Fraenkel & Wallen, 2006). Observations were conducted using an observation protocol (Appendix F) and audio recorded.

Interviews

I conducted 45-minute interviews with six participants, three at each school. The study utilized strict guidelines to prepare and conduct interviews (Creswell & Poth, 2018). The principal interviewees, two in total, were identified before the study. Each principal then suggested two teachers they thought would be willing to participate. I contacted the teachers and arranged the interviews. Appropriate informed consent forms (Creswell, 2007) (Appendix G), inclusive of a description of the nature and scope of the study and audio recording consent, were obtained from all interviewees. The study utilized a semi-structured (Fraenkel & Wallen, 2006) interview protocol (Appendix H) adapted from a previous study (Bowers et al., 2019b). Interviews were conducted virtually via Zoom using adequate recording (Creswell, 2007) via audio recording. They were conducted at a convenient meeting time (Creswell, 2007) for the interviewees.

Observation and Interview Analysis

Observations were recorded via Rev, and the interviews were recorded via Zoom (virtually). Both interviews and observations were transcribed via Rev. I then coded and analyzed the transcripts using NVivo, looking for trend patterns and comparison to survey data. Observations and interviews were coded with *a priori* codes (Creswell & Poth, 2018). *A priori* codes consisted of competence in using data, attitudes toward data, collaboration, and organizational support.

Validity Strategies

This study avoided many survey development issues (Irwin & Stafford, 2016) by using TDUS (Wayman et al., 2016), which is a validated measure that was developed by a team of researchers and piloted before being offered for general use by districts and schools that seek to better understand data use. To increase response rate, I guaranteed survey participant anonymity and offered the survey online for easy access (Pazzaglia et al., 2016a). Before observations, I worked to gain trust (Creswell & Poth, 2018) by having the principal introduce me and lend me credibility.

I triangulated multiple data sources by reviewing the Teacher Data Use Survey (TDUS) (Wayman et al., 2016), observations, and interviews. The survey, four observations of data use meetings, and six interviews provided rich data (Schreiber & Asner-Self, 2011) to describe how data use is supported and implemented in the studied schools. The interviews helped illuminate why participants answered a certain way on the survey, while observations offered an in-practice counterbalance to survey perception data. In comparing observational data with educator self-reported data, the study avoided conflating attitudes and actions (Jerolmack & Khan, 2014).

In this section, I outlined strategies I employed to increase the validity of my study. In the next chapter, I will review the findings from my study across quantitative and qualitative data.

Chapter 4: Findings

Introduction

The purpose of this study was to shed light on the role of the school leader in data use by describing how school leaders are currently supporting data use and how that support is received by teachers. Due to the continued emphasis on data use in educational policy, the integration of data use into instructional reform is now an expectation (Cosner, 2014; Levin & Datnow, 2012), yet even as there is continued pressure to conduct data use, studies question whether data use has an impact on student outcomes (Gleason et al., 2019). A consistent influencer of data use effectiveness is the school leader—the person that can promote schoolwide data use (Cosner, 2014) or be a primary obstacle to teachers using data (Wayman et al., 2012a). While the leader’s impact is well documented, the literature has yet to provide consistent guidance on how school leaders can support data use that results in school improvement (Levin & Datnow, 2012).

This study adds to the literature on data use, as it includes rich data from a case study of two schools involving a survey, interviews, and observations to describe how school leaders support data use in schools, how teachers receive that support, and how data use is implemented. This study is significant in that it revealed the preferred data source of teachers, the leader support actions that were best perceived by teachers, and how data use was being implemented. These findings have the potential to help current principals use data for school improvement. The findings may also help those that support school leaders to better prepare and train leaders on the role of school leaders in data use.

Research Questions

The overarching question for this study was: *How do school leaders in New York State support teachers' use of state, school, and classroom data?* To further understand this question, I focused on five sub-questions:

1. To what extent do school leaders report supporting data use?
2. To what extent do teachers perceive leader support of data use?
3. Which data use organizational supports from school leaders are most significant?
4. How, if at all, is collaborative teacher meeting time used for data use?
5. Which types of assessments (state, school, or classroom) do teachers perceive the best and use most frequently?

This chapter outlines the findings from my study in relation to my research questions. The findings include quantitative data from the Teacher Data Use Survey (TDUS) as well as qualitative data from participant interviews and observations. The first section includes background information on the participating district, schools, and participants. The next two sections review the quantitative data and then qualitative findings organized by the two central themes that emerged: inquiry and decision-making.

District, School, and Participant Information

This section gives background information on the district, schools, and participants. I have replaced all names with pseudonyms.

District Context

District Y is a suburban district in New York State that serves 2,790 students across five schools. There are two schools serving PreK-2nd grade, one school serving 3rd-4th grade, one middle school (grades 5-7), and one high school (grades 8-12). The district is primarily

comprised of White (49%) and Hispanic (32%) students, with a significant amount of economically disadvantaged students (35%). Table 2 illustrates the district and school student demographics.

Table 2. *District Y, School A, and School B Student Demographics*

Subgroup	School A	School B	District Y
Black or African American	2%	0%	3%
Hispanic or Latino	41%	25%	32%
Asian or Native Hawaiian/Other Pacific Islander	16%	13%	13%
White	36%	58%	49%
Multiracial	4%	5%	3%
English Language Learners	27%	11%	12%
Students with Disabilities	17%	11%	12%
Economically Disadvantaged	38%	19%	35%

Source: data.nysed.gov

The district specializes in an English/Spanish dual language program and 1-1 technology providing devices for all students. The district’s strategic plan outlines the use of benchmark data in reading and math to set student goals and achieve growth as a key component. The district has a 94.5% 4-year graduation rate. District Y had high scores in reading (62%) and math (65%) on the New York State grades 3-8 assessment, outperforming New York State in both subjects (see Table 3 for a summary of NYS performance). It should be noted that the proficiency may not be representative of the population, as the district had low participation on the state test ranging from 49-66% participation from each grade. While District Y’s student state test participation percentages may seem low, New York has a history of parents opting out of state testing. In

2010, New York extended reading and math tests across more days and more time allotted per test (Rivera-McCutchen, 2019). Frequent changes to test structure, format, and scoring made year-to-year comparisons impossible, leaving families wondering if the assessments were more about holding teachers and schools accountable than they were about monitoring and assisting student progress over time (Rivera-McCutchen, 2019). Parent frustration led to an opt-out movement, with many families refusing for their students to test.

Table 3. 2021 District Y Proficiency on the NYS ELA and Math Tests v. NY State

Grade	ELA Proficiency	NY State	Math Proficiency	NY State
Grades 3-8	62%	57%	65%*grades 3-7	44%
3	69%	60%	66%	53%
4	69%	62%	61%	47%
5	53%	47%	65%	42%
6	67%	62%	61%	39%
7	46%	49%	71%	40%
8	59%	59%	100% *Regents	90% *Regents

Source: data.nysed.gov

School Context

In this study, I conducted research in the two PreK-2nd grade schools, School A and School B. School A serves 369 students, and School B serves 333 students. Both schools have majority White and Hispanic students. School A’s students are 41% Hispanic and 36% White, while School B’s students are 58% White and 25% Hispanic (see Table 2 for school demographics). School A has greater percentages of students with special needs than District Y, with 27% English Language Learners, 17% students with disabilities, and 38% economically

disadvantaged. In comparison, School B has fewer students with special needs than District Y, with 11% English Language Learners, 11% students with disabilities, and 19% economically disadvantaged.

Study Participants

The study involved three different forms of participation. First, the principal and classroom teachers at each school were invited to participate in the Teacher Data Use Survey. Then each principal and two teachers from each school participated in an interview on data use. Lastly, I observed two professional learning communities (PLCs) at each school. The survey was conducted anonymously, so I cannot provide a list of participants, but it consisted of the principal of each school and classroom teachers. Table 4 is a list of the 24 interview and observation participants.

Table 4. *Interview and Observation Participants*

School	Role	Pseudonym
School A	Principal	Ms. Thompson
School A	K Teacher/Team Lead	Ms. Allen
School A	K Teacher	Ms. Smith
School A	K Teacher	Ms. Johnson
School A	K Teacher	Ms. Williams
School A	K Teacher	Ms. Brown
School A	K Teacher	Ms. Jones
School A	1 st Grade Teacher/Team Lead	Ms. Miller
School A	1 st Grade Teacher	Ms. Davis
School A	1 st Grade Teacher	Ms. Wilson
School A	1 st Grade Teacher	Ms. Anderson
School A	1 st Grade Teacher	Ms. Taylor

Table 4 (continued)

School	Role	Pseudonym
School A	1 st Grade Teacher	Ms. Thomas
School A	1 st Grade Teacher	Ms. Moore
School B	Principal	Ms. Mitchell
School B	Librarian/Team Lead	Ms. Harris
School B	STEAM	Ms. Clark
School B	Social Worker	Ms. Lee
School B	1 st Grade Teacher/Team Lead	Ms. Walker
School B	1 st Grade Teacher	Ms. Young
School B	1 st Grade Teacher	Ms. Wright
School B	1 st Grade Teacher	Ms. Hill
School B	1 st Grade Teacher	Ms. Lewis
School B	1 st Grade Teacher	Ms. Scott

Interview Participant Profiles

During the interviews, participants were asked about their backgrounds. This section provides a brief description for each interviewee.

Ms. Thompson. Ms. Thompson is the principal at School A. She is in her first year as a principal at the school. Previously she worked at the central office of District Y as an instructional leader. In that role she worked in all five schools in the district supporting the principals with areas including data use, instruction, professional development for staff, and coaching teachers. Additionally, in her central office role, she worked on projects and served as a thought partner to the superintendent and deputy superintendent.

Ms. Allen. Ms. Allen is a K teacher at School A. She serves as the grade team lead for the K team. She has worked at School A for three years previously, also teaching PreK. Overall,

she has been teaching for 27 years. She has taught all grades from PreK through sixth grade. In her previous school, she also served as the math coach for one year. Ms. Allen is also a parent in the district with a child in 10th grade and another child in 12th grade.

Ms. Miller. Ms. Miller is a 1st grade teacher at School A. She serves as the grade team lead for the 1st grade. She has taught at School A for 25 years and has been a teacher for 30 years overall. She has previously taught 2nd, 3rd, and 5th grades. She has been teaching 1st grade the entire time at School A.

Ms. Mitchell. Ms. Mitchell is the principal at School B. School B is her first principalship, and this is her third year as principal there. Previously she worked for three years as an instructional leader at District Y. In this role, she supported PreK-12, overseeing schools with areas including curriculum, instruction, assessment, and data. Before joining District Y, Ms. Mitchell worked as a director of instruction at a charter school in Manhattan.

Ms. Walker. Ms. Walker is a 1st grade dual language teacher at School B. She serves as the grade team lead for 1st grade. She has worked at School B for eight years and has been a teacher for 15 years. She previously worked in another district as a preschool teacher, a special education teacher, and a bilingual teacher. She also helped the central office of her previous district with registration, including interviewing parents.

Ms. Harris. Ms. Harris is the librarian at School B. She serves as the team lead for the specials team consisting of the librarian, STEAM teacher, social worker, and psychologist. Ms. Harris has worked at School B for two years. She has been a teacher for 29 years, all within District Y. Before becoming a librarian, Ms. Harris worked as a classroom teacher for 27 years including grades K, 1st grade, 2nd grade, 4th grade, and as a learning specialist. Most of her career, 17 years, has been as a kindergarten teacher.

Quantitative Data Findings

Introduction

The data I collected first in the study came from the Teacher Data Use Survey (TDUS), which has a teacher and a principal version. The survey questions (see Appendices B and C for the administrator and teacher versions of the TDUS) ask participants about data availability, attitudes toward data use, supports for data use, and application of data use. I chose the TDUS in part because there have been multiple studies validating the TDUS (National Center for Education Evaluation and Regional Assistance at IES, 2021). One of the great features about the TDUS is that the survey questions get customized to the participating district. Before administering the survey, the researcher must consult the district or school to know the specific forms of data they use and want to measure. For example, instead of listing summative assessments, the researcher would list the actual name of that state's assessment. Before administering the TDUS, I had a phone call with each principal to get their feedback on what would be appropriate to list for the summative, interim, and formative assessments described on the TDUS. Both principals agreed on the following list: for summative data, the New York State English Language Learner assessment (NYSELAT); for interim assessments, the NWEA MAP Growth reading and math assessments and the district's reading and writing benchmark assessments; and for formative data, the districtwide system of Badge Books, which capture students' mastery of the skills and concepts associated with their grade. The TDUS was emailed by the principal to staff as well as a reminder email.

For my quantitative data analysis, I conducted a *t*-test and an analysis of variance (ANOVA), which are ideal to measure the significance of group differences (Mertler & Reinhart, 2017). A *t*-test measures if there is a statistically significant difference between two groups

(Schreiber & Asner-Self, 2011). I used the *t*-test for each school to answer if school leader and teacher answers were statistically significantly different regarding the leader's support of data use. I also ran an ANOVA to analyze the difference of means between groups (Schreiber & Asner-Self, 2011). I used an ANOVA to analyze the difference of mean answers as to the usefulness of the different types of data: summative, interim, and formative. I ran an ANOVA for each school, and I only analyzed teacher responses, removing principal respondents.

Nebraska Study

In addition to conducting analysis of my data, I also analyzed my study's TDUS results compared to a recent larger study also utilizing the TDUS. In a 2021 study, the Nebraska Department of Education partnered with the National Center for Evaluation and Regional Assistance to study Nebraska teacher and principal perceptions and use of data through the TDUS. The intention of the study was to learn about data use practices to inform plans for statewide professional development on data use. The study involved a large sample size with 353 schools, 3,572 teachers, and 171 principals (National Center for Education Evaluation and Regional Assistance at IES, 2021). The Nebraska study provided a good comparative set to my study because it used the exact same survey, the TDUS, one year prior to my study, and included a large sample size. The following two sections review the key quantitative data findings from my study grouped by the ANOVA results and *t*-test results.

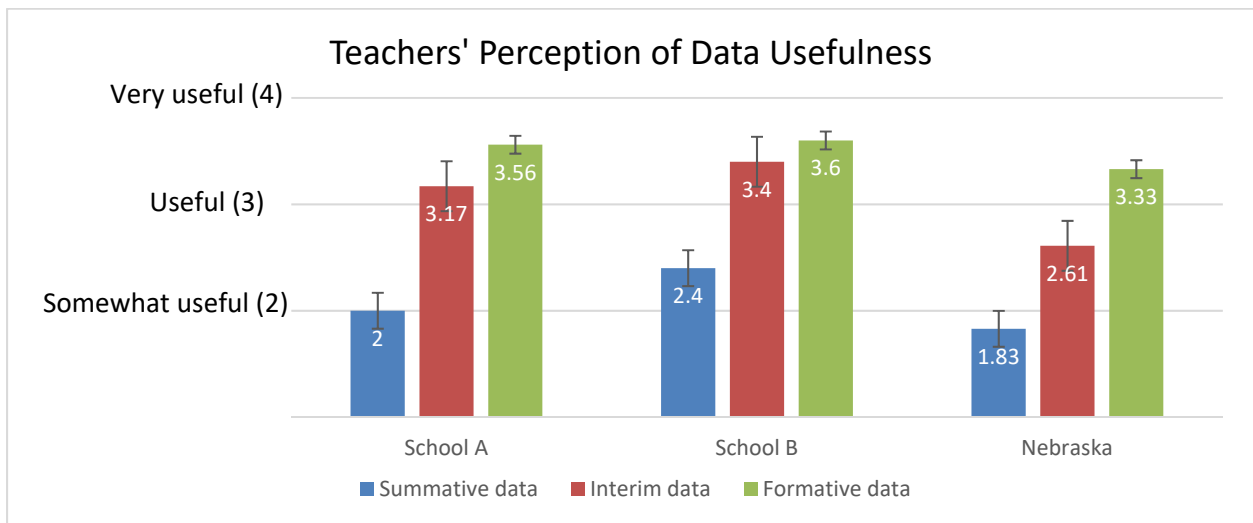
Teacher Perception of the Usefulness of Summative, Interim, and Formative Data

In my study, I wanted to answer which types of assessments (state accountability tests, periodic interims, or classroom data) teachers perceive as the best and use most frequently. I measured this by reviewing participants' answers to question 4 on the TDUS (see Appendix C). Question 4 asks, "Now, how useful are the following forms of data to your practice?" followed

by the specific names of the summative, interim, and formative data sources. Question 4 also asks participants about other potential data sources, which I excluded from my analysis. After collecting the TDUS responses, I analyzed the data via ANOVA to view variances across teachers' ratings of data usefulness across the different data sources. An ANOVA demonstrates the between and within variance (Schreiber & Asner-Self, 2011).

The TDUS data showed that teachers from both School A and B rated formative data as the most useful, followed by interim data and then summative data. These findings are consistent with the results from the comparative population set from Nebraska (National Center for Education Evaluation and Regional Assistance at IES, 2021) (see Figure 8).

Figure 8. *Teachers' Perceptions of the Usefulness of Summative, Interim, and Formative Data*



Note. For Nebraska: teachers $n = 3,216$ for summative data, $n = 3,340$ for interim data, and $n = 3,203$ for formative data. For School A: teachers $n = 9$. For School B: teachers $n = 5$.

Source: National Center for Education Evaluation and Regional Assistance at IES, 2021.

Table 5 shows the ANOVA results comparing teachers at School A's ratings of the usefulness of summative, interim, and formative data. The data type usefulness ANOVA shows a statistically significant difference across groups, $F(2,33) = 7.04, p < 0.001$. There was a very

large effect size ($\eta^2 = .31$). I can reject the null hypothesis and assert that there is a difference in how teachers at School A perceive the usefulness of different data sources.

Table 5. ANOVA Test Results of School A Teachers' Perceptions of the Usefulness of Summative, Interim, and Formative Data

Data Type	Usefulness	Df	F	η^2
Summative Data	2.00 (1.00)	2	7.04***	.31
Interim Data	3.17 (1.09)			
Formative Data	3.56 (0.28)			

Note. *** = $p \leq 0.001$ Teachers $n = 9$ Single factor ANOVA of School A Teachers' Perceptions of the Usefulness of Summative, Interim, and Formative Data. Data taken from the Teacher Data Use Survey administration.

Table 6 shows the ANOVA results comparing teachers at School B's ratings of the usefulness of summative, interim, and formative data. The ANOVA shows a non-significant trend indicating a preference for formative data, $F(2,17) = 2.53, p = 0.11$ with a large effect size (.23).

Table 6. ANOVA Test Results of School B Teachers' Perceptions of the Usefulness of Summative, Interim, and Formative Data

Data Type	Usefulness	Df	F	η^2
Summative Data	2.40 (1.30)	2	2.53	.23
Interim Data	3.40 (0.71)			
Formative Data	3.60 (0.80)			

Note. Teachers $n = 5$ Single factor ANOVA of School B Teachers' Perceptions of the Usefulness of Summative, Interim, and Formative Data. Data taken from the Teacher Data Use Survey administration.

Tables 7 and 8 show the means for teacher ratings of the usefulness of each data source for School A and School B. Teachers from School A and B rated formative data's usefulness the highest. On a scale of 1-4 (1 = not useful, 2 = somewhat useful, 3 = useful, and 4 = very useful), School A teachers gave a mean rating of 3.56 for the usefulness of formative assessments, and School B teachers gave a mean rating of 3.6. Both schools also rated summative data as the least useful. School A teachers gave a mean rating of 2.00 regarding the usefulness of summative data, and School B teachers gave a mean rating of 2.4. At both schools, both formative data and interim data were rated on average as useful, while summative data was only considered somewhat useful.

Table 7. Means and Standard Deviations of School A Teachers' Perceptions of Usefulness of Summative, Interim, and Formative Data to Inform Teaching Practices

Data type	Teachers ($n = 9$)		
	Number	Mean	Standard Deviation
Usefulness of summative data	9	2.00	1.00
Usefulness of interim data	9	3.17	1.04
Usefulness of formative data	9	3.56	0.53

Note. Usefulness was measured on a four-point scale in which 1 = not useful, 2 = somewhat useful, 3 = useful, and 4 = very useful.

- a. The summative assessment is NYSESLAT.
- b. The Interim assessment is the MAP Growth Interim assessment and reading and writing benchmarks.
- c. The formative assessment is Badge Book data.

Table 8. Means and Standard Deviations of School B Teachers' Perceptions of Usefulness of Summative, Interim, and Formative Data to Inform Teaching Practices

Data type	Teachers ($n = 5$)		
	Number	Mean	Standard Deviation
Usefulness of summative data	5	2.4	1.14
Usefulness of interim data	5	3.4	0.84
Usefulness of formative data	5	3.6	0.89

Note. Usefulness was measured on a four-point scale in which 1 = not useful, 2 = somewhat useful, 3 = useful, and 4 = very useful.

- a. The summative assessment is NYSESLAT.
- b. The Interim assessment is the MAP Growth Interim assessment and reading and writing benchmarks.
- c. The formative assessment is Badge Book data.

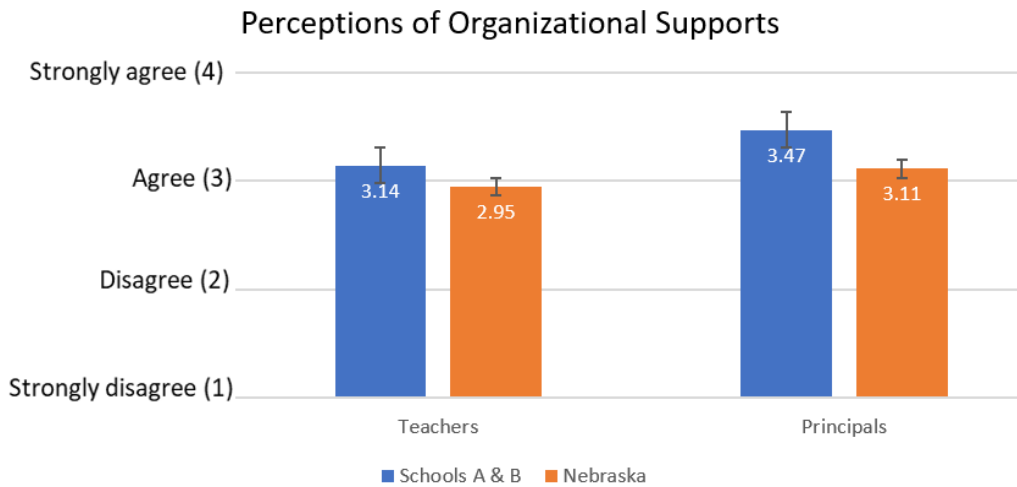
In the next section, I will review findings from the TDUS on how principal and teachers rated the organizational supports for data use in their schools.

Perceptions of Organizational Supports

In my study, in addition to understanding the types of data teachers prefer to use, I wanted to reveal more about leader support of data use. I was looking to answer the extent leaders report supporting data use and compare this to the extent teachers perceive leader support of data use. To measure this, I used a *t*-test, which measures if there is a statistically significant difference between two groups (Schreiber & Asner-Self, 2011). I ran the *t*-test for each school to answer if school leader and teacher answers were statistically significantly different regarding the leader's support of data use. I analyzed participants' answers to questions 10, 12, and 13 on the TDUS, which are related to organizational supports, including support for data use, principal leadership, and computer data systems (see Appendices B and C). Table 13 (on p. 66) provides the exact text of each of these questions.

The quantitative data demonstrated that, overall, both leaders and teachers perceived high levels of leader support for data use. Figure 9 shows the comparison of teacher and principal ratings of organizational supports from School A, School B, and the comparative data set from Nebraska. District Y’s (School A and B) teacher mean ratings (3.14) and principal mean ratings (3.47) were between *agree* and *strongly agree* that there are organizational supports for data use. District Y’s teacher and principal perceptions of organizational supports for data use were significantly higher than the comparative set from Nebraska. Nebraska teachers’ mean rating was 2.95 and principal mean rating was 3.11 for perceptions of organizational supports. In both Nebraska and District Y, the principals rated organizational supports higher than did their teachers.

Figure 9. *Perceptions of Organizational Supports Schools A&B v. Nebraska*



Note. For Nebraska: teachers $n = 3,572$ and principals $n = 171$. For School A & B: teachers $n = 9$ and principals $n = 2$.

Source: National Center for Education Evaluation and Regional Assistance at IES, 2021.

Table 9 shows the results of a *t*-test comparing District Y teachers’ perceptions of organizational supports compared to the perceptions of the Nebraska teachers. District Y

teachers rated organizational supports for data use significantly higher than did the Nebraska teachers, $t(139) = 2.88, p \leq .001$.

Table 9. *t-Test Comparison of Perceptions of Organizational Supports School A&B Teachers v. Nebraska Teachers*

Group	Perception of Organizational Supports	<i>t</i>	<i>Df</i>
School A & B Teachers	3.14 (0.53)	2.88***	139.00
Nebraska Teachers	2.94 (0.02)		

Note. *** = $p \leq 0.001$. There is a large difference in the sample size from Nebraska $n = 3,572$ and School A & B $n = 9$ that may impact the statistical significance of the *t*-test.

Table 10 shows the results of a *t*-test comparing District Y principals’ perceptions of organizational supports compared to those of the Nebraska principals. District Y principals rated organizational supports for data use significantly higher than did the Nebraska principals, $t(45) = 3.23, p \leq .001$.

Table 10. *t-Test Comparison of Perceptions of Organizational Supports School A&B Principals v. Nebraska Principals*

Group	Perception of Organizational Supports	<i>T</i>	<i>df</i>
School A & B Principals	3.47 (0.38)	3.23***	45.00
Nebraska Principals	3.10 (0.04)		

Note. *** = $p \leq 0.001$. There is a large difference in the sample size from Nebraska $n = 171$ and School A & B $n = 2$ that may impact the statistical significance of the *t*-test.

School A v. School B

While District Y demonstrated a high perception of organizational supports for data use, when viewed apart, Schools A and B showed distinct results. School A's ratings of organizational supports for using data were similar among the principal (mean of 3.35) and teachers (mean of 3.30), including perceptions of teachers' access to professional learning support for using data, principals' leadership for data use, and computer data systems. Table 11 shows the *t*-test results comparing School A teachers and School A principal ratings of organizational supports for data use. There was no significant difference between principal and teacher ratings, $t(23) = -0.26, p = 0.79$.

Table 11. *t-Test Comparison of Perceptions of Organizational Supports School A Teachers v. School A Principal*

Group	Perception of Organizational Supports	<i>t</i>	<i>df</i>
School A Teachers	3.30 (0.59)	-0.26	23.00
School A Principal	3.35 (0.49)		

Conversely, at School B, the principal (mean of 3.59) had higher ratings of organizational supports for using data than the teachers (mean of 2.80). Table 12 shows the *t*-test results comparing School B teachers and School B principal ratings of organizational supports for data use. There was a significant difference in teacher and principal ratings, $t(27) = -5.57, p \leq .001$.

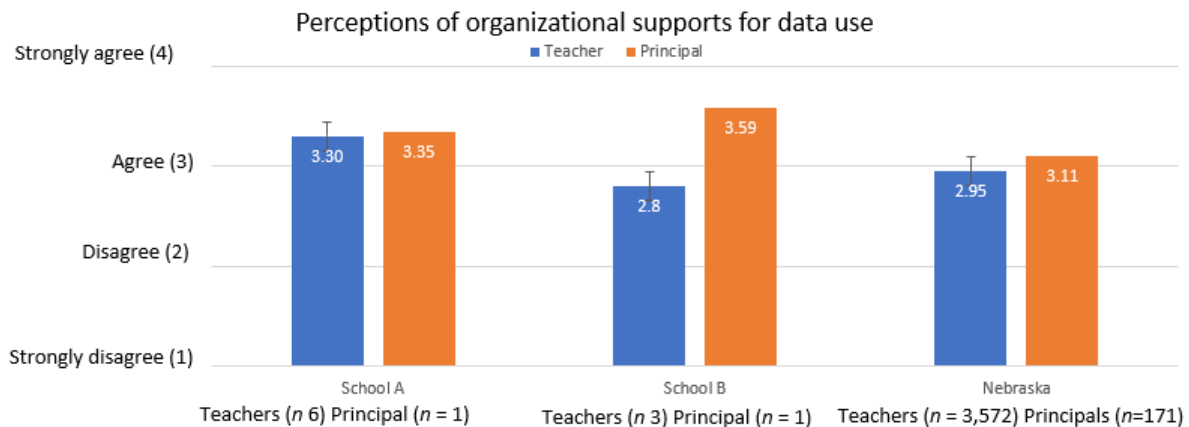
Table 12. *t*-Test Comparison of Perceptions of Organizational Supports School B Teachers v. School B Principal

Group	Perception of Organizational Supports	<i>t</i>	<i>df</i>
School B Teachers	2.80 (0.24)	-5.57***	27.00
School B Principal	3.59 (0.26)		

Note. *** = $p \leq .001$.

Figure 10 shows the comparison of School A, School B, and Nebraska teacher and principal perceptions of organizational supports for data use. School A has the closest similarity of perceptions between the teachers and the principal, with only a mean difference of 0.05. The population set of Nebraska teachers’ and principals’ perceptions also had a small mean difference of only 0.16. Lastly, School B had the greatest difference between teacher and principal ratings, with a mean difference of 0.79.

Figure 10. Comparison of Perceptions of Organizational Supports School A v. School B. v. Nebraska



Source: National Center for Education Evaluation and Regional Assistance at IES, 2021.

In the next section, I will dig into the item analysis of the organizational supports questions on the TDUS to better understand which areas of support were perceived as the most and least evident.

Item Analysis

In addition to answering to what extent principals and teachers perceive organizational supports for data use, I also sought to answer which supports are most evident. Table 13 outlines School A’s item-level means on the survey questions pertaining to organizational supports. At School A, the highest rated items were primarily around the principal’s support of data use. The highest rated items included the principal encouraging data use as a tool for effective teaching, the principal being a good example of an effective data user, the principal discussing data with the teachers, and the computer systems in the district providing access to lots of data. TDUS also demonstrated which organizational supports were the least evident. At School A, the lowest rated items from the teachers and the principal were about professional development for data use.

Table 13. School A’s Item-Level Means and Standard Deviations of Teachers’ and Principal’s Perceptions of Organizational Supports for Using Data

Subscale and item	Teachers			Principal		Mean difference
	Number	Mean	Standard Deviation	Number	Mean	
<i>Support for Data Use subscale</i>						
[I am/My teachers are] adequately supported in the effective use of data.	6	3.33	0.52	1	3.00	0.33
[I am/My teachers are] adequately prepared to use data.	6	3.50	0.50	1	3.00	0.50
There is someone who answers my [my teachers’] questions about using data.	6	3.17	0.75	1	4.00	-0.83
There is someone who helps [my/my teachers’] change [my/their] practice (e.g., my/their teaching) based on data.	6	3.00	0.82	1	3.00	0.00

Table 13 (continued)

Subscale and item	Teachers			Principal		Mean difference
	Number	Mean	Standard Deviation	Number	Mean	
My district [provides/provides my teachers] enough professional development about data use.	6	2.83	0.75	1	2.00	0.83
My district's [professional development/professional development for my teachers] is useful for learning about data use.	6	2.50	0.84	1	2.00	0.50
<i>Principal Leadership subscale</i>						
[My principal or assistant principal(s) encourages/I encourage] data use as a tool to support effective teaching.	6	3.67	0.52	1	4.00	-0.33
[My principal or assistant principal(s) creates/I create] many opportunities for teachers to use data.	6	3.33	0.82	1	3.00	0.33
[My principal or assistant principal(s) has/I have] made sure teachers have plenty of training for data use.	6	3.00	1.26	1	3.00	0.00
[My principal or assistant principal(s) is/I am] a good example of an effective data user.	6	3.67	0.52	1	4.00	-0.33
[My principal or assistant principal(s) discusses/I discuss] data with [me/my teachers].	6	3.67	0.52	1	4.00	-0.33
[My principal or assistant principal(s) creates/I create] protected time for using data.	6	3.17	0.98	1	3.00	0.17
<i>Computer Data Systems subscale</i>						
I have the proper technology to efficiently examine data.	6	3.50	0.84	1	4.00	-0.50
The computer systems in my district provide me access to lots of data.	6	3.67	0.52	1	4.00	-0.33

Table 13 (continued)

Subscale and item	Teachers			Principal		Mean difference
	Number	Mean	Standard Deviation	Number	Mean	
The computer systems (for data use) in my district are easy to use.	6	3.33	0.82	1	4.00	-0.67
The computer systems in my district allow me to examine various types of data at once (e.g., attendance, achievement, demographics).	6	3.50	0.55	1	4.00	-0.50
The computer systems in my district generate displays (e.g., reports, graphs, tables) that are useful to me.	6	3.33	0.82	1	3.00	0.33

Note. Scale items were measured on a four-point scale in which 1 = strongly disagree, 2 = disagree, 3 = agree, and 4 = strongly agree. Brackets indicate where survey wording differed between the teacher and principal versions.

Table 14 outlines School B’s item-level means on the survey questions pertaining to organizational supports. The teachers at School B’s highest rated item was that the district has computer systems that provide access to a lot of data. The survey results also revealed the least evident organizational supports. At School B, the principal’s ratings were most notably more positive than teachers’ ratings on items about the principal being an effective model of data use and having sufficient technology to look at data.

Table 14. *School B's Item-Level Means and Standard Deviations of Teachers' and Principal's Perceptions of Organizational Supports for Using Data*

Subscale and item	Teachers			Principal		Mean difference
	Number	Mean	Standard Deviation	Number	Mean	
<i>Support for Data Use subscale</i>						
[I am/My teachers are] adequately supported in the effective use of data.	3	3.00	0.00	1	3.00	0.00
[I am/My teachers are] adequately prepared to use data.	3	2.67	0.58	1	3.00	-0.33
There is someone who answers my [my teachers'] questions about using data.	3	2.67	0.58	1	4.00	-1.33
There is someone who helps [my/my teachers'] change [my/their] practice (e.g., my/their teaching) based on data.	3	2.67	0.58	1	3.00	-0.33
My district [provides/provides my teachers] enough professional development about data use.	3	2.67	0.58	1	3.00	-0.33
My district's [professional development/professional development for my teachers] is useful for learning about data use.	3	2.67	0.58	1	3.00	-0.33
<i>Principal Leadership subscale</i>						
[My principal or assistant principal(s) encourages/I encourage] data use as a tool to support effective teaching.	3	3.00	0.00	1	4.00	-1.00
[My principal or assistant principal(s) creates/I create] many opportunities for teachers to use data.	3	3.00	0.00	1	4.00	-1.00
[My principal or assistant principal(s) has/I have] made sure teachers have plenty of training for data use.	3	3.00	0.00	1	3.00	0.00
[My principal or assistant principal(s) is/I am] a good example of an effective data user.	3	2.33	0.58	1	4.00	-1.67

Table 14 (continued)

Subscale and item	Teachers			Principal		Mean difference
	Number	Mean	Standard Deviation	Number	Mean	
[My principal or assistant principal(s) discusses/I discuss] data with [me/my teachers].	3	3.00	0.00	1	4.00	-1.00
[My principal or assistant principal(s) creates/I create] protected time for using data.	3	2.67	0.58	1	3.00	-0.33
<i>Computer Data Systems subscale</i>						
I have the proper technology to efficiently examine data.	3	2.00	1.00	1	4.00	-2.00
The computer systems in my district provide me access to lots of data.	3	3.33	0.58	1	4.00	-0.67
The computer systems (for data use) in my district are easy to use.	3	3.00	0.00	1	4.00	-1.00
The computer systems in my district allow me to examine various types of data at once (e.g., attendance, achievement, demographics).	3	3.00	0.00	1	4.00	-1.00
The computer systems in my district generate displays (e.g., reports, graphs, tables) that are useful to me.	3	3.00	0.00	1	4.00	-0.33

Note. Scale items were measured on a four-point scale in which 1 = strongly disagree, 2 = disagree, 3 = agree, and 4 = strongly agree. Brackets indicate where survey wording differed between the teacher and principal versions.

Summary

I used the TDUS to look at which data sources teachers consider the most useful and understand more about the perceptions of organizational supports of data use. Results showed that teachers prefer to use formative data for decision-making. They positively rated both

formative and interim data usefulness, while only give summative data a somewhat useful rating. These findings were consistent across School A, School B, and the Nebraska teachers.

Overall, District Y showed high ratings and alignment between principal and teacher perceptions of organizational supports. This finding is made more significant when compared to the recent study in Nebraska. Even compared to this much larger sample, District Y teachers and principals demonstrated better perceptions of organizational supports and stronger alignment. When viewed as individual schools, Schools A and B showed very different results. School A showed high ratings and alignment across the principal and teachers. The teachers rated the principal specifically as a key component of their support of data use. Conversely, at School B, the teachers provided lower ratings of organizational support and were not aligned with the principal. The teachers rated the principal's support of data use as only *somewhat agree*. In the next section, I will outline the qualitative findings across central emergent themes.

Qualitative Data Findings

Introduction

In this section, I will provide an overview of the qualitative data, central findings grouped by emergent themes, and inconsistent findings. First, I will provide context on how I viewed my results. I will define the two central themes of inquiry and decision-making, providing background literature and a preview of related findings. While data use has been studied extensively, qualitative studies reviewing how data is used in practice are sparse. The Classification Framework for Instructional Responses to Data (Farley-Ripple et al., 2019) offers a new way of understanding how teachers use data based on both research and a validation study. After introducing the two central themes, I will outline the Classification Framework for Instructional Responses to Data (Farley-Ripple et al., 2019) as an additional lens through which

to review my findings. Following that, I will give an overview of each of the four observations, including a brief vignette description as well as a summary. Lastly, I will review findings in detail under the inquiry and decision-making themes.

My qualitative data included professional learning communities (PLCs) observations and interviews with the principals and teachers at each school. The qualitative data helped to triangulate my data and further validate my findings. While reviewing the observation and interview transcripts, I used predetermined a-priori codes based on the TDUS data framework. The a-priori codes were attitudes toward data, collaboration, competence in data use, and organizational supports. After reviewing the qualitative data, I did not feel any additional codes were necessary; however, I did add sub-themes to further outline areas within each code. Table 15 displays the a-priori codes, sub-themes, and descriptions of each term. In the next section, I will outline the central themes that emerged.

Table 15. *List of Codes and Descriptors*

A-Priori Code	Subthemes	Description
Attitudes Towards Data	Shared Vision	Teachers/Principal demonstrate a positive attitude towards the use of data Teachers/Principal understand a shared vision for data use
Collaboration	Decision-Making	Teachers work together using data to ask questions, evaluate problems, and make decisions
Competence in Data Use	Data Types	Teachers/Principal are aware of various data types available to them and their uses Teachers review and analyze data Teachers articulate key data inferences
Organizational Supports	Data Warehouse, Encourage Data Use, Resources, Professional Development	Administration provides support for data use through a data warehouse, encouragement, resources, and professional development

Central Themes

In this section, I will introduce each central theme that emerged from my qualitative data: inquiry and decision-making. For each theme, I will provide some background literature as well as a preview of my findings. Table 16 has a sample quote for each theme to further demonstrate its meaning.

Table 16. *Example Quotes for Central Themes*

Theme	Example Quote from Interviews
Inquiry	“In order to be a strategic diagnostician to help each individual child, you can't do it without data. Even informal data is valuable to a teacher when you're monitoring something. So you have to be specific about what you're working on with the students and then work on it, and that data that you get from all the assessments that we use should be what teachers are using to plan for their instruction.” [Ms. Walker]
Decision-Making	“I think that we use data all the time to make decisions about grouping, to make decisions about the kind of work that we give them, to make decisions about planning lessons, planning additional supports, planning enrichment. We use it to make class lists. So I think it's a constant conversation. And we do have PLCs that meet every cycle and so the data often drives the data that the teachers are seeing in the moment often drives those conversations in how can we help each other, my kids are struggling in this area, or I have this group, I don't know what to do with, what has worked for you with similar learner profiles, et cetera.” [Ms. Mitchell]

Inquiry. The first theme that emerged from my findings was inquiry. Inquiry is a staple of data use conceptual models. For example, inquiry is one of the three key phases of the Data Wise Improvement Process consisting of prepare, inquire, and act (Boudett et al., 2013). Data Wise inquiry includes creating a data overview, digging into the data, and examining instruction (Boudett et al., 2013). The Phased-Based Model of School Leadership for Collaborative School Data Practices (Cosner, 2014) also speaks to the need for inquiry, suggesting the practice of diagnosing and intervening to support collaborative practice development. Similarly, the Principal Leadership for Data-Driven Decision Making Model (Levin & Datnow, 2012) calls for analysis of student achievement. Lastly, the Data Use to Improve Student Learning Model

(Wayman et al., 2016) suggests that teachers should form questions, examine data, and evaluate problems. While inquiry is heavily outlined in theory, it was only somewhat present in my findings. In this study, participants echoed sentiments about the importance of inquiry. However, my study revealed that participants deviated from their stated inquiry process when conducting data use in practice. When reviewing my findings, I will further outline how results were aligned or misaligned to the general literature on the nature of inquiry with data use.

Decision-Making. The next central theme to emerge was decision-making. The literature on data use recommends a slow decision-making process involving examination of instruction and relevant research on the problem of practice. For example, Data Wise recommends observing in classrooms and reviewing external sources to build teachers' knowledge base of effective instruction (Boudett et al., 2013). Data Wise argues that gaining insight about a "problem of practice" is essential before jumping into creating solutions (Boudett et al., 2013). The literature on data use is also consistent that data use for decision-making is best conducted in groups (Hoogland et al., 2016).

In this study, participants shared sentiments that matched the literature when describing their data-driven decision-making process. My study findings also confirmed that teachers preferred to use data during collaborative meeting times. Additionally, observations and interviews showed that participants placed a premium on consensus building and joint decision-making. However, observations revealed a different decision-making methodology than the traditional data-driven method. In contrast to the slow and deliberate decision-making suggested in the literature, my findings revealed educators using an expedited process that prioritized identifying a solution quickly. In the subsequent sections, I will elaborate on the methodology of decision-making observed in District Y.

The Classification Framework for Instructional Responses to Data

When reviewing my findings under the two themes of inquiry and decision-making, I will also consider how educators' actions aligned to the Classification Framework for Instructional Responses to Data (Farley-Ripple et al., 2019). The Framework for Instructional Responses to Data provides theory on categorizing teacher data use actions. In the study, the researchers developed a framework to describe how teachers use data to inform instruction. They then conducted a mixed methods study, including a survey, interviews, and observations across 5 districts and 20 schools to test the validity of the new framework. The methodology used was similar to the mixed methods approach of my study. As well, the same interim assessment, NWEA MAP Growth, was used in both my study and the framework study. As such, Farley-Ripple et al. provides a good basis to review the results from my study. The framework outlines instructional responses to data by domain, action, and practice. The two main domains are instrumental uses, which focus on immediate in-classroom adjustments, and conceptual uses, which focus on deeper inquiry work, such as understanding teaching practices. Table 17 summarizes the classification framework. In subsequent sections, I will review qualitative findings by the central themes of inquiry and decision-making. I will also outline how my study aligned with the framework of instructional responses to data.

Table 17. *Classification Framework for Instructional Responses to Data*

Domain	Action	Practices
Instrumental Uses	Instruction	Planning Strategies In-class grouping/differentiation
Conceptual Uses	Content Placement Goal setting Learning about students Learning about teaching Learning about the system Celebrate	

Source: Farley-Ripple et al., 2019.

Observations

In this section, I will provide a short synopsis for each of the four observations I conducted. All observations were of Professional Learning Communities (PLCs). District Y has a structure where PLCs meet once every 6 days and work on one main problem of practice for a 6-week cycle. The PLCs are run by a lead teacher who is responsible for setting the agenda each week and guiding the discussion. Administration typically do not attend the PLC meetings unless it is a specially scheduled time they are pushing in for, such as to review benchmark data. Ms. hompson shared that the expectation instead is that the PLCs are “run by a teacher leader with a set agenda.”

School A Grade K PLC Meeting: Sentence Writing Assessment Review

Inside a K classroom, six teachers gathered to review students’ recent writing during a 40-minute meeting. District Y uses a Badge Book where students earn badges throughout the year as they show competence in a skill or concept. Badge Book competencies are normed across the district. The team was reviewing students’ work toward the Sentence Writing Badge, where

students have to write a sentence with a capital letter, ending punctuation, and spaces between the words.

During the meeting, a debate arose about what help is appropriate for students to use on the sentence writing assessment. Ms. Allen, the team lead teacher, complained that only a few of her students passed; however, Ms. Williams shared that her students did well on the task but also had access to the rubric on their writing sheet. She questioned if that was cheating. Ms. Jones shared that her students were allowed to use their writing partner but similarly questioned if that should be allowed on an assessment, “Because we’ve also had this conversation, our kids are so used to checking with their writing partners. So, we said, if it’s an assessment, are they allowed to do that? Because it’s a taught tool, it’s a strategy, if they’re using it, I don’t see why not.” All six teachers determined that students should be allowed to use tools on the assessment with slightly different reasoning. Ms. Brown, Ms. Johnson, Ms. Jones, and Ms. Smith described that students should get credit for accessing the tools they were taught. Ms. Smith explained, “And using those strategies, and using those tools on their own, I think they should [get] credit for that.” Ms. Williams grounded her thinking in the language of the standards: “And if they think about all the kindergarten standards, a lot of them are with support.” Lastly, Ms. Allen focused on the distinction between a formal test and this assessment: “This is a kindergarten badge book assessment, not a test.” As a result of their conversation, the teachers determined to allow students access to learned class tools during future writing assessments, such as the word wall, the writing rubric, and writing partners.

The teachers then discussed how their students did and what strategies to use going forward. Ms. Allen held up her stack of student work. If other teachers had student work with them, they did not make them visible. Throughout the meeting, teachers shared general

statements on their students' performance, such as Ms. Allen saying, "Out of the 14 kids, four of them, in this assessment, earned the badge," or Ms. Johnson sharing, "I think with writing, and with sentence writing, that the problem is not so much structured writing, it's when they had to write independently," or Ms. Smith describing, "And one day they can do all of what is needed for sentence writing. And then the next day or the afternoon, it's the complete opposite." They discussed different strategies they have tried to assist students with sentence writing.

Ms. Johnson shared, "I was having trouble with the sentences, big time. So I started putting daily oral language." Daily oral language is an activity where students edit incorrect sentences. The team all agreed to add sentence correction into their daily whole class literacy work. Toward the end of the meeting, the team transitioned to discussing an upcoming STEAM day and what students would present to parents.

Summary. The K team meeting observation at School A demonstrated good collaboration among teachers, use of data to identify a problem, and use of teacher expertise to identify a solution. During the observation, the K team seemed comfortable together. For example, Ms. Allen explained she had posted an agenda mostly for my benefit, as the team normally can function well without one, "We usually don't use one [an agenda], because I don't think we need one. Usually it's when everybody talks over each other, and I told Jordan, I think we're very polite." All teachers participated, and no one used the time to conduct other tasks, such as grading or using their phones. Teachers were open about sharing successes and missteps from their classrooms without fear of judgment. For example, Ms. Allen shared that she has a student who has been consistently writing sentences but did not do so on the recent assessment. When she held up his work, clearly disappointed, her colleague quickly stepped in and said, "He was having a bad day." Data was used to identify a problem within the predetermined focus of

writing. Ms. Allen shared in her interview how the grade had determined a focus on writing based on a district-wide goal of improvement in writing:

So, currently right now, our focus has been on writing, especially in kindergarten. When they come to us, they usually cannot read or write. So writing has been a big focus this year because writing benchmarks were not a thing in the past. This is something the district has put in new this year. When they come to us, they can't read words, they can't write words. They use pictures to tell the story. By the time they leave us, most of the kids can write at least one simple sentence, if not a little bit more. So you see a tremendous amount of growth. So we bring pieces of work samples, whole classes, and watch for where we see we need to drive our instruction, what we think is working best for us, and we can share that with our colleagues.

During the meeting, teachers reviewed results from a recent sentence writing assessment and agreed that students still needed support in this area. After confirming this need, the teachers switched to trying to find a solution. They did not delve into the data deeper, such as reviewing the assessment question. While considering solutions, teachers voiced their knowledge of different potential strategies. For example, Ms. Johnson shared her successful use of daily sentence corrections with her students. Other teachers added ideas on how they could start doing this practice regularly. Ms. Brown shared:

I mean, we could make a slide and even just do it as a class. Like, let's look at this sentence. What edits can we do? Because when I used to teach first grade, that was a really hard thing.

After continuing to discuss teachers' suggestions on sentence writing strategies, the teachers moved on to STEAM day planning. There was no discussion of revisiting sentence writing.

School A Grade 1 PLC Meeting: Preparation for Math NWEA

Inside a 1st grade classroom, six teachers gathered to review recent math NWEA MAP Growth data during a 38-minute meeting. The lead teacher explained the goal as test preparation: "Just so get them prepared for the NWEA. I counted down. I think we have 10, 11 days until the NWEA starts." District Y takes MAP Growth, an adaptive assessment that adjusts to students'

individual levels, in reading and math three times a year. Ms. Miller, the team lead teacher, pulled up the grade report on the MAP Growth reports site on the smart board. The grade report shows the grade's average performance as well as the national average performance for that grade based on a study of a nationally representative set of students. Ms. Miller provided an overview of the grade's relative performance:

So it says here, the mean RIT score of the second, the second score on top, for our whole grade was 170.6. Yeah, if you look at the grade level national, which is second from the bottom, it was 170.0. We were right in the ballpark of what nationally first graders did.

The teachers discussed how they are frustrated that, although there is an enrichment teacher for higher level students, the students did not show growth on MAP. Ms. Davis shared her annoyance that the enrichment teacher does not cover what is on the test: "I'm so disappointed on the last NWEA because I really thought enrichment was helping them with those skills." Ms. Miller said she complained about this to the principal and was told enrichment was doing "project-based stuff." Based on the low growth for this group, the team then turned to deciding where to focus their high group lessons. Ms. Miller pulled up the Learning Continuum, a MAP Growth report showing a continuum of learning skills based on student scores, on the smart board. She explained how the Learning Continuum shows objectives for each band of students: "As you can see here, if this kid is in RIT band, they're supposed to be developing this." The teachers reviewed the list for their high students and considered different topics. The design of MAP Growth does not show which objectives students were tested on. The teachers considered what they have not taught yet, what they thought was most likely to come up on the test, and what they have resources for. They decided to focus on multiplication and division, exposing kids to this through centers and online tools such as BrainPOP, Super Teacher, and ST Math.

Summary. As with the K meeting, the 1st grade meeting also demonstrated good collaboration among teachers, use of data to identify a problem, and use of teacher expertise to identify a solution. Teachers openly shared areas they were upset about. For example, Ms. Davis shared her disappointment in her higher students' performance on the most recent NWEA MAP Growth assessment: "The only thing I have to say is, I'm so disappointed on the last NWEA because I really thought enrichment was helping them with those skills and it wasn't." In this meeting, teachers were addressing the upcoming NWEA MAP Growth assessment and how to raise scores for their highest students. Teachers used their expertise to share different potential strategies, such as manipulatives and online math worksheets that have advanced options beyond 1st grade material. At the end of the meeting, the teachers confirmed where they could source the multiplication and division materials online for their upper students. There was no discussion of revisiting higher students' math mastery.

School B Specials PLC Meeting: Lunch Kindness Ambassador Program

Inside the library, three educators—a librarian, STEAM teacher, and a social worker—gathered for 30 minutes to discuss implementation of a kindness ambassador program. The program would run during lunch to encourage positive behavior in the cafeteria. Ms. Harris, the team lead, first considered if this constituted a SMART goal: "We will create a campaign to promote kindness ambassadors during the second grade lunch period through June. I think it's specific. My question was the measurable part. Is it measurable?" Ms. Clark suggested they use a set of criteria and a checklist. They worked together to determine the criteria: (1) kind words, manners, and compliments; (2) self-advocating and big problem vs. small problem; (3) keeping the area clean; (4) inclusive of others; and (5) cafeteria voice. They defined each criterion with examples, such as manners being *please* and *thank you* and self-advocating being solving

problems on your own. Ms. Harris continued to probe the group: “Anything else for kindness? What does it look like in somebody’s mind?” Ms. Clark offered to create a PowerPoint of the criteria to help instruct the students. Next, they determined that students who won would earn sashes and their name displayed on a white board. Finally, they outlined how they would continue this work at their next meeting by finalizing the checklist and reviewing the slideshow.

Summary. Similar to the teams at School A, the Specials team at School B demonstrated good collaboration, identification of a problem, and discussion of possible solutions based on teacher expertise. The team included Ms. Lee, a social worker in her first year working. Ms. Harris and Ms. Clark, both veteran teachers, went out of their way to assist Ms. Lee. For example, they shared with her about how to invest in her future:

- Ms. Lee: Is there any perks for doing lunch duty?
Ms. Harris: 20 dollars per session.
Ms. Lee: Oh really?
Ms. Clark: Yeah. It's \$20 for 30 minutes. Eat lunch while you're in there.
Ms. Harris: My advice to you: get to the top of the pay scale as quickly as you possibly can, cause it will make money for you exponentially over 30 years.
Ms. Clark: I just finished my sixty.
Ms. Harris: And invest it in your retirement.

The team meeting was focused on creating a kindness ambassador program for the cafeteria. This issue was identified within the team’s larger focus on social and emotional learning (SEL). In her interview, Ms. Harris explained the predetermined focus of SEL:

So I have a PLC right now, but it's just with special area teachers and we're currently... It's just me, the science teacher, the social worker, and the psychologist, and we're working on our SEL data. So that was the other thing I didn't mention. We do the SEL web assessment as a school and then the special area teachers focus on that for our common goals throughout the year during our PLC. So currently we're working on a goal of empathy and impulse control. So books that I choose might also include opportunities for students to explain when characters were being empathetic to one another, and the evidence that they see. When we're working on impulse control, we focused on whole body listening, what it means to be whole body listening and reinforcing that through

small groups and whole group lessons for kids that need more help on the impulse control piece.

Given this focus, the team was discussing a kindness ambassador program for the cafeteria where students could demonstrate good social behavior. Teachers shared different strategies they had experience with, such as stories about self-control and websites with pre-made lessons on kindness. The team chose kindness criteria based on teachers' expertise. At the end of the meeting, they discussed finalizing the checklist and a slideshow of kindness criteria at the next meeting.

School B Grade 1 PLC Meeting: Reading and Writing Research Article

Inside a 1st grade classroom, six teachers gathered to discuss the connection between reading and writing instruction during a 45-minute meeting. The lead teacher, Ms. Walker, first reviewed the work the PLC had done so far this year. Last year, the team had worked on a Badge I-can book where students could see badges they had earned and set goals for future ones. Ms. Walker explained, "In their book that they can refer to and make goals ... then that way children are really taking ownership and really understanding if they didn't get something." Then this year they reviewed the curriculum and realized it was missing shared reading. Ms. Walker reviewed the steps they took:

We looked at shared readings, we created a folder, imported a lot of things that are completely aligned with the curriculum and made a resources bank in that folder for anything that's Shared Reading.... We created a schedule on what the five day looks like for the activities.

Ms. Walker explained that districtwide this year there is a big emphasis on writing because students have been struggling. She described how administrators created benchmarks, which they now give three times a year. She explained how previously they used PLC time to grade the benchmarks together to ensure consistency across multiple teachers:

In January we decided to pull all of our work together and we graded it together. Someone's not interpreting the rubric from their own lens. We're having conversations about it, and then data is more accurate because we're all grading it together and having those conversations.

Then they realized they did not have grammar in the curriculum and again created a folder of resources for that.

Ms. Walker then explained that, for the meeting this day, she asked the principal for readings on the connection of reading and writing instruction. She reviewed the options and chose two for the team to read. She posted on the white board three things for the teachers to look for while reading: anything they agree with, anything that they argue, and questions. The group read silently, and when everyone was done, Ms. Walker asked if anyone wanted to share what resonated with them. The teachers took turns sharing which parts resonated with them. Ms. Wright shared, "I just totally love this really hit home with me. We should be teaching students how to use writing in concert with reading to improve comprehension, increase knowledge, and to conquer academia. I love it." Ms. Hill stated, "That encoding and decoding, how they should be taught together when you're learning a skill, and now this is how you use this skill. This is how you decode it, and then you know how to decode it, now you have the skill to encode it and to be able to write it." Ms. Walker closed the meeting celebrating the growth they had made so far this year in writing.

Summary. As with the other team meeting observations, the 1st grade team meeting at School B demonstrated good collaboration, identification of a problem, and solving based on teacher expertise. All teachers participated, and no one used the time to complete other tasks, such as grading or being on their phone. During the meeting, they were focused on the need to have better integration of the reading and writing curriculum. This issue fits into the larger predetermined district-wide focus on writing that Ms. Walker shared in her interview: "It was a

big emphasis this year on writing. We're assessing it three times a year, at the beginning of the year. October-ish, we give them a month to transition to school.” After reviewing an article on the benefits of integrating reading and writing instruction, teachers shared their thoughts and knowledge on the matter. The teachers concluded the meeting, discussing the stress of making up for lost time from the pandemic and being proud of the work they have accomplished with students. There was no discussion of how to apply the knowledge from the article to their classrooms.

This section provided a description and summary of each of the four PLC observations. In the next section, I will review how these observations and the interviews demonstrated two central themes of inquiry and decision-making. For each theme, I will summarize the findings across the qualitative data as well as provide background context from the literature.

Central Themes

In the section that follows, I will review the qualitative data by each theme. For each theme, I will give background literature and qualitative findings across interviews and observations.

Inquiry

Throughout the literature, a key component of the data use cycle is the idea of investigation. Data Wise (Boudett et al., 2013) describes this process as identifying the “learner-centered problem,” which is common to many students and, if addressed, would help students meet their goals. Chenoweth (2015) says school leaders should “find patterns in data and use them to improve instruction” (p. 17).

Like the literature, in interviews participants described using data in a cycle of inquiry. Ms. Thompson, the principal at School A, described how inquiry occurs in the PLCs:

We have in all of our grade levels, PLCs that are run by trained teacher leaders, that run on an inquiry cycle, a six to eight-week inquiry cycle. That's really how the grade level gets nitty and gritty with their data as a group. We're looking at the patterns within the grade levels in the PLCs, using data and having a pre and a post within those inquiry cycles to track growth and see the difference that we're making as teachers.... The goal is to use data to make decisions on this inquiry cycle.

Ms. Mitchell, the principal at School B, similarly voiced how data is central to understanding the impact of teaching on learning:

I don't think there's a point in the work without the data. I think it's everything. We're not here to just read stories because.... You know what I mean? What is teaching without teaching learners and the people in front of you? And if you care about the people in front of you and you want to teach them to grow, you need to know where they are and you need to know the impact of what you do. So there is no effective teaching without data.

The teachers at both schools also demonstrated an interest in the use of data for understanding. Ms. Harris, the librarian at School B, shared how teachers use data to diagnose and assist all students:

In order to be a strategic diagnostician to help each individual child, you can't do it without data. Even informal data is valuable to a teacher when you're monitoring something. So you have to be specific about what you're working on with the students and then work on it, and that data that you get from all the assessments that we use should be what teachers are using to plan for their instruction.

Ms. Walker, a 1st grade teacher at School B, expressed how data is used as part of a cycle of inquiry:

So we look at data in our PLCs, we make goals for our students. And so it's mostly driven by our PLCs. We look at to see where is the most need. We create a goal, and then we work and do different things within each PLC to reach that goal, and then reassess again, and take a look to see how the students did and how they progressed over that period of time during the inquiry cycle.

While interviews were aligned to the theoretical data use inquiry process, observations revealed participants using different practices. Research suggests asking why and formulating a hypothesis; however, observations showed participants instead stating a problem and then moving to solving the problem. For example, during the K PLC meeting at School A, while

teachers were discussing students' ability to write sentences, they did not use the assessment item to further diagnose the issue. When asked about the specific prompt of the assessment, Ms. Allen shared she was not sure:

Ms. Johnson: What was the assignment?

Ms. Allen: I have to look at somebody to makes sense, to remember it.

Ms. Johnson: Oh.

Ms. Allen: But it was some sort of writing a sentence.

Teachers stated that students were having issues writing sentences but did not formulate a hypothesis to test as to why this was. Instead, after stating the issue, the teachers moved to considering what to do. Ms. Johnson shared, "Before the break, I was having trouble with the sentences, big time. So, I started putting daily oral language," articulating a problem of practice and then an immediate shift to the solution.

Similarly, the grade 1 PLC meeting at School A used data to state a problem and then moved to finding a solution. The teachers identified a concern with higher students not showing growth on NWEA but did not make a hypothesis to test as to why. Instead, after outlining the concern, they transitioned to creating a solution. The team used the Learning Continuum report from their assessment NWEA MAP Growth. The Learning Continuum is a list of potential learning objectives for students based on scores ideal for planning, not diagnosing. The teachers reviewed the report and chose objectives to cover.

Likewise, at School B, the Specials PLC did not follow a typical inquiry cycle. The teachers named students' behavior during lunch as a concern and spent the rest of the time working on the solution. They did not discuss why there are misbehaviors at lunch. Instead, they created criteria to teach the students about proper cafeteria behavior. Similarly, the 1st grade PLC at School B did not follow a typical inquiry process. The teachers stated that writing has been a concern with students and shared multiple solutions they had incorporated, such as adding

in grammar to the curriculum. They did not develop a hypothesis to test why students are challenged in writing. Instead, the PLC focused on different methods to employ to address the concern.

In her interview, Ms. Miller explained that the PLCs serve as a time for teachers to identify student problems and share best practices on how to address them:

And so my team will constantly gather, look at data, "Okay, what do they need?" Learners are not working, are not starting with capital letters. They're not complete sentences. We're now onto paragraphs by now. So we constantly will look at that and then we'll plan lessons come up with strategies. People will go to their classrooms, work on it. Somebody will tweet something. "Oh, wow. This worked for my kids." We do that kind of a thing.

As opposed to traditional inquiry cycles, which emphasize questioning and probing, the observations at District Y emphasized the ability to determine a student problem quickly and then transition to finding a solution.

In the next section, I will outline how the observed PLCs did and did not conform to the Classification Framework for Instructional Responses to Data (Farley-Ripple et al., 2019) regarding inquiry.

The Classification Framework for Instructional Responses to Data. Within the Classification Framework for Instructional Responses to Data, inquiry would be considered the conceptual domain, which involves deepening understanding without an immediate direct action, while actions that involve direct application to instruction would be considered instrumental (Farley-Ripple et al., 2019). The PLC observations at School A and B focused primarily on instrumental uses of data. Data was used in all four observations as an impetus for immediate action in the classroom, such as adding daily sentence correction activities in the K classrooms. In this study, teachers were asked about which data sources they prefer. They mentioned data that gave them information they could act on immediately. For example, Ms. Miller shared her

preference of data from their reading app Lexia: “I will constantly look at the Lexia to see what finesse skills they're working on so I can pull them and work on that with them.” Across observations, there was no direct evidence of conceptual uses of data, such as deepening understanding of the system or teaching. The emphasis instead was on using data for direct and immediate application in the classroom.

In the next section, I will review the second major theme of decision-making providing background literature and findings across the qualitative data.

Decision-Making

The literature recommends that, after conducting inquiry, the next stage is to develop an action plan based on the data analysis. Of the eight steps in Data Wise, develop an action plan is the sixth only after teachers have extensively reviewed data and instruction (Boudett et al., 2013). In the interviews, participants messaged similarly that no decision is made blindly but instead always grounded in data. Ms. Thompson, the principal at School A, explained how data is used to validate choices:

Teachers have to make choices all the time. That's their job. They make choices in every single part of their day. You can't validate a choice or be sure that you're making a great choice, unless you have data to back it up.

Ms. Mitchell shared how data is the basis for decision-making:

I think that we use data all the time to make decisions about grouping, to make decisions about the kind of work that we give them, to make decisions about planning lessons, planning additional supports, planning enrichment. We use it to make class lists. So I think it's a constant conversation.

Ms. Allen described how data is essential in determining her next steps in the classroom:

I think you need to know where they're at to help them get to where they need to be. So I think it's very important to give a pre-assessment to know how much they know before you start teaching. You can't just start teaching until you know how much they know beforehand. Every group that you get is different than the group you had last year. You can't just teach what you taught last year.

Although participants described following a data-driven decision-making process, observations showed a different methodology to decision-making. During PLC meetings, instead of questioning and investigating, teachers stated an area to address. This process of agreeing on a problem to address occurred quickly at the start of the meeting. For example, in the K PLC at School A, teachers quickly determined to work on student sentence writing. Ms. Allen, the grade lead, shared her class's overall performance on the sentence writing badge: "It came back out of the 14 kids, four of them, in this assessment, earned the badge." The 1st grade PLC at School A similarly quickly stated the focus area of the meeting at the outset. The teachers were focused on increasing the scores for the highest students in math on the NWEA MAP Growth assessment. The decision to focus on these students was based on the idea that the teachers could increase those students' scores with only a short amount of time before the test. Ms. Miller explained:

If we focus on the students that are really drawn for us to mold, on a higher level, and then do some lessons. Just so get them prepared for the NWEA. I counted down. I think we have 10, 11 days until the NWEA starts.

The Specials PLC also stated their focus area quickly at the onset of the meeting. They decided to work on a Kindness Ambassador Program for lunch. Ms. Harris opened the meeting sharing, "We will create a campaign to promote kindness ambassadors during the second grade lunch period through June."

After stating the focus area, teams spent the most time discussing teachers' knowledge and expertise with different potential strategies. The groups focused on feasibility of different solutions, such as familiarity with resources for it, and teacher previous success with them, such as good student outcomes. For example, during the 1st grade team meeting on sentence writing, Ms. Allen shared a song she used to help students remember sentence structure: "I know the strategy that we had been working on was the Apple Song from the morning meeting. We used

the Apple Song—do you know the Apple Song?” Ms. Johnson said she had been having success with using daily oral language, a practice of sentence correction practice:

Before the break, I was having trouble with the sentences, big time. So I started putting daily oral language. They did the editing. And I started doing that, that they’d have to write correctly. And they liked it. But at least I felt like some kids were actually seeing it now for a sentence. Like before, maybe not understanding this as a sentence. And that you know all the things that we’ve been teaching. But this was a little bit challenging, but I liked it. I think it’s something that I would do more often.

During the 1st grade team meeting at School A, teachers also leveraged their knowledge to address the problem of higher students’ math skills. Ms. Miller shared how she helps students do addition by presenting the problem vertically instead of horizontally: “There’s a lot of this, it shows two digit adding, three digit adding horizontally. I’m always like, make it stand up make it go vertical.” Ms. Anderson shared a BrainPop video on subtraction: “The BrainPOP math reducing video ... with a cute way of borrowing from the neighbor.” And Ms. Anderson explained that she likes Super Teacher because “the website that has all the math sheet you could print and you can go in by different grade levels.”

The Specials team at School B also focused on teacher knowledge of best practices for teaching student kindness. For example, one of the criteria was students’ ability to differentiate big problems they need the teacher’s help with from small problems they can solve on their own. Ms. Clark explained why she likes this criterion:

I love the big problems for small problems. Today with Student Y, someone sat in her spot. I go, "Student Y." "Yeah." "Big problems. Small problems." She's like "It's a small problem." I said, "Okay, I'm going to go to the back. I'm going to get this. By the time I come back, you and Student X, let's figure out that small problem. They shared the spot.

Ms. Lee shared a program called Nearpod, which includes pre-made lessons on character development” “Cause Jen had showed me that at Jackson and it's like pre-made lessons, kind of already made. So maybe that could be helpful to find something on kindness.” And Ms. Harris

told the group about Listening Larry, a book that teaches students about being an active listener: “That's our whole body listening. That was our last thing. That's like the whole year campaign for impulse control, what it means to be a listener. And so they learned about each body part and what it means.”

Lastly, the 1st grade team meeting at School B also leveraged teacher expertise. After reading an article on the benefits of combining reading and writing instruction, the teachers shared their personal beliefs based on experience. Ms. Walker commented:

Well that was the reason for the integrated curriculum. With Lucy Calkins,¹ has a continuum, right? But then that was the thing for primary elementary. That's why they bridged it together. If you're learning about something and you're reading about something, you're supposed to have the opportunity to write about it. That's where, even though it's we're writing is a separate entity and it kind of takes away from like the way you should teach writing. For the primary elementary grades, that's why they married it like that.

Ms. Lewis also shared her opinion on the curriculum based on her experience:

I look at the curriculum map now that we have, some of it seemed a little disjointed, especially in the beginning, because someone that was teaching in the higher grades was writing for the primary grades and I don't think she understood it really well.

Across all four observations, teachers showed a preference for solutions that the whole team could readily incorporate. For example, during the K team meeting at School A, the teachers considered if all could easily incorporate daily sentence correction work. Ms. Williams assured them she could:

Ms. Brown: Can you put that [daily sentence practice] in?
Ms. Williams: No problem.

¹Lucy Calkins is the founder of the Teachers College Reading and Writing Project at Columbia University. She is the author of the reading, writing, and phonics Units of Study series, which is frequently used as part of the English Language Arts curriculum in schools.

The solutions chosen by the other teams also were readily able to be integrated. For example, the 1st grade teachers at School A chose math worksheets that everyone could print and use.

Similarly, the previous work the 1st grade PLC at school B had done all involved strategies the team could readily incorporate. The lead teacher explained that one of the main projects the PLC had undertaken this year was adding shared reading resources based on teachers' understanding of this as an important need for the literacy programming. Ms. Walker described the process:

Then this year in the beginning of the year, we looked at the integrated curriculum and realized that there was a lack of a very important piece in the curriculum that were there. We looked at shared readings, we created a folder, imported a lot of things that are completely aligned with the curriculum and made a resources bank in that folder for anything that's Shared Reading, because obviously primary elementary really needs that Shared Reading.

Likewise, when the team identified that students were struggling in writing, they determined a solution based on teacher expertise. Ms. Walker outlined:

The children are having trouble writing.... Then looking at the curriculum again, we realize, huge grammar things are coming up. We don't have a grammar curriculum or a grammar book. We do grammar based on the kids' writing and incorporate that in, but we didn't have something specific to go by. So again, we created another folder and started to talk about grammar and that's where we are today.

Both shared folders provided the team with ready-made resources they could easily begin using immediately.

In the next section, I will outline how the teacher use of data for decision-making observed in my study is and is not aligned to the Classification Framework for Instructional Responses to Data (Farley-Ripple et al., 2019).

The Classification Framework for Instructional Responses to Data. The Classification Framework for Instructional Responses to Data terms decisions that involve direct application to instruction as instrumental (Farley-Ripple et al., 2019). Within the instrumental domain, there are four primary actions: instruction (planning, strategies, in-class

grouping/differentiation), content, placement, and goal setting (Farley-Ripple et al., 2019).

Across the four observations, decision-making primarily focused on instruction through strategies and content. For instance, in the K PLC meeting at School A, they chose a strategy of daily oral language to address sentence writing. In the 1st grade PLC meeting at School B, the teachers added shared reading and grammar to the content to assist with students' literacy skills. There was no direct evidence of teachers using data for placement, such as recommending students for special education, or goal setting, such as setting individual student goals; however, these were mentioned in interviews. For example, Ms. Walker shared that during PLCs, they make student goals based on data: "So we look at data in our PLCs, we make goals for our students." Additionally, Ms. Mitchell explained how data is used for determining additional supports for students: "I think that we use data all the time to make decisions about grouping ... planning additional supports, planning enrichment." Ms. Walker described how data is used for placement:

And especially if children are falling into an area where, they're at risk academically, then we have a process for RTI for our IST process. And we put our information into branching minds where we set goals for the kids, and we track them specifically on the area that they're struggling in and track them over time, and then after the inquiry cycle with that child, then the committee gets together again, assesses. Are they progressing? Are they not progressing? We adjust goals if need be, and we track a child over time. And then that data will allow us to then see if a child should maybe be assessed for special ed, if enough time has passed and they haven't progressed, and we've done all these interventions.

In the next section, I will outline how across the qualitative data consensus building was evident.

Consensus Building. In both interviews and observations, participants demonstrated an interest in coming to consensus and norming across the grade level, as opposed to making different decisions for each classroom or different students. Ms. Allen explained the emphasis of norming in PLC meetings:

We all have a shared goal. Then we go back and meet with our grade level teams and turnkey information to make sure we're all on the same page, using the data to drive our instruction. It doesn't matter what our goal is, whether it's math, or reading, or writing, but we use that same vision, using the data to drive our instruction, and sharing best practices amongst your team.

Similarly, Ms. Thompson explained that the goal of PLCs is to come to consensus: “Beyond my role and the teacher's role, it's really a group-level role to make decisions for the whole grade, based on the kids that we have in that cohort.” The consensus sentiments shared during interviews were mirrored in the PLC observations, where the teachers generated one joint decision for the whole grade to follow. For example, in the K PLC meeting at School A, all teachers agreed to add daily sentence correction work to their literacy block. Likewise, in the 1st grade PLC meeting at School A, all teachers agreed to create centers work for their highest students on multiplication and division.

In the next section, I will outline additional findings that fell outside the themes of inquiry and decision-making or were inconsistent with most of the evidence.

Inconsistent Findings

While the preponderance of evidence from qualitative data is presented organized under the themes of inquiry and decision-making, there were extraneous pieces of evidence that either did not fit into these themes or were inconsistent with most findings. Within inquiry and decision-making there, were pieces of evidence in observations and interviews that were contradictory. While PLC observations did not include the traditional inquiry cycle as described in the literature, there were instances that could represent inquiry. For example, during the K PLC on sentence writing, Ms. Johnson questioned why students were struggling. She proposed a theory that it is based on the structure or lack of structure in the prompt to students:

I think with writing, and with sentence writing, that the problem is not so much structured writing, it's when they had to write independently. I did a lot of dictation with sentences. I'll dictate the sentence and see if they can write it. Some are okay, some are

not okay. But then, even those kids that are really writing beautifully, when they go to write independently we're just like, okay, what's the weekend news? They have difficult deciding, number one, what to write. Which, okay, I understand. And then to actually write the sentence on their own is hard for them. So, I don't know, structured I think it's so much easier. And even if you just go word for word, like I see the black dog. A lot of them can at least put down words that correspond to what you're saying.

With traditional inquiry, the team would have wanted to collect data to test this hypothesis, which the K team did not do. However, the glimpse of attempting to understand why students struggled could be evidence that sometimes the PLCs do engage in inquiry.

Most meetings did not include student work review; however, there were some instances. During the K team meeting at School A, it was unclear which teachers had brought their student work because they did not look at it or pass it to other teachers. Ms. Williams did, however, use hers in one instance to go over one child's sentence in detail:

I think too, with some of my higher kids, their first sentence.... Here's a good example. He wrote, I went to Hunter's birthday party. He has spaces, an upper case, a period. But then, as it goes, he writes more sentences, which is amazing, but now he's not applying the upper case. So, he earned the kindergarten badge, technically.

In this instance the teacher did utilize the student work to understand his strengths and weaknesses.

Typically, in inquiry, teachers would review multiple pieces of data. During the PLCs, teachers were only observed referencing one assessment. However, in interviews, participants referenced using multiple measures. For example, Ms. Miller shared how she combines data to get a full picture of students:

So, like I said, I think each component of data, reading, writing, math, NWEA, the writing benchmarks, branching minds if they're on that, ESGI, I think it's all pieces of the puzzle, and you have to look at it as a whole to really see where a child is.

The teacher's description may show that the PLCs observed were not representative of the use of multiple measures typically done at School A. Or it may allude to teachers using multiple measures when viewing data alone, a practice that was out of the scope of this study.

During the observations, teachers determined one joint plan of action for all students. No differentiation was observed. However, during her interview, Ms. Walker described how she leverages data for differentiation:

That's the first thing I think about before I plan anything, is: What levels are my kids? How am I going to enrich the kids that need to be enriched? The kids that are on level, what is their work going to look like? And the children that need support, how do I progress, and push them, and challenge them? So that's the first thing I think about for any lesson is: What is each child going to be doing?

Having only observed four meetings, it is unclear whether differentiation does happen regularly or not in District Y.

There were also findings that were outside of inquiry and decision-making. For instance, all six interview participants noted that the district does not have a functional data warehouse. Ms. Thompson, the principal at School A, shared the background on the district's efforts to create a data warehouse:

We started with one. It was called, I think, Ed-Data. It was very exciting. It basically triangulated all of our data and created dashboards. Then, we lost it all. Then, the pandemic came and we had to buckle down on virtual. I was a virtual principal for a year. Prior to that, I was an instructional leader. We did. I don't know if we do right now, but it hasn't become priority, as we're trying to get everything else back on track in terms of programming. My answer is, I'm not sure anymore, but we have tried every year.

While all participants shared that there was no data warehouse, they seemed satisfied with the school Google sheets that offered them accessible data in an easy-to-use format. According to Ms. Allen:

In our school, we have this class placement sheet, which is where we house our fall, winter, and spring reading benchmarks, writing benchmarks, and NWEA data. So we have the ability to look at not just our classes, but other classes, as well, so we can see all of that. Yes, constantly. You can see because it's a Google Sheet. So when I log on, I can see what other teachers are on there. And there's always somebody else on there using it.

Another finding outside of the central themes was on professional development for data use. Consistently across the interviews, participants shared that formal data use trainings were

not a focus but instead that most learning occurred during teacher collaborative time. Ms. Harris told how PLCs are a great source of ongoing PD on data use:

Jordan: Have you ever participated in data related professional development or coaching at your school?

Ms. Harris: Yeah. Yeah. In terms of coaching, we've over the years, hired many people to come in to work with us, to utilize data. I can't remember names offhand right now, but also a lot of our professional development involves that ongoing.

Jordan: Can you give me an example?

Ms. Harris: So our PLCs, we could start with where our PLC has to be a smart goal. So if you are assessing a smart goal, you're consistently thinking about it and strategically analyzing it and it's time sensitive, it's measurable, and there's pre-post involved. So it can start from that level. If we're talking about professional development that happens after school, this year, they've allowed independent studies to happen for professional development. So if you feel that you need to learn more about how to read NWEA reports and how to utilize that there was an independent... They may actually have been a group of that, but people were doing studies on learning more about it through videos and online learning. And now currently, there's a school. Many people are taking professional development on learning how to utilize Seesaw to inform their instruction.

Similarly, Ms. Allen described a loose professional development occurring when working together:

Let me think. I think so. We have talked about how to analyze different pieces of work, whether it be looking at levels of writing, or looking at NWEA data and what we should be looking for. So there's definitely things that we've discussed.

These comments demonstrate perceptions that professional development for data use more frequently happens in collaborative time as opposed to formal training sessions.

In the next section, I will provide a summary of the qualitative findings.

Summary

In reviewing my qualitative data, two major themes emerged: inquiry and decision-making. Research suggests that data use be part of an inquiry cycle in which analysis is conducted and then used as the basis of decision-making. In this study, principals and teachers self-reported to follow these tenets of data use. Participants shared an interest in data for investigation and deeper understanding. They also shared a belief that no decision should be

made without evidence to back it up. However, observations revealed a different process of decision-making. During all four PLC meetings, data was used to quickly identify an area of concern. Teachers then transitioned to solving the problem relying on teacher expertise to make decisions. In the process of decision-making, feasibility of the solution and consensus building were valued.

In the next section, I will summarize findings across quantitative and qualitative data in relation to my research questions.

Conclusion

In this study, I sought to answer the following research question: *How do school leaders in New York State support teachers' use of state, school, and classroom data?* with the sub-questions:

1. To what extent do school leaders report supporting data use?
2. To what extent do teachers perceive leader support of data use?
3. Which data use organizational supports from school leaders are most significant?
4. How, if at all, is collaborative teacher meeting time used for data use?
5. Which types of assessments (state, school, or classroom) do teachers perceive the best and use most frequently?

To better understand data use in schools, I collected TDUS answers from the principals and teachers, conducted interviews on data use with the principals and teachers, and observed two PLC meetings at each school. In this section, I will provide a summary of key findings.

My data showed that, overall, both leaders and teachers reported high perceptions of support for data use from their school leader. This was evidenced in both the TDUS responses and interviews. However, there was a much greater alignment of leader and teacher perception of

leader support of data use at School A than at School B. In keeping with this finding, teachers at School A rated the principal as one of the highest organizational supports of data use, while teachers at School B rated the principal as one of the lower organizational supports of data use.

As described by principals and teachers in interviews, collaborative meeting time in District Y is intended to be used for data use inquiry cycles. The structure of PLCs is that they are led by a lead teacher, who sets the agenda and follows a 6-week inquiry cycle on a given area. Participants outlined that in the meetings teachers typically bring student work and conduct data analysis. They use the data findings to drive instructional change.

PLC observations revealed a different data use process. Across all four observed PLC meetings, teachers used data to state a problem with student performance and then transitioned to developing a strategy to address the stated concern. Teams relied on teacher expertise to determine a solution, prioritizing feasibility and consensus.

Lastly, my study found there was a strong preference for formative assessments. This was seen across TDUS answers at both School A and School B. The TDUS has teachers rate across a four-point continuum, with 1 being *not useful*, 2 being *somewhat useful*, 3 being *useful*, and 4 being *very useful*. Formative assessments were rated the highest between *useful* and *very useful*. After formative assessments, teachers considered interim assessment the next most useful. Both schools rated summative assessments as the least useful, giving them an average rating of only *somewhat useful* at informing instruction.

Chapter 5: Discussion

Introduction

Due to educational policy, data use in schools is now a prominent method of instructional reform (Cosner, 2014; Levin & Datnow, 2012), yet it is unclear whether it improves student outcomes (Gleason et al., 2019). One of the key factors that has been documented as an influencer of data use is the school leader (Cosner, 2014; Wayman et al., 2012a). The existing literature on the impact of school leaders on data use is limited (Levin & Datnow, 2012) and frequently only conceptual (Cosner, 2014). This study sought to increase the knowledge of how school leaders support data use and how that support is received and implemented by teachers. Much of the existing studies (Table 1) focus on quantitative data, review only one specific data use intervention, and only study the teachers. This study adds to the literature in that it focused on the relationship between principal actions and teacher data use, was not limited to a single data use intervention, such as a particular interim assessment, and provided mixed method data from a survey, interviews, and observations.

Research Questions

The overarching question for this study was: *How do school leaders in New York State support teachers' use of state, school, and classroom data?* To further understand this question, I focused on five sub-questions:

1. To what extent do school leaders report supporting data use?
2. To what extent do teachers perceive leader support of data use?
3. Which data use organizational supports from school leaders are most significant?

4. How, if at all, is collaborative teacher meeting time used for data use?
5. Which types of assessments (state, school, or classroom) do teachers perceive the best and use most frequently?

Results revealed that, overall, both leaders and teachers reported positive perceptions of leaders' support of data use, such as encouraging data use and providing training. Prominent evidence of organizational supports included dedicated time for collaborative data use and resources such as data systems. Collaborative meeting time was used for data use with a method that prioritized efficiency. Lastly, the study showed that teachers preferred formative assessments over interim or summative data. In the next section, I will detail how my findings compare to the existing literature on data use in schools and what conclusions might be drawn from them.

Interpretations

In the interpretations, I will outline how my findings compare to the existing research on data use in schools. First, I will cover the why of data use, discussing the research and study findings on the vision of data use in schools. Next, I will consider the what of data use, outlining the preferred data source in recent studies as well as my own. Then I will review the who of data use, considering the school leader's role in supporting data use as outlined in the research and my study. Lastly, I will review the how of data use, comparing data use theoretical models to the process observed in my study. After drawing comparisons between the literature and my findings, I will propose a new data use model—Do, Know, Now—describing its steps, rationale, and possible benefits. I will conclude with limitations of my study, conclusions, and implications for research, theory, policy, and practice.

Data Use Why: Vision

An important aspect of data use in schools is understanding the purpose behind it. In my study, participants demonstrated a vision for data use that matches the literature's definition of data use for continuous improvement (Hamilton et al., 2009; Schildkamp et al., 2015). As shared in the results, Ms. Mitchell, the principal at School B, stated her belief that data is the way to improve instruction: "There is no effective teaching without data." Similarly, as shared in the results, Ms. Allen stated, "We use that same vision, using the data to drive our instruction." These statements are in alignment with the literature that suggests data should be used to better understand barriers to learning (Agasisti & Bowers, 2017). There was evidence that the vision of data use was shared across the building. When asked if she thought her school has a shared vision for data use, Ms. Allen responded, "Absolutely ... We all have a shared goal." Participants showed alignment to the research on the vision of using data to improve instruction. In addition to the why of data use in schools, what data sources should be used is also pertinent.

Data Use What: Data Source Preference

The findings from this study support the assertion that data use should be expanded beyond standardized tests for accountability (Mandinach & Schildkamp, 2021). Several recent studies demonstrate a preference for and effectiveness of using formative data (Chatterji et al., 2009; Jennings & Jennings, 2020; Thompson & Allen, 2012). Mandinach and Schildkamp (2021) state that, while each data set has a distinct use, "the most valued data were the classroom-specific data that were most closely aligned to instruction and student work" (p. 69). A study using the same TDUS survey used in my study revealed that of the group of teachers who demonstrated the most data usage, respondents stated that, as compared to state, benchmark, or district data, they use classroom data more frequently (98.8%), agree that classroom data is

useful to their practice (98.8%), and take more action with classroom data (97.3%) (Bowers & Zhang, 2017).

As in the literature, the participants in my study showed a preference for formative data, such as classroom assessments, over interim or summative assessments. Across School A, School B, and the comparative set from Nebraska, teachers rated formative data as the most useful to their practice. At School A, the data type usefulness ANOVA showed a statistically significant difference across groups, $F(2,33) = 7.04, p < 0.001$, with a very large effect size ($\eta^2 = .31$). At School B, the ANOVA showed a non-significant trend, indicating a preference for formative data, $F(2,17) = 2.53, p = 0.11$, with a large effect size (.23).

In this study, teachers expressed having more investment in classroom assessments to inform instruction. For example, when asked what data is the most useful to her practice, Ms. Allen shared, “A teacher given assessment, where I can measure that, is a lot more important, in my opinion.” In comparison, Ms. Allen questioned the validity of NWEA MAP Growth, her school’s interim assessment. Her students take MAP Growth on iPads, and she shared how at the beginning of the year students struggle with the mechanics of testing on an iPad, such as over-clicking or skipping directions, and this lowers her trust in the results: “But for kindergarten, beginning of the year, it's [MAP Growth] really not an accurate piece of data.” Similarly, Ms. Miller outlined how she likes formative data over other assessments. She shared how important it is to frequently reassess and adjust at the first grade level. For example, she likes to use a reading app to inform her instruction: “I really like the Lexia, because that gives me real-time data on finesse skills that they're having trouble with or comprehension.” In contrast, she dislikes NWEA MAP Growth because it is not aligned to her instruction: “But my issue with the NWEA is they are assessed on things I don't teach.” The survey results and

interviews from this study provide strong evidence of a perception that formative data is the most useful. While teachers are the primary agents of data use, their work is heavily influenced by the school leader.

Data Use Who: The Role of the Leader

My study's findings were consistent with the literature, which has consistently outlined that a school leader's support of data use is essential (Boudett et al., 2013; Bowers et al., 2019b; Cosner, 2014; Honig, 2017; Wayman et al., 2012a). Data use places an emphasis on major leader actions seen in the general leadership frameworks around developing a vision, fostering collaboration and continual inquiry for improvement (Hitt & Meyers, 2018). Leadership practices that foster data use include establishing and reinforcing a data use agenda, buffering teachers from outside disruptions, developing distributed leadership for data use (Cosner, 2011), allocating collaborative time, ensuring access to data, and using meeting protocols (Boudett et al., 2013; Gerzon, 2015). Among these practices, distributed leadership for data use, allocation of collaborative time, ensuring access to data, and using meeting agendas were all evident in my study. For example, the principals and teachers in my study articulated the importance of distributing leadership on data use through the team lead role. At District Y, the team lead is responsible for running the PLC meetings, including setting and facilitating the agenda. The teacher leader role allows someone outside of the principal to foster a culture of data use. When describing the PLC meetings she runs, Ms. Allen shared, "So these [PLCs] are where we use our data to help us." Across all four PLC observations the team lead emphasized data use, and teachers in the meeting appeared comfortable collaborating under the guidance of a colleague.

My study demonstrated school leader support for data use at both School A and School B. For example, in the study, TDUS results on organizational supports were more

positive than the recent large-scale Nebraska TDUS study (National Center for Education Evaluation and Regional Assistance at IES, 2021). District Y teachers rated organizational supports for data use significantly higher than did the Nebraska teachers, $t(139) = 2.88, p \leq .001$.

In this study, both teachers and principals were aligned on the principal's demonstration of the importance of data use in their schools. Ms. Thompson, the principal at School A, explained how data is the basis of resource allocation: "Data has a huge role in the way our money is spent in the district and where our energy goes, as well." Similarly, Ms. Mitchell, the principal at School B, described how she uses data as the basis for major school decisions:

What kind of resources we need for kids, what kind of programming we need for kids. The way we organize the summer program is based on student data. The applications we buy or try out are based on need. No decision is made randomly. The kind of curriculum we are looking at and investigating or adopting or writing is based on data.

Teachers echoed the school leaders' self-reports, outlining how their school leaders demonstrate a commitment to data use in their schools. Ms. Allen shared standard practices they have to review data with the principal:

We meet with her [the principal] a couple times a year to go over what our goals are for the year, and whether our learners are meeting their goals. And she always says, "Have you checked with this? Have you looked at your NWEA data? Have they met their..." We have color coded charts for where everybody should be during each grade, and how many have met their goals. We have a class placement sheet, and where everybody should be. And if they're not there, are they showing ... are they making progress, which is all you really want to see.

Ms. Walker also explained the regular review of data with the principal:

The principals also have a data collection sheet for every student in the school where on a Google form, everybody fills in their reading level, their NWEA data. What else is on that sheet? The ESL information with what level on ESL they are. So that way, every time the principal meets with you, she's looking at that and going over it with you.

The sentiments of the principal and teachers about the leader's support of data use were also evident in organizational supports for data use at both Schools A and B.

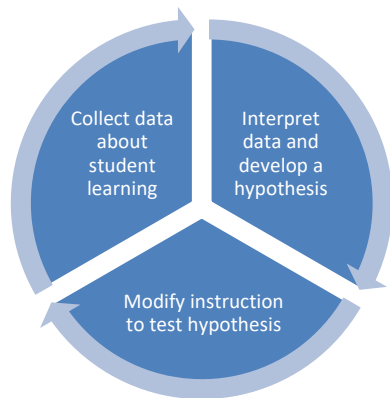
There are four main influencers to teacher data use that principals can enable: competence in using data, attitudes toward data, collaboration, and organizational supports (Wayman et al., 2016). In my study, there was evidence of school leaders' support of data use via these influencers at both School A and School B. For example, all grades were allotted a weekly time to collaborate on data use. There was the creation of a teacher leader role of grade-level lead who created agendas and maintained a focus during these PLC meetings. Principals created Google data sheets for their schools to assist teachers with accessing data and encourage data tracking. And teachers referenced availability of resources, such as online instructional materials, in relation to data use.

Based on the findings, my study is consistent with the literature that the school leader is an important component to schools' data use. In addition to the why, what, and who of data use, the how of data use is a complex process.

Data Use How: Models

Multiple models have attempted to delineate the process, including data-driven decision-making (Mandinach & Gummer, 2016), data-based decision-making (Prenger & Schildkamp, 2018), and inquiry cycles (Boudett et al., 2018). Figure 11 represents a combination of data use models from the literature based on the National Center for Education Evaluation and Regional Assistance's guide, "Using Student Achievement Data to Support Instructional Decision Making" (Hamilton et al., 2009).

Figure 11. *Data Use Cycle*



Source: Hamilton et al., 2009.

As seen in Figure 11, across the literature, there are consistent components of data use, including collection of data, development of a hypothesis, and adjustments to instruction. Another key aspect is the cyclical nature where teachers can enter the process at any point and continually cycle through (Hamilton et al., 2009).

My findings showed a lot of alignment to research data use models; however, the observed process diverged in two main regards—participants were not observed asking probing why questions or conducting cycles of inquiry. This study utilized the Data Use to Improve Student Learning Model (Wayman et al., 2016) as the primary data use model framework as it is based on research and practice. Under this model, teacher data use includes these steps: form questions, examine data, synthesize information, make decisions, and evaluate problems: “A typical inquiry cycle includes examining data to identify a problem, developing hypotheses (making predictions) about how to improve student learning, collecting and synthesizing data, and creating actionable recommendations to inform decisionmaking” (Wayman et al., 2016, p. 3). As shared in the results, Ms. Thompson said that they use inquiry cycles in PLCs: “We have in all of our grade levels, PLCs that are run by trained teacher leaders, that run on an

inquiry cycle, a six to eight-week inquiry cycle.” However, observations showed that teachers did not follow the inquiry steps as defined in the literature. Table 18 outlines each observation and what evidence was or was not observed for the steps of inquiry.

Table 18. *Data Use Model Components v. District Y Observations*

	K PLC School A	1st PLC School A	Specials PLC School B	1st PLC School B
Form Questions	No why questions	No why questions	No why questions	No why questions
Examine Data	Student sentence writing work samples	NWEA MAP Growth Class Report	No student work present	No student work present
Synthesize Information	Focus on student sentence writing	Focus on higher students’ math skills	Focus on lunch kindness program	Focus on integration of the reading and writing curriculum
Make Decisions	Add daily sentence correction practice	Create centers for multiplication and division	Develop lunch kindness ambassador criteria	No decision made
Evaluate Problems	No cycle referenced	No cycle referenced	No cycle referenced	No cycle referenced

The two major areas that diverged from data use models in my study were forming questions and evaluating. A review of all four PLC observation transcripts revealed that a why question was not asked once. Across the meetings, the focus was more on how to address the identified problem than on why it was happening. There was also no reference made to cycling back to the student problem that was being discussed. Teams appeared to stay within an overarching area week to week, such as writing, but not necessarily within a minute topic, such as sentence writing. The differences from conceptual data use models and the observations in my study are consistent with other recent findings showing inconsistent fidelity to the models given the realities of everyday life in schools.

Inconsistent Data Use Implementation Studies

A debate in the research on data use is whether the data use frameworks constitute a theory of action (Mandinach & Schildkamp, 2021) given that they have not consistently been proven. There are many findings that do not align to the existing theory. For example, a recent study revealed that, due to external demands, school leaders simplified the Data Wise (DW) Improvement Process to satisfy compliance in lieu of following the thorough improvement process with fidelity (Yurkofsky, 2022). Influenced by their professional identities, their beliefs about DW, and their perception of regulation, leaders responded with a combination of six different types of responses: accommodation and assimilation, adaptation and avoidance, compromise and compliance (Yurkofsky, 2022). Another recent study demonstrated the disconnect between existing data use expectations and the reality of school life. Findings showed three aspects of data use in schools: the anticipatory accounts (idealistic goal of data use), analytical enactments (actual use), and administrative concerns (logistical challenges) (Selwyn et al., 2021).

Other studies demonstrate missing components of the theoretical data use models. For example, a review of 111 school improvement plans found that not even one included a hypothesis of the school problems (Meyers & VanGronigen, 2021). The principals wrote the cause of the identified problem as a statement to be solved rather than a question to be explored. The following example shows how the principal describes the root cause as a statement not a wondering: "Professional development is not translating into practice. Observation and feedback was not focused on looking for professional development strategies and ensuring action plans were being implemented" (Meyers & VanGronigen, 2021, p. 448). School leaders may prefer to state the root cause as fact instead of posing it as a hypothesis, due to a perception that leading

with confidence is paramount: "Not one root cause was developed as a hypothesis, but all were stated as fact. Collectively, these results posit that principals are being taught, perhaps implicitly, that they are to lead with directness and confidence" (p. 449). Similarly, a study showed that, while leaders understand the concept of inquiry, few engage in it. A survey of superintendents showed that, while 73% felt their preparation program had prepared them to "conduct research related to solving district problems" (Peterson et al., 2008), their heaviest focus remained on managerial problems. Researchers have also questioned the efficacy of current data use models, given the current realities of data in schools. "As new types of data have become available and accessible, there is an open question as to whether traditional data analysis tools and workflows are up to the challenge" (Bowers & Krumm, 2021, p. 630). Given that multiple studies have revealed a potentially different data use model in practice, findings may suggest the need to redefine the process.

Data Use in Practice

Using a combination of my study and another recent study on teacher data use (Garner et al., 2017), I will outline what actions were taken by teachers. In Garner et al., the researchers reviewed an observation of a full-day data day. The day involved a team of 6th grade math teachers. Teachers had a list of test items showing how many students had answered each question correctly as well as an item analysis document showing the distribution of student responses. All test items were correlated to state standards and mathematical categories. Just as with my study, teachers used the existing data to identify a student problem. One of the teachers, Rachel, quickly identified that the lowest-scoring items were aligned to Standard 3E on students' fluency with the order of operations. As with the participants in my study, the teachers focused on existing data instead of investigating by gathering additional data:

The strict adherence to existing data limited teachers' analysis of students' mathematical understanding. Devon and Rachel did not, for instance, seek out other questions about the order of operations, examine the distribution of students' responses, or even read the item in question. (Garner et al., 2017, p. 417)

Like the participants in my study, in Garner et al., as soon as a problem was identified, the teachers moved to finding a solution instead of conducting further data analysis. The researchers explained how participants used the data to determine a focus area and then transitioned to solving the problem: "The Riverview teachers identified the order of operations as a difficult standard for their students and described ways to reteach the content without examining the assessment item" (p. 416). While discussing potential solutions, the teachers leveraged their expertise. The researchers described the various solutions proposed by the teachers: "After identifying a problem area, Devon launched into a possible instructional strategy: teaching a checklist to apply the order of operations. Rachel then offered a similar strategy involving sticky notes" (p. 416). The team focused on teacher knowledge of the problem. Devon explained his previous success using the checklist: "When you do one problem each time, and draw it line-by-line, then students follow it" (p. 416). The teachers in Riverview also mirrored the ones in my study in their selection of an instructional strategy that could be implemented immediately. Garner et al. term the immediate instructional fixes employed as "instructional management approaches" (p. 17), which prepare students to answer a question they missed. After reviewing one of the missed items and available teaching resources, the teachers determined the best solution was to use questions from a test prep book: "Ultimately, she suggested finding similar items in a common test-prep book (Turn 50), ostensibly to use in future lessons" (p. 418). As with the solutions observed in my study, the test prep book solution offered a readily available option that could be implemented immediately. Like the observed PLCs in my study, the teachers' data use ended there. There was no discussion of cycling back to this learning to review

progress or make further adjustments. The teachers' closure of the problem once a solution is found may be explained by the prioritization when using standardized testing to continue to address missed test items rather than pushing for deeper understanding (Garner et al., 2017). Under this assumption, teachers would be more likely to review and address the latest assessment data in the next meeting rather than revisit the data from the previous one.

Table 19 summarizes the key components of the data use observations both from my study and from Garner et al. (2017). During both the observed PLCs and the data day observed in Garner et al., the main actions were: (1) reviewing existing data, (2) articulating a problem, (3) considering solutions from teacher expertise, and (4) selecting a ready-to-use solution. In both cases, my study and Riverview, there is no arrow back to review of data again after the selection of a solution; the process stops and begins anew the next time with a different data set.

Table 19. *Data Use in Practice*

Data Use Action	My Study	Garner et al. (2017)
Review of existing student data	-review of a student sentence writing assessment -review of NWEA MAP Growth math results	-review of a standardized district benchmark math assessment
Problem articulation	-student sentence writing -higher students' math skills	-fluency with order of operations
Solving with teacher expertise	-consideration of strategies and resources previously used by teachers	-consideration of strategies and resources previously used by teachers
Selection of ready-to-use solution	-selection of daily sentence correction activities -selection of math multiplication and division worksheets	-selection of test prep practice questions

The missing components of not cycling back to evaluate progress is a significant departure from the research on data use. Research consistently outlines that feedback is a vital component of the data use cycle (Halverson, 2010). Data Wise (Boudett et al., 2013) and Data

Teams (Schildkamp et al., 2016) both argue that data-driven decision-making involves many feedback loops to achieve better results. A two-year case study review of four data teams revealed, “data use is not a linear process, and that teams go through different feedback loops to reach higher levels of depth of inquiry” (Schildkamp et al., 2015, p. 228). The literature suggests that cycling is an essential part of data use, yet it was not present in either my study or Garner et al. (2017).

Another distinction between data use in practice and theory is the reliance on teacher expertise. At both Riverview and in my study, teachers focused on their knowledge to find solutions. However, research has outlined that teacher knowledge is not a solid basis for data-driven decision-making. Schildkamp et al. (2015) argue that “teachers do not use data to its best effect.... A majority of decisions are based on intuition” (p. 228). Teacher knowledge is often left out of data use models entirely. For example, in the Phased-Based Model of School Leadership for Collaborative School Data Practices (Cosner, 2014), none of the eight steps include leveraging teacher expertise. Similarly, the Principal Leadership for Data-Driven Decision Making Model (Levin & Datnow, 2012) includes four principal actions and five teacher actions for effective data use, none of which include teacher knowledge. Likewise, the Data Use to Improve Student Learning Model (Wayman et al., 2016) does not reference teacher expertise. Given that the use of teacher expertise is not considered part of typical data use models, the utilization of teacher knowledge as opposed to data analysis as the basis of decisions represents a departure from the literature.

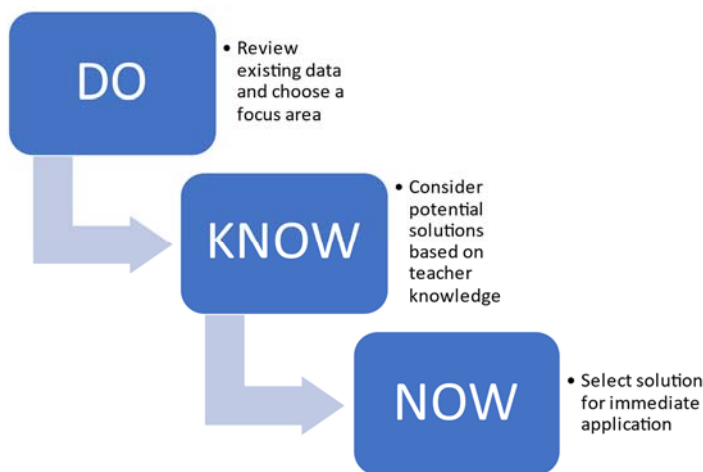
In both cases, my study and the Riverview case study, the discrepancies between the data use observed and the theoretical data use do not seem to be explained by a lack of belief in data use. As with my study, the participants at Riverview had a school leader who was supportive of

data use. “The Riverview Principal, Vera Cardwell, emphasized the importance of using data to inform instruction” (Garner et al., 2017, p. 413). The principal, Ms. Cardwell, chose the 6th grade team to be observed, as she felt they were “particularly invested in using data to inform instruction” (p. 413). The teachers themselves also reported an interest in data use. One teacher described herself as “data heavy,” while another described how the team regularly held ceremonies to share data with students (p. 413). Given that data use in practice deviates in a meaningful way from theoretical data use models and is not explained by participant disbelief in data use, the findings suggest that a new model is needed.

Do, Know, Now

Based on my study’s findings as well as those of Garner et al. (2017), I propose a new data use model, which I have named the Do, Know, Now data use model. Figure 12 outlines the Do, Know, Now data decision-making model, where teachers review existing data, consider solutions relying on teacher expertise, and select a ready-made solution.

Figure 12. *Do, Know, Now*



The first step in the process is **Do**, where teachers review existing data, such as an in-class formative assessment, to determine a focus area to address. For example, the K team at School A reviewed an existing in-class writing assessment and determined to address student sentence writing. The next step in the process is **Know**, where teachers leverage teacher knowledge of both the availability and effectiveness of different possible solutions to the identified problem. For instance, in the K meeting at School A when teachers wanted to address students' sentence writing, they discussed strategies teachers were familiar with, what resources existed for them, and what prior success teachers had had using them. The final step is **Now**, where teachers select a solution that can be implemented immediately. For example, in the K meeting at School A, teachers chose to add daily sentence correction practice into their literacy block. The solution already had existing materials, time that could be allotted to it in the schedule, and required no additional training or practice from teachers. As such, it could be implemented immediately.

In addition to Gardner et al. (2017), another recent study (Detra et al., 2022) also suggests educators operating under the Do, Know, Now model. Researchers conducted interviews with principals from 40 schools to better understand principal impact on school culture and engagement. One of the major themes to emerge was around data-informed perspectives, defined as analyzing data to inform decision-making (Detra et al., 2022). One principal described his teachers' process of data use as, "They [teachers] identify their strengths, where they want to focus. We talk to them about why we do this [specific best practices]" (p. 355). This description fits with Do, Know, Now—teachers use existing data to determine a focus area, then leverage teacher knowledge of best practices to decide on a next step. As with both my study and Garner

et al. (2017), Detra et al. (2022) showed that data was used to determine an area of focus, but not to create a hypothesis or cycle through a feedback loop.

There are several key differences between my proposed Do, Know, Now model and a traditional PDSA model. PDSA recommends that data be collected to help understand a question at hand: “A theory of improvement is a hypothesis that you will test during your iterative research cycles, called Plan-Do-Study-Act (PDSA)” (Hinnant-Crawford, 2020, p. 120). In comparison, the Do, Know, Now model leverages existing data. PDSA suggests that data be the sole basis of action planning: “Carefully constructed measures, employed, collected, and analyzed (through the PDSA cycle) will answer that essential improvement science question” (p. 136). Conversely, in the Do, Know, Now model, data is used only at the initial stage to determine a problem with student performance. Then teachers lean into their expertise to determine a good solution. Considerations include the feasibility of the solution, such as availability of resources, and the efficacy of the solution, such as teacher prior success with it. Lastly, while PDSA is an iterative process involving continual cycles as you monitor progress (Shakman et al., 2021), the Do, Know, Now process concludes at the selection of a solution. I have outlined how Do, Know, Now constitutes a different process than PDSA. I will now consider why educators may want a different process than PDSA.

Why Do, Know, Now

PDSA cycles are impractical given the time constraints in schools. A study reviewing results from a large-scale experiment to demonstrate current data practices in urban districts showed that districts had data systems in place and had staff committed to improving student achievement; however, barriers such as time resulted in varying degrees of investment (Heppen et al., 2011). Similarly, teachers have limited time in collaborative meetings to dedicate to data

use. In a large-scale examination of collaborative time usage across schools in the U.S., teachers reported spending most time discussing concerns about student work and behavior and planning special activities and very little time on academic planning (Lomascolo & Angelle, 2017). As I am arguing that educators are not functioning under existing data use theories because of the realities of school, I next propose a different theory, satisficing, that may explain their data use practices.

Satisficing

I propose that educators are using my Do, Know, Now model because it works within the confines of school life in ways existing models do not. In this section, I will provide an overview of Satisficing theory, a streamlined decision-making process, which if applied to data use in schools, allows the decision-makers, teachers, to come to a solution efficiently. Satisficing may explain why teachers are using my proposed Do, Know, Now method instead of the Plan, Do, Study, Act process.

The literature has outlined two large methodologies of decision-making—complete rationality, which assumes the decider has all the relevant information needed and should pick the optimal choice, and bounded rationality, which assumes the decider cannot know all the variables involved with certainty and the decider should use what is known to make a good enough choice (Mallard, 2020). While many within economics have touted complete rationality as the best method, when applied it can be overly time-consuming and unrealistic. “In all but the very simplest of situations we are simply unable to identify, assimilate and process information in an optimizing manner” (p. 15). For these reasons, other methods have been introduced that work more efficiently and with the acceptance of uncertainties.

Satisficing, originally conceived of by the economist Herbert Simon, is a method within bounded rationality in which the decision maker seeks a quick process that produces a good enough solution. “Satisficing is fundamental to modelling bounded rationality because it vastly reduces the amount of information decision-makers need to process to reach any given choice, making decisions possible with cognitive capacities that are insufficient to make them optimally” (Mallard, 2020, p. 36). For example, if looking for a job using complete rationality, the job seeker would want to know about every available opening, while if using satisficing, they would only want to know about jobs relevant to their experience and experience level (Mallard, 2020). Satisficing “holds that it can be permissible, even right, to act in ways which have less than optimal consequences, so long as those consequences are *good enough*” (McKay, 2021, p. 2). Satisficing acknowledges that decisions involve a relationship between the complexity of the environment and the capabilities of the decision-maker. “It depends on whether a task’s environment’s complexity exceeds a decision maker’s information-processing constraints” (Bendor, 2010, p. 56). Satisficing is ideal when there are constraints on the information, processing, or solutions (Mallard, 2020). Satisficing offers a rational decision-making process in light of the unavoidable budgets of life; “in satisficing, we maximize, given our budgets” (Byron, 2004, p. 62). Within satisficing, decision makers often employ heuristics, or prior experience, to simplify their decisions (Mallard, 2020). In the next section, I will outline some of the benefits of satisficing.

Benefits of Satisficing. Satisficing benefits the decision maker in that it allows for the consideration of other goals of the decision-maker outside of the decision at hand. “A satisficing strategy places limits on how much we insist on finding before we quit that search and turn our attention to other matters” (Byron, 2004, p. 36). There are many scenarios in which the decision,

even if important, is not the *only* decision of importance the decision-maker must consider.

Burch (1996) outlines the characteristics of times when satisficing is ideal as:

- When a quick fix is needed.
- When there is neither time nor money for extensive review of all possibilities.
- When interim adjustments are needed in order to buy time for long-range planning.
- When a major fundamental change is not needed – or not wanted. The existing situation is relatively satisfactory and does not need major changes (p. 102).

Satisficing is efficient. It offers a maximizing mentality within a realistic view of existing constraints:

This suggests that what we really want to do is to *maximize within constraints*. Satisficing comes in, not at the final step of selecting an option, but rather in setting the (optional) constraints within which we must straightforwardly optimize. There is no set level of utility that counts as a “good enough” outcome. Rather, what’s “good enough” is for the agent to do the best they can *either* within the demandingness-moderating constraints, or (if they’re willing to go “above and beyond”) at whatever greater level of burden they’re willing to accept. (Chappell, 2019, p. 252)

Satisficing provides a reasonable decision-making process given the regular constraints of time, energy, and resources. In the following sections, I will give examples of applications of satisficing.

Everyday Life Decisions. Satisficing is ideal for everyday life decisions in which the decision maker has constraints, and a good enough decision will do. For example, someone looking for a home may utilize satisficing, stopping the search once they have found an acceptable house because “looking for a house competes with our other goals for our time and energy” (Byron, 2004, p. 36). Similarly, when grocery shopping with a time constraint and a money constraint, stopping the search after an acceptable option is found makes sense (Byron, 2004). Studies support that using satisficing in everyday decision-making has better results for

people. Schwartz et al. (2002) documents four different studies that showed when people insisted on using maximizing decision-making for everyday life decisions, they were less happy than had they used satisficing. As compared to satisficers, maximizers showed less life satisfaction, lower self-esteem, less happiness, and greater sensitivity to regret (Schwartz et al., 2002).

Judicial Decisions. Engel and G uth (2018) argue that satisficing is the correct decision-making model for judges. In court cases, the judge has limited information. They only hear the evidence as presented by the lawyers. The judge then has to consider the plausibility of the stories presented and any alternatives. Given a satisficing mentality, the judge is most concerned with not making a mistake if things do not go well rather than making the best decision if everything goes well, “She [the judge] does not aim at picking precisely the one scenario with the highest overall satisfaction. All she is concerned with is choosing a scenario with a gain/loss balance that is ‘good enough’” (Engel & G uth, 2018, p. 229). The judge therefore will decide for the plaintiff if their claim is good enough, not only the best option. Deciding in this way results in the least likelihood of an error. Engel and G uth explain, “Plaintiff wins if there is a scenario that sufficiently supports her claim and is sufficiently more likely than any alternative (counter) scenario” (p 230). Instead of considering every possible scenario, the judge instead only interprets between the “two alternative interpretations of the evidence” (p. 230) as presented by both sides.

Marketing. Marketing traditionally has assumed the consumer has access to all relevant information about competing products and should use a maximizing decision-making process; however, St uttgen et al. (2012) suggest that satisficing is a better model for marketing. In the experiment, researchers observed college students choosing a type of instant noodles. Using eye-tracking, they showed that consumers often skip information from alternative products, an action

that would not make sense if they were utilizing maximizing decision-making. Results also showed participants using heuristics, a common component of satisficing, as they were more likely to return to a product already deemed to be satisfactory in their prior experience. The study also showed that all participants followed the satisficing stopping rule, having found an acceptable option increased the stopping probability. Therefore, in the satisficing marketing model, the most important aspect is not providing the consumer with all the information on different products but the order in which products are searched (Stüttgen et al., 2012). In the next section, I will consider why satisficing may work well in schools.

Satisficing in Schools. I have argued that educators are not using existing data use models because they are impractical in schools. Satisficing may offer a more streamlined decision-making process that lends itself to the constraints of school life. Winter (2000) argues that satisficing is the right decision-making model to use when organizations are trying to determine when to stop capability learning: “Since the actual pay-off to continued investment in learning is unknown when the investment is made, there is no reason to expect overt learning to stop at the point that an omniscient observer would pick” (p.991). Winter’s argument holds true in schools as well. There is no way to know when teachers have sufficiently learned enough on a topic, and satisficing offers a reasonable method to keep learning moving forward instead of stagnating.

Satisficing is also ideal in collaborative decision-making because it can accommodate multiple viewpoints in accepting a good enough option instead of insisting on agreement of the best option, “While it [satisficing] may not maximize from the point of view of a unitary-collective system, its balancing of competing values, interests, and preferences may work better in plural-collaborative circumstances” (Burch, 1996, p. 102). Within schools, data use is

typically conducted during collaborative teacher meeting times. Satisficing offers a good way to make decisions quickly with consensus.

Within schools, one could argue there is no time to waste on the process of selecting solutions when students must be taught within a finite school year and day. Satisficing is also beneficial because it allows the decision-maker to start enjoying the benefits of their decision. “At some point, we have to start collecting the rewards that only come when we make a genuine commitment—when we stop looking for something or someone better” (Byron, 2004, p. 38). Although the process of my proposed Do, Know, Now is different, the result still yields instrumental data use (Schildkamp et al., 2013) in that teachers are adjusting instruction to address a student weakness. Satisficing simply offers a way to reap the benefits for students as fast as possible and get the most out of limited instructional time. While the emphasis is on speed, satisficing would not constitute negative data use, such as applying an incorrect intervention (Schildkamp et al., 2013), or data abuse, such as the intentional negative use of data in which data is purposively manipulated, such as cheating on tests (Schildkamp et al., 2013).

Non-Rational Satisficing. While I have suggested satisficing in schools, others may argue that this method does not produce strong outcomes, oversimplifies complex problems, and is not appropriate given the high stakes of student learning. Satisficing is a fast method that accounts for uncertainties but uses crude processes when some problems may require more precise ones:

Certain problems are ill matched to the crudeness of satisficing because they show up the crudeness of the heuristic’s discriminatory abilities.... Satisficing is too crude to be optimal even in the long run for such problems because it cannot distinguish what is suboptimal from what is *imperfect yet optimal*. (Bendor, 2010, p. 64)

Byron (2004) shares that “the stakes involved are also pertinent—indeed crucial” (p. 37) to determining whether satisficing is appropriate. Some may argue that the stakes of student

outcomes are too high to utilize a satisficing model. Satisficing may not elicit the best choice: “This [satisficing] approach leans towards the lowest common denominator of acceptability. This is rarely the best choice and often a poor one” (Burch, 1996, p. 103). Garner et al. (2017), whose teachers I argue demonstrated satisficing, suggest that quick decisions based on prior experience lead only to instructional management and not instructional change. They contend that the quick methodology produces inequities that might otherwise be addressed using more thorough data decision-making processes. While satisficing is one possible explanation for the observed data use in my study, other theories may also explain teachers’ actions. In the following sub-sections, I will review street-level bureaucrats and garbage can decision-making as other potential explanations.

Street-Level Bureaucrats. Originally conceived of to describe French welfare offices, street-level bureaucrats theory suggests that public service workers combine their understanding of their role, shortcuts in practice, and perceptions of their claimants to create the policy to be delivered (Lipsky, 2013). In this theory, street-level bureaucrats are defined as “a diverse group whose formal task is to increase the welfare of society and help their citizen-clients” (Cohen & Hertz, 2020, p. 442). These public service roles have high expectations placed on them wherein they should put their own interests aside to follow formal policy to help their clients and communities (Cohen & Hertz, 2020). However, based on qualitative observations of welfare workers, street-level bureaucrats theory states there should be limited expectations for public service work given the constraints on the domain:

In these public service systems—buffeted by pressures to reduce costs and narrow discretion in the name of improved policy implementation—the production of constructive social orders in policing, classroom teaching, social work and other front-line practices may depend upon the grounding in reality that convincing accounts such as this one [French Welfare Offices] provides. (Lipsky, 2013, p. 140)

The theory further suggests that public service workers are pressured by their work environment and the state agency's desire to advance policy implementation such that they focus on measured performance targets over the clients' needs (Cohen & Hertz, 2020).

The street-level bureaucrats theory offers another possible explanation for the data use behaviors observed in my study. As public service workers, the teachers in my study fit within the definition of street-level bureaucrats. In keeping with the definition, they are closest to the work and furthest from decision-making; "they are on the front lines of governing, yet they are furthest from the centers of power and closest to citizens" (Cohen & Hertz, 2020, p. 442). The teachers in my study also have a lot of discretion in the execution of their work, another key feature of street-level bureaucrats (Cohen & Hertz, 2020). The theory outlines that street-level bureaucrats are under pressure to follow the state agency's policy agenda (Cohen & Hertz, 2020). The teachers in my study may be under policy pressure around data use, such as accountability policies. Under street-level bureaucrats theory, the pressure the teachers are under may result in them choosing solutions that are best suited to following organizational instructions rather than focusing on student needs. Another potential explanation for the teachers' data use could be garbage can decision-making.

Garbage Can Decision-Making. Garbage can decision-making takes place in organized anarchies characterized by problematic preferences, unclear technology, and fluid participation (Cohen, 1972). These organizations do not have a set of clear preferences for how decisions are made, use trial-and-error to operate, and have varied participants and level of participation for any choice (Cohen, 1972). Within the organized anarchies, decisions cannot be made using systematic decision-making models and instead are made under a garbage can model with four variables: a stream of choices (each choice has a decision time and participants in the decision), a

stream of problems (a time at which the problem becomes visible and the amount of energy required to resolve it), a rate of flow of solutions, and a stream of energy from participants (Cohen, 1972). Under the model, all streams enter the garbage can, a solution meets a problem and results in a decision being made (Cohen, 1972). In the garbage can model, decisions normally result in flight (leaving the problem without resolution) or oversight (adopting a solution irrespective of the problem) (Cohen, 1972). Given organizational constrictions, decision makers often end up making a non-optimal choice (Cohen, 1972).

Garbage can decision-making is another potential explanation for the observed data use in my study. School-based management is a primary example of garbage can decision-making where the decision processes are ambiguous and under conflicting demands (Tamir & Grabarski, 2019). As teachers in my study looked to use data to inform instruction, the processes were unclear, and there were competing interests. Under this model, teachers may be matching solutions to problems that have been thrown into the can together, resulting in a solution that may not actually solve the problem.

Decision-Making Theories Summary. Satisficing, street-level bureaucrats, and garbage can decision-making are all viable explanations for the teacher data use actions I observed in my study. In satisficing, the decision maker is limited in the time they can spend making the decision and has many unknown variables. Given these constraints, the decider stops the search once an adequate solution has been found. Street-level bureaucrats make decisions within the confines of the organization's policies and focus on decisions that match performance goals. Garbage can decision-making assumes a vague process in which choices, participants, solutions, and problems are all thrown in together and the decider must match a solution to a problem. While each theory represents a distinct model, they have similarities across them. For example, all three assume a

level of ambiguity in the decision-making process that renders systematic decision-making impossible. They also all assume there are constraints put on the decision-maker. Ambiguity and constraints are two hallmarks of decision-making in schools (Tamir & Grabarski, 2019). Based on the evidence of my study, I believe satisficing is the best explanation for the teachers' decision-making process. The teachers in my study articulated a desire to meet the needs of their students, while serving one's community is not ascribed to street-level bureaucrats. The teachers also always started with problem identification and then moved to looking for solutions, an ordered process not represented in garbage can decision-making.

Summary

Given the inconsistent results from school data use, my study sought to shed light onto the why, what, who, and how of data use in schools. Findings were consistent with the literature in the vision of data use to improve instruction and the preference of formative assessments by educators. Findings were also consistent that the school leader is a central data use enabler by providing organizational supports and a culture of data use. However, as with other data use studies in schools, the how of data use was inconsistent with previous theoretical data use models. I propose the Do, Know, Now data use model, which outlines data use in practice. In Do, Know, Now, teachers start with existing data and articulate a problem, then they consider possible solutions based on teachers' expertise; finally they select a ready-to-implement solution.

The addition of the Do, Know, Now model to the literature is significant. It acknowledges the constraints of daily life in schools that thus far have been largely avoided in data use theory. The Do, Know, Now model may utilize a satisficing decision-making process, allowing educators to quickly determine next steps and maximize the number of problems they

can solve. Although the Do, Know, Now model has potential, my study has several limitations that limit the application of my findings.

Limitations

Given the constraints of time and a single researcher, the study only utilized two schools, which is a small sample size. While using similar schools from the same district may have avoided additional variables, it also makes my results less generalizable. I was also limited in how much qualitative data I could collect. I was only able to conduct six interviews and observe four PLCs. With limited observations, there is a chance that what I observed was performative actions instead of authentic work. The PLCs were run by the lead teacher, who in all four meetings, was a dominant participant (Creswell, 2007) that may have altered the agenda of the meeting. Of the two schools, there was limited participation on the TDUS survey, with only 9 teachers participating at School A and 5 at School B. The study, therefore, did not reach the recommended survey sample sizes for a confidence level of 95% and a margin of error of 5% (Pazzaglia et al., 2016). There are also myriad variables that impact data use, and this study was not able to account for all of them.

It is also important to acknowledge my own bias and positionality as a researcher. Throughout my tenure in education, I have used data to improve student outcomes. As a teacher, an assistant principal, and a charter network Senior Director of Curriculum and Instruction, I facilitated data use and saw improved student outcomes. While I have seen evidence-informed practices be able to have a tremendous impact on student outcomes, I have also observed frequent misuse of data to the detriment to students. Under pressure of accountability testing, I have observed school leaders allocate teacher time toward a narrow group of bubble students

they hope to be able to push over the proficiency threshold. I have also seen the modification of instruction to mirror the test.

In addition to my prior experience, I acknowledge that I currently work at a non-profit that specializes in Measures of Academic Progress (MAP), a student growth assessment tool. Lastly, I am currently a doctoral student in Teachers College's Urban Education Leaders Program. The program offers course work directly related to the use of data in schools. I recognize that my positionality may impact my methods, analysis, and perceived implications.

I attempted to increase the generalizability of my study by including comparisons to other similar studies. For example, I included the Nebraska sample set, which included 353 schools, 3,572 teachers, and 171 principals (National Center for Education Evaluation and Regional Assistance at IES, 2021). Similarly, I included Garner et al. (2017) to show another study where teachers' data use fell outside the theoretical data use frameworks.

I offered satisficing as a possible explanation for my proposed Do, Know, Now data use model. While much of my results fit into the satisficing theory, some of them do not. Teacher and principal interviews indicated a decision-making process based on data analysis, which, although not observed during my four observations, may still be the norm at Schools A and B. Also, although teams did not evaluate every possible solution, they also did not always stop after the first acceptable one was shared, as the satisficing model suggests they might.

Lastly, while I offer research and practice recommendations, it should be noted there are many other possibilities. The field of data use is extensive, and a complete review of the literature was beyond the scope of this study. Further research is needed to investigate the ideas presented here as well as practical suggestions for various stakeholders.

Conclusions

Due to educational policy, school data use for improvement is now an expectation (Cosner, 2014; Levin & Datnow, 2012). This study sought to shed light on the role of school leaders in school data use. The importance of school leaders to effective data use is nested within the larger literature on educational school leadership. Evidence suggests that school leaders are second only to teachers in terms of their impact on outcomes (Grissom et al., 2021) and that school improvement does not occur in the absence of quality leadership (Hitt & Meyers, 2018; Jarl et al., 2021). Data use should be considered a primary feature of existing leadership theory (Bowers et al., 2014). While there are various models of educational leadership, including instructional leadership (Hitt & Tucker, 2016), distributed leadership (Hitt & Meyers, 2018), transformational leadership (Hitt & Tucker, 2016), and leadership for learning (Boyce & Bowers, 2018), research has suggested that contexts may require combining models or shifting models over time (Day et al., 2016; Hitt & Meyers, 2018). Instead of focusing on alignment to one set model, this study considers how data use leadership sits within important leader actions seen across multiple frameworks. For example, two areas central to both data use and effective school leadership are a focus on student learning and teacher collaboration (Hitt & Tucker, 2016; Jarl et al., 2021; Wayman et al., 2016). Principals play an important role in fostering data use by maintaining a focus on learning and setting conditions for collaboration. For example, principals can allocate collaborative time, ensure access to data, and use meeting protocols (Boudett et al., 2013; Gerzon, 2015). However, research on school leader actions to improve data use is limited.

Despite evidence suggesting the essential role of principals in data use (Cosner, 2014; Wayman et al., 2012), there is inadequate literature focused on the role leaders play (Levin & Datnow, 2012), and much of what does exist is only conceptual (Cosner, 2014). This study,

which included a survey, interviews, and observations, provides rich data on the role of school leaders in data use. Findings from my study and others reveal that existing data use models may not be predictive of actual data use in schools. Across data use models, including the Plan-Do-Study-Act (PDSA) (Hinnant-Crawford, 2020), Data Wise (Boudett et al., 2013), Data Teams (Schildkamp et al., 2016), and the Data Use for Improved Student Learning (Wayman et al., 2016), the general steps include reviewing data, creating a hypothesis, and testing the hypothesis. While these data use models continue to gain popularity, several studies show inconsistencies with implementation (Garner et al., 2017; Meyers & VanGronigen, 2021; Peterson et al., 2008; Selwyn et al., 2021; Yurkofsky, 2021). Based on the findings of my study and Garner et al. (2017), I propose a new data use model—the Do, Know, Now model. In the Do, Know, Now model, teachers use existing data, leverage teacher expertise, and select ready-made solutions. Do, Know, Now promotes a model that acknowledges the data use constraints (Selwyn et al., 2021) common in schools and may be viewed as utilizing satisficing decision-making, allowing teachers to come to solutions faster than traditional data use cycles.

The introduction of the Do, Know, Now model is important for school leaders, as it moves the discussion of data use from conceptual frameworks to working theory that may be better able to predict teacher actions with data. Leaders can dedicate time and energy to supporting teachers in the ways they are using data given the realities of schools. For example, given teachers' propensity to choose ready-to-use solutions, principals may want to invest in high-quality options for teachers to select from. What Works Clearinghouse, a review team of educational programs that is part of the Institute of Education Sciences (IES) within the U.S. Department of Education, is one way principals might find high-quality programs to invest in. Reviewing WWC for programs that have shown success with PreK-2nd grade, the same grades

as the schools in my study, I provide a few examples. One potential program principals could invest in is Earobics, a supplemental early literacy program that gauges students' level and provides engaging instructional materials. The program has multiple studies that meet What Works Clearinghouse (WWC) standards and show positive effects for alphabets and potentially positive effects for reading fluency (U.S. Department of Education, 2009). Another program leaders might devote funds to is DreamBox Learning, a supplemental math program that provides individualized learning paths for students based on level and learning style. The program has a study that meets WWC standards and showed potential positive effects for math achievement (U.S. Department of Education, 2013). Spelling Mastery is another instructional material resource that is designed to provide explicit spelling skills for grades 1-6, including phonemic, morphemic, and whole-word strategies. The program has a study that meets WWC standards and showed potential positive effects for writing achievement with a high improvement index of +30 (the average student who receives this intervention will move up 30 percentile points, e.g., from 30th percentile to 60th percentile) (U.S. Department of Education, 2014). Under the Do, Know, Now model, all three of these programs would assist teachers with their selection of a solution by providing effective solutions aligned to their students' needs.

Beyond principals, district leadership may also be able to support finding high-quality resources for schools to invest in that align with teachers' actions based on Do, Know, Now. A recent study suggests the need for District Research Leaders (DRLs) who gather and share research to help school leaders make informed decisions (Shewchuk & Farley-Ripple, 2022). While the literature has demonstrated that there is limited capacity to find and use research at the school level, district leaders can serve as knowledge brokers, taking on the burden of locating

and distilling research that they can then share with schools (Shewchuk & Farley-Ripple, 2022). However, further definition of the exact work DRLs should do is needed (Shewchuk & Farley-Ripple, 2022). Do, Know, Now offers district leadership a concrete method of how they can support schools with research based on observed data use practice. For example, DRLs could review and share high-quality programs and materials for school leaders to select from and teachers to use as part of their data use under Do, Know, Now.

While there is a rationale for the Do, Know, Now model, it is yet unclear if the model is beneficial, neutral, or negative toward student outcomes. Student learning was outside the scope of my study, and I cannot conclude the impact of the observed teacher data use on student outcomes. There is some evidence that adapting PDSA to school needs does not reduce effectiveness. For example, in a recent study, as leaders adapted Data Wise to their needs, it did not affect their outcomes: “It was not clear that when leaders implemented DW with greater fidelity or integrity (i.e., accommodation), they experienced more success than when they adapted assimilated or avoided DW” (Yurkofsky, 2022, p. 333). However, other studies (Garner et al., 2017) suggest negative repercussions of adjusting data use models, such as electing remediation over instructional improvement.

In the next section, I will outline the implications of the conclusions of this study on research, theory, policy, and practice.

Implications

The emphasis on data use in education is continuing to increase (Mandinach & Gummer, 2016) as classrooms generate more data than ever (Krumm & Bowers, 2022), yet evidence that it results in improvement is inconsistent. While schools are consistently collecting information, they may not be processing it to improve instruction (Schildkamp et al., 2013). When used

poorly, data can serve to further perpetuate inequities rather than correct them (Krumm & Bowers, 2022). Organizational supports, set by the school leader, have been found to significantly impact teacher data use (Bolhuis et al., 2016). This study included conclusions on how data is being used in schools that could have important implications for research, theory, policy, and practice.

Research and Theory

Given the importance of data use and the remaining gaps in knowledge, more research is needed. My study showed evidence of some of the leadership practices found to be effective for promoting teacher data use, including developing distributed leadership for data use (Cosner, 2011), allocating collaborative time, ensuring access to data, and using meeting protocols (Boudett et al., 2013; Gerzon, 2015). However, student outcomes were outside the scope of my study. More research should be done to evaluate the efficacy of leadership data use practices.

This study also has implications for research on Education Leadership Data Analytics (ELDA). ELDA considers how to partner educators with data scientists to further evidence-based improvement cycles: “the intersection of facilitating educators’ use of data to inform evidence-based improvement cycles, combined with the work of data scientists to help organize and visualize the data” (Bowers, 2021b, p. 15)—for example, the use of a data scientist to visualize data analytics in a way that meaningfully represents patterns in the information to school leaders (Bowers, 2021b). While my study did not include a partnership between school leaders and data scientists, my findings illuminate that data use is difficult given the constraints of schools, and a partnership with a data scientist could be beneficial. My study may help guide this area of research based on the findings that participants preferred simple data displays, displays with multiple measures on a student, and displays meant for actionable data use. Both schools in my

study used a Google document with student assessment data that participants felt was beneficial because it was easy to access and understand. This finding is aligned to sentiments shared from participants in a recent Education Data Analytics Collaborative Workshop that, although complex visualizations may be possible, the easiest to read is best: "Simple is the best. Although I know many types of visualizations as a data scientist, I found that during the workshop that teachers/administrators prefer to have a simple visualization (e.g. bar chart) so that they can interpret immediately" (Bowers, 2021b, p. 80).

Another consistent finding between my study was the desire to use data immediately to inform instruction. In *Do, Know, Now*, teachers take action on the data right away. Likewise, a school leader at the ELDA workshop commented, "We discussed visualizations that would help teachers make immediate changes to classroom instruction" (Bowers, 2021b, p. 80). ELDA is one potential way to alleviate some of the burden of school data use (Bowers & Krumm, 2021). Creating simple and actionable data visualizations is one example of how ELDA may help school leaders with effective data use. More research should be done on ELDA's efforts and impact.

My study also has implications for future research on school leadership. While there is a lot of research on leadership, more qualitative research is needed that elevates the perspective of teachers. For example, leadership for learning presumes a distributed leadership model between principals and teachers, and therefore necessitates understanding teachers' perspectives in addition to leaders' (Ahn et al., 2021). My study, which included qualitative data from teachers, provides some alignment to a recent study on the differences in perspectives on leadership across teachers individually, teachers collectively, and leaders (Ahn et al., 2021). A multi-level factor analysis of the Teaching and Learning International Survey (TALIS, 2018) showed that across

47 countries, 152,635 teachers, and 9,079 schools globally, principals and teachers are misaligned in their concept of school leadership including data use (Ahn et al., 2021). Similarly, my study demonstrated that teacher data use actions were not aligned to the principals' descriptions of data use in their schools. When viewed collectively at the school level, globally teachers said they view data use as collective data analysis (Ahn et al., 2021). This finding aligns with my study, where teachers collaboratively viewed data to come to a joint decision. My study represents some aligned qualitative findings from the United States, one of the 47 countries from Ahn et al. (2021). Further qualitative research is needed to understand the interplay of teacher and principal perceptions of leadership. For example, Bowers (2020) conducted a congruency-typology model of the TALIS 2018 results and found that different variables correlated to different degrees of alignment of teacher and principal perceptions of leadership, with the highest alignment at schools with high responder teachers who had more teaching experience and higher job satisfaction. My study, Ahn et al. (2021), and Bowers (2020) all suggest that future research on data use leadership should include qualitative teacher data to create a more accurate portrayal:

Upon reflecting on this recent evidence that prioritizes collective teacher perspectives over those of principals, this study suggests that, in evaluating organization-wide leadership, researchers and policymakers may need to draw evidence from multiple data sources, such as collective teachers and other instructional staff (e.g. coaches) in addition to that of principals. (Ahn et al., 2021, p. 36)

More qualitative research should be conducted in schools to fully describe school leadership inclusive of data use, for example, a study attempting to validate the Do, Know, Now process and document its effectiveness.

In my study, I propose satisficing as a possible explanation for the use of the Do, Know, Now model; however, other decision-making theories, including street-level bureaucrats and garbage can decision-making, represent other potential explanations. More research is needed on decision-making processes in schools. For example, while satisficing has been documented in

other fields, such as marketing and economics, it has not been studied in the field of education. My study revealed that with a high threshold for good enough educational strategies, satisficing may be a viable decision-making tool for schools. More research should be done on the implications of using satisficing decision-making in schools. For example, my study did not connect the use of satisficing with student outcomes. Studies should be done correlating student outcomes to satisficing decision-making. However, given the number of variables impacting student outcomes, it may be difficult to show enough correlation. Also, given the high stakes of student outcomes, schools may not want to participate in a satisficing study.

Policy and Practice

In addition to research implications, my study has policy implications. The Gordon Commission on the Future of Assessment in Education argues that assessment should shift from appraisal to diagnosis to support students and the building of intellectual competencies (Rice & Gordon, 2014). However, policymakers continue to utilize assessments for evaluation instead of learning (Rice & Gordon, 2014). This study revealed that educators are most invested in formative data to inform instruction. This finding may help convince shifts in policy on assessment and data use for learning. Educational policy continues to promote data use in schools but does not detail a specific process schools should follow. To promote more consistent improvements, policies should be updated to include specific processes. In this study, I proposed the Do, Know, Now model, which may offer an option to be included in future policies.

This study also has the potential to help current practitioners. In the study, I propose the Do, Know, Now data use model based on findings from my study as well as Garner et al. (2017). This model may allow leaders to provide more targeted support for data use. For example, under my proposed Do, Know, Now model, teachers select solutions that are ready to be implemented

immediately in classrooms, and principals could support their teachers by allocating money to provide high-quality materials for them to choose from. There are multiple examples of ready-made materials that have been shown to increase student outcomes, such as Spelling Mastery (U.S. Department of Education, 2014), DreamBox Learning (U.S. Department of Education, 2013), and Earobics (U.S. Department of Education, 2009).

The research on data use thus far has outlined the importance of the school leader in data use effectiveness, but not provided enough guidance on specific actions they should take. This study provides potential direction to school leaders on how to best support teacher data use. The Do, Know, Now model offers school leaders a working theory on their teachers' data use that they can use to tailor their support. Under the Do, Know, Now model, teachers select a ready-to-implement solution for the identified student problem. Offering high-quality, ready-to-implement solutions is one example of how this study's findings could help school leaders support effective data use in their schools.

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Appendix A: Sample TDUS Dashboard Report

Teacher Data Use Survey (TDUS) Results
Pilot Study Findings
August 6, 2017

VERSIONS

TEACHERS
ADMINISTRATORS
SUPPORT STAFF

PARTICIPANTS

2988 TEACHERS
268 ADMINISTRATORS
527 SUPPORT STAFF

3783

SPECIFIC FORMS OF DATA

STATEASSESS
BENCHMARK
DISTRICTASSESS
CLASSROOMASSESS

Purpose. The purpose of the Teacher Data Use Survey (TDUS) is to provide helpful information to district and school leaders about how teachers use data, their attitudes toward data, and the supports that help them use data.

Versions. A comprehensive perspective is possible because there are three versions of the TDUS—one for teachers, one for administrators, and one for instructional support staff (ISS).
Framework. The TDUS is based on a framework with five total components designed to measure the actions teachers take with data and then four supporting components that inform these actions: their competence in using data, their attitudes

toward data, their collaboration, and their organizational supports.
Data Availability, Frequency of Use, and Usefulness. The TDUS begins with questions that collect descriptive information about various forms of data for the school or district. The first two pages show the availability of these data, the frequency of their use, and their perceived usefulness.

IS THIS FORM OF DATA AVAILABLE TO TEACHERS?

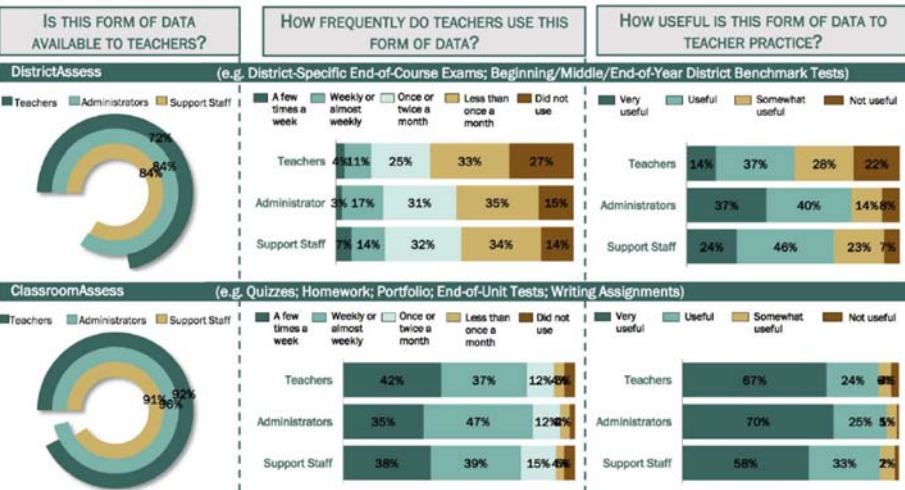
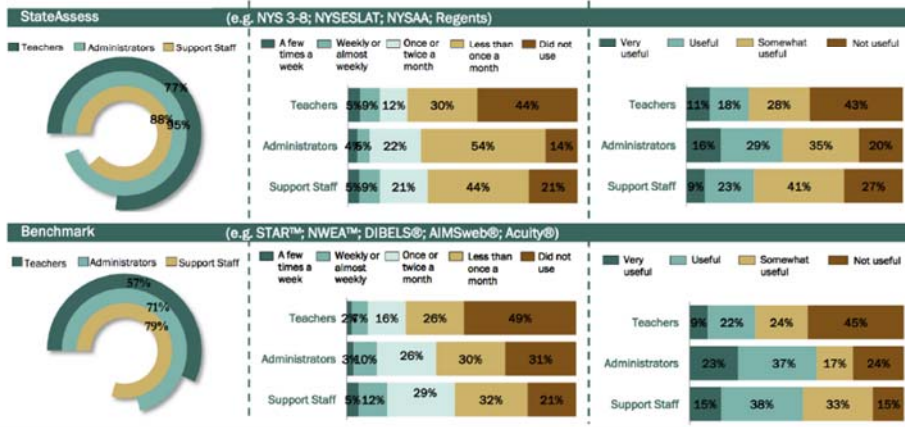
As part of the organizational support component, respondents share the availability of various forms of data.

HOW FREQUENTLY DO TEACHERS USE THIS FORM OF DATA?

As part of the action component, respondents share how frequently they use the forms of data to plan for instruction.

HOW USEFUL IS THIS FORM OF DATA TO TEACHER PRACTICE?

As part of the attitudes toward data component, TDUS asks how useful the various forms of data are to teacher practice.



Survey Scales. The TDUS contains nine scales that measure either the actions teachers take with data or one of the four supporting components. These scales are in all three survey versions, although the question stems and/or question items may vary depending on the version.

Findings. The following section shares the findings for scales within each of the five components of the framework: actions, competence in using data, attitudes toward data, collaboration, and organizational support. The responses to all items are averaged for each respondent on a scale of 1 to 4, resulting in the respondent's scale mean for that component. Then, all scale means are combined by survey version.

Source: Bowers & Zhang (2017)

Appendix B: Teacher Data Use Survey: Administrator Version

Teacher Data Use Survey: Administrator Version



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The Teacher Data Use Survey can be used to query teachers, administrators, and instructional support staff about how teachers use data to support instruction, their attitudes toward data, and the supports that help teachers use data.

A guide on how to use this survey, along with all three versions of the survey, is available in Wayman, J. C., Wilkerson, S. B., Cho, V., Mandinach, E. B., & Supovitz, J. A. (2016). *Guide to using the Teacher Data Use Survey* (REL 2017-166). Washington, DC: U.S. Department of Education, Institute of Education Sciences, National Center for Education Evaluation and Regional Assistance, Regional Educational Laboratory Appalachia. That report is available at <https://ies.ed.gov/ncee/edlabs/projects/project.asp?projectID=2461>.

**Teacher Data Use Survey
Administrator Version**

**Jeffrey C. Wayman
Vincent Cho
Ellen B. Mandinach
Jonathan A. Supovitz
Stephanie B. Wilkerson**

Prepared for the Institute of Education Sciences (IES) under Contract ED-IES-12-C-0005
by Regional Educational Laboratory Appalachia administered by CNA.

Welcome! The purpose of the Teacher Data Use Survey is to learn about how teachers use data for educational improvement in your district. Administering the Teacher Data Use Survey can provide many benefits to district and school leaders as well as teachers. Among them the Teacher Data Use Survey can yield:

- A comprehensive perspective on how teachers use data, their attitudes toward data, and the supports that help them use data.
- An evidence base from which to plan ongoing support, such as professional development, computer data systems, and collaborative structures for data use.
- A triangulated assessment of how administrator and instructional support staff view teacher data use.

There are three versions of the Teacher Data Use Survey: one for teachers, one for instructional support staff and one for principals and assistant principals.

The Teacher Data Use Survey takes about 15–20 minutes to complete. Please continue to the next page to start the survey.

The following questions ask about various forms of data that teachers may use in their work.

1. Are the following forms of data available to your teachers?

Form of data	Yes	No
<State data>	<input type="checkbox"/>	<input type="checkbox"/>
<Periodic data>	<input type="checkbox"/>	<input type="checkbox"/>
<Local data>	<input type="checkbox"/>	<input type="checkbox"/>
<Personal data>	<input type="checkbox"/>	<input type="checkbox"/>
Other	<input type="checkbox"/>	<input type="checkbox"/>

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.

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

Form of data	Do not use	Less than once a month	Once or twice a month	Weekly or almost weekly	A few times a week
<State data>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<Periodic data>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<Local data>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<Personal data>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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 teachers’ practice?

Form of data	Not useful	Somewhat useful	Useful	Very useful
<State data>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<Periodic data>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<Local data>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<Personal data>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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

If you indicated that <local data> is “not available” to your teachers in question 1, OR if you indicated that your teachers “do not use” <local data> in question 2, please go to question 9.

8. These questions ask about <local data> developed and used in your school or district. In a typical month, how often do your teachers do the following?

Action	Less than once a month	Once or twice a month	Weekly or almost weekly	A few times a week
a. Use <local data> to identify instructional content to use in class.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. Use <local data> to tailor instruction to individual students' needs.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. Use <local data> to develop recommendations for additional instructional support.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. Use <local data> to form small groups of students for targeted instruction.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e. Discuss <local data> with a parent or guardian.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f. Discuss <local data> with a student.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
g. Meet with a specialist (e.g., instructional coach or data coach) about <local data>.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
h. Meet with another teacher about <local data>.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Items adapted from Wayman, J. C., Cho, V., & Shaw, S. (2009). *Survey of Educator Data Use*. Unpublished instrument.

If you indicated that <personal data> is “not available” to your teachers in question 1, OR if you indicated that your teachers “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 your teachers do the following?

Action	Less than once a month	Once or twice a month	Weekly or almost weekly	A few times a week
a. Use <personal data> to identify instructional content to use in class.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. Use <personal data> to tailor instruction to individual students' needs.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. Use <personal data> to develop recommendations for additional instructional support.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. Use <personal data> to form small groups of students for targeted instruction.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e. Discuss <personal data> with a parent or guardian.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f. Discuss <personal data> with a student.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
g. Meet with a specialist (e.g., instructional coach or data coach) about <personal data>.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
h. Meet with another teacher about <personal data>.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Items adapted from Wayman, J. C., Cho, V., & Shaw, S. (2009). *Survey of Educator Data Use*. Unpublished instrument.

If you indicated that <state data> is “not available” to your teachers in question 1, OR if you indicated that your teachers “do not use” <state data> in question 2, please go to question 7.

6. These questions ask about <state data>. In a typical school year, how often do your teachers do the following?

Action	One or two times a year	A few times a year	Monthly	Weekly
a. Use <state data> to identify instructional content to use in class.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. Use <state data> to tailor instruction to individual students' needs.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. Use <state data> to develop recommendations for additional instructional support.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. Use <state data> to form small groups of students for targeted instruction.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e. Discuss <state data> with a parent or guardian.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f. Discuss <state data> with a student.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
g. Meet with a specialist (e.g., instructional coach or data coach) about <state data>.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
h. Meet with another teacher about <state data>.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Items adapted from Wayman, J. C., Cho, V., & Shaw, S. (2009). *Survey of Educator Data Use*. Unpublished instrument.

If you indicated that <periodic data> is “not available” to your teachers in question 1, OR if you indicated that your teachers “do not use” <periodic data> in question 2, please go to question 8.

7. These questions ask about <periodic data> used in your school or district. In a typical month, how often do your teachers do the following?

Action	Less than once a month	Once or twice a month	Weekly or almost weekly	A few times a week
a. Use <periodic data> to identify instructional content to use in class.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. Use <periodic data> to tailor instruction to individual students' needs.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. Use <periodic data> to develop recommendations for additional instructional support.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. Use <periodic data> to form small groups of students for targeted instruction.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e. Discuss <periodic data> with a parent or guardian.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f. Discuss <periodic data> with a student.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
g. Meet with a specialist (e.g., instructional coach or data coach) about <periodic data>.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
h. Meet with another teacher about <periodic data>.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Items adapted from Wayman, J. C., Cho, V., & Shaw, S. (2009). *Survey of Educator Data Use*. Unpublished instrument.

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.

10. These questions ask about supports for using data. Please indicate how much you agree or disagree with the following statements:

Statement	Strongly disagree	Disagree	Agree	Strongly agree
a. My teachers are adequately supported in the effective use of data.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. My teachers are adequately prepared to use data.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. There is someone who answers my teachers' questions about using data.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. There is someone who helps my teachers change their practice (e.g., their teaching) based on data.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e. My district provides my teachers enough professional development about data use.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f. My district's professional development for my teachers is useful for learning about data use.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Items adapted from Wayman, J. C., Cho, V., & Shaw, S. (2009). *Survey of Educator Data Use*. Unpublished instrument.

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

Statement	Strongly disagree	Disagree	Agree	Strongly agree
a. Data help teachers plan instruction.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. Data offer information about students that was not already known.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. Data help teachers know what concepts students are learning.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. Data help teachers identify learning goals for students.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e. Students benefit when teacher instruction is informed by data.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f. I think it is important to use data to inform education practice.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
g. I like to use data.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
h. I find data useful.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
i. Using data helps me be a better educator.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Items adapted from Wayman, J. C., Cho, V., & Shaw, S. (2009). *Survey of Educator Data Use*. Unpublished instrument.

Appendix C: Teacher Data Use Survey: Teacher Version

Teacher Data Use Survey: Teacher Version



Tools

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Teacher Data Use Survey
Teacher Version

Jeffrey C. Wayman

Vincent Cho

Ellen B. Mandinach

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Prepared for the Institute of Education Sciences (IES) under Contract ED-IES-12-C-0005
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- A comprehensive perspective on how teachers use data, their attitudes toward data, and the supports that help them use data.
- An evidence base from which to plan ongoing support, such as professional development, computer data systems, and collaborative structures for data use.
- A triangulated assessment of how administrator and instructional support staff view teacher data use.

There are three versions of the Teacher Data Use Survey: one for teachers, one for instructional support staff and one for principals and assistant principals.

The Teacher Data Use Survey takes about 15-20 minutes to complete. Please continue to the next page to start the survey.

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?

Form of data	Yes	No
<State data>	<input type="checkbox"/>	<input type="checkbox"/>
<Periodic data>	<input type="checkbox"/>	<input type="checkbox"/>
<Local data>	<input type="checkbox"/>	<input type="checkbox"/>
<Personal data>	<input type="checkbox"/>	<input type="checkbox"/>
Other	<input type="checkbox"/>	<input type="checkbox"/>

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.

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?

Form of data	Do not use	Less than once a month	Once or twice a month	Weekly or almost weekly	A few times a week
<State data>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<Periodic data>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<Local data>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<Personal data>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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?

Form of data	Not useful	Somewhat useful	Useful	Very useful
<State data>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<Periodic data>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<Local data>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<Personal data>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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 school year, how often do you do the following?

Action	One or two times a year	A few times a year	Monthly	Weekly
a. Use <state data> to identify instructional content to use in class.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. Use <state data> to tailor instruction to individual students' needs.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. Use <state data> to develop recommendations for additional instructional support.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. Use <state data> to form small groups of students for targeted instruction.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e. Discuss <state data> with a parent or guardian.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f. Discuss <state data> with a student.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
g. Meet with a specialist (e.g., instructional coach or data coach) about <state data>.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
h. Meet with another teacher about <state data>.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Items adapted from Wayman, J. C., Cho, V., & Shaw, S. (2009). *Survey of Educator Data Use*. Unpublished instrument.

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> used in your school or district. In a typical month, how often do you do the following?

Action	Less than once a month	Once or twice a month	Weekly or almost weekly	A few times a week
a. Use <periodic data> to identify instructional content to use in class.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. Use <periodic data> to tailor instruction to individual students' needs.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. Use <periodic data> to develop recommendations for additional instructional support.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. Use <periodic data> to form small groups of students for targeted instruction.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e. Discuss <periodic data> with a parent or guardian.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f. Discuss <periodic data> with a student.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
g. Meet with a specialist (e.g., instructional coach or data coach) about <periodic data>.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
h. Meet with another teacher about <periodic data>.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Items adapted from Wayman, J. C., Cho, V., & Shaw, S. (2009). *Survey of Educator Data Use*. Unpublished instrument.

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> developed and used in your school or district. In a typical month, how often do you do the following?

Action	Less than once a month	Once or twice a month	Weekly or almost weekly	A few times a week
a. Use <local data> to identify instructional content to use in class.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. Use <local data> to tailor instruction to individual students’ needs.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. Use <local data> to develop recommendations for additional instructional support.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. Use <local data> to form small groups of students for targeted instruction.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e. Discuss <local data> with a parent or guardian.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f. Discuss <local data> with a student.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
g. Meet with a specialist (e.g., instructional coach or data coach) about <local data>.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
h. Meet with another teacher about <local data>.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Items adapted from Wayman, J. C., Cho, V., & Shaw, S. (2009). *Survey of Educator Data Use*. Unpublished instrument.

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?

Action	Less than once a month	Once or twice a month	Weekly or almost weekly	A few times a week
a. Use <personal data> to identify instructional content to use in class.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. Use <personal data> to tailor instruction to individual students’ needs.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. Use <personal data> to develop recommendations for additional instructional support.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. Use <personal data> to form small groups of students for targeted instruction.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e. Discuss <personal data> with a parent or guardian.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f. Discuss <personal data> with a student.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
g. Meet with a specialist (e.g., instructional coach or data coach) about <personal data>.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
h. Meet with another teacher about <personal data>.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Items adapted from Wayman, J. C., Cho, V., & Shaw, S. (2009). *Survey of Educator Data Use*. Unpublished instrument.

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.

10. These questions ask about supports for using data. Please indicate how much you agree or disagree with the following statements:

Statement	Strongly disagree	Disagree	Agree	Strongly agree
a. I am adequately supported in the effective use of data.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. I am adequately prepared to use data.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. There is someone who answers my questions about using data.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. There is someone who helps me change my practice (e.g., my teaching) based on data.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e. My district provides enough professional development about data use.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f. My district’s professional development is useful for learning about data use.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Items adapted from Wayman, J. C., Cho, V., & Shaw, S. (2009). *Survey of Educator Data Use*. Unpublished instrument.

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

Statement	Strongly disagree	Disagree	Agree	Strongly agree
a. Data help teachers plan instruction.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. Data offer information about students that was not already known.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. Data help teachers know what concepts students are learning.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. Data help teachers identify learning goals for students.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e. Students benefit when teacher instruction is informed by data.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f. I think it is important to use data to inform education practice.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
g. I like to use data.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
h. I find data useful.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
i. Using data helps me be a better teacher.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Items adapted from Wayman, J. C., Cho, V., & Shaw, S. (2009). *Survey of Educator Data Use*. Unpublished instrument.

12. 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:

Statement	Strongly disagree	Disagree	Agree	Strongly agree
a. My principal or assistant principal(s) encourages data use as a tool to support effective teaching.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. My principal or assistant principal(s) creates many opportunities for teachers to use data.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. My principal or assistant principal(s) has made sure teachers have plenty of training for data use.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. My principal or assistant principal(s) is a good example of an effective data user.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e. My principal or assistant principal(s) discusses data with me.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f. My principal or assistant principal(s) creates protected time for using data.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Items adapted from Wayman, J. C., Cho, V., & Shaw, S. (2009). *Survey of Educator Data Use*. Unpublished instrument.

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

Statement	Strongly disagree	Disagree	Agree	Strongly agree
a. I have the proper technology to efficiently examine data.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. The computer systems in my district provide me access to lots of data.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. The computer systems (for data use) in my district are easy to use.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. The computer systems in my district allow me to examine various types of data at once (e.g., attendance, achievement, demographics).	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e. The computer systems in my district generate displays (e.g., reports, graphs, tables) that are useful to me.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Items a–d adapted from Wayman, J. C., Cho, V., & Shaw, S. (2009). *Survey of Educator Data Use*. Unpublished instrument.

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

Statement	Strongly disagree	Disagree	Agree	Strongly agree
a. I am good at using data to diagnose student learning needs.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. I am good at adjusting instruction based on data.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. I am good at using data to plan lessons.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. I am good at using data to set student learning goals.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Items adapted from Wayman, J. C., Cho, V., & Shaw, S. (2009). *Survey of Educator Data Use*. Unpublished instrument.

The following questions ask about your work in collaborative teams.

15. 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 18.

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

Statement	Strongly disagree	Disagree	Agree	Strongly agree
a. Members of my team trust each other.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. It's ok to discuss feelings and worries with other members of my team.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. Members of my team respect colleagues who lead school improvement efforts.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. Members of my team respect those colleagues who are experts in their craft.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e. My principal or assistant principal(s) fosters a trusting environment for discussing data in teams.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Items a–d are from University of Chicago Consortium on School Research. (2013). *Teacher Survey Codebook*, Chicago, IL: Author.

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

Action	Never	Sometimes	Often	A lot
a. We approach an issue by looking at data.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. We discuss our preconceived beliefs about an issue.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. We identify questions that we will seek to answer using data.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. We explore data by looking for patterns and trends.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e. We draw conclusions based on data.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f. We identify additional data to offer a clearer picture of the issue.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
g. We use data to make links between instruction and student outcomes.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
h. When we consider changes in practice, we predict possible student outcomes.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
i. We revisit predictions made in previous meetings.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
j. We identify actionable solutions based on our conclusions.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

18. What else would you like to share with us about data use?

Appendix D: Survey Participant Informed Consent Form

TEACHERS COLLEGE COLUMBIA UNIVERSITY

INFORMED CONSENT

Dear Teacher or Principal,

DESCRIPTION OF THE RESEARCH: I am a doctoral candidate at Teachers College, Columbia University, inviting you to participate in a research study on school leader support of teachers' data use. As an educator, you are actively involved in using data to make informed decisions. I am interested in learning how school leaders can best support their staff in understanding and using data to help make decisions to promote learning and improve student outcomes. In addition, I will look at data use across different data sources including state, school, and classroom data.

If you agree to participate in this study, your participation will be in the form of an electronic survey that takes 15-25 minutes to complete.

RISKS AND BENEFITS: The risks and benefits associated with this study are minimal. It is unlikely that data collected from the survey could be used to prejudice others against the participants since all identifying information will not be included. All participants are anonymous, and the school district and schools are assigned code names like X, Y, Z, etc. In addition, at any time, you have the right to discontinue your participation if you feel any sense of discomfort. Your participation in this study is of great importance because you will be contributing to the knowledge base of teacher use of data to improve student outcomes. Research has shown that even though educational policy has emphasized data use in schools, we still do not know the best supports that lead to improved student outcomes. By participating in the research, you will perhaps be helping other schools and districts in the future by contributing to this knowledge base. Another benefit of participating is the sense of awareness of your own practices that will emerge from reflecting on the questions raised during the survey. Lastly, your school will receive an overview report on survey responses that may help you understand and improve your data use practices.

PAYMENTS: Although you will be taking time from your busy schedule to complete the survey, I regret that there is no financial reward for your participation and time. Upon completion and approval of my dissertation by Teachers College, if you desire, I will gladly provide a copy of my dissertation for your review.

DATA STORAGE TO PROTECT CONFIDENTIALITY: I will preserve confidentiality throughout my research. Data will be stored on a password protected device and will be destroyed after a successful dissertation defense and acceptance by Teachers College.

TIME INVOLVEMENT: Your participation will take approximately 15-25 minutes for the survey.

HOW THE RESULTS WILL BE USED: The results of this study will be used for the development of my doctoral dissertation in partial fulfillment of the requirements for the Ed.D. degree at Teachers College, Columbia University. After using the research for my doctoral dissertation, the results may be used at educational conferences and published in educational journals and/or books.

TEACHERS COLLEGE COLUMBIA UNIVERSITY

PARTICIPANT'S RIGHTS

Principal Investigator: Jordan Anne Grant

Research Title: **How School Leaders Support Teachers' Data Use: A Case Study of New York Schools' Perception and Use of State, School and Classroom Data**

- I have read and discussed the Research Description with the researcher. I have had the opportunity to ask questions about the purposes and procedures regarding this study.
- My participation in research is voluntary. I may refuse to participate or withdraw from participation at any time without jeopardy to future medical care, employment, student status or other entitlements.
- The researcher may withdraw me from the research at his/her professional discretion.
- If, during the course of the study, significant new information that has been developed becomes available which may relate to my willingness to continue to participate, the investigator will provide this information to me.
- Any information derived from the research project that personally identifies me will not be voluntarily released or disclosed without my separate consent, except as specifically required by law.
- If at any time I have any questions regarding the research or my participation, I can contact the investigator, who will answer my questions. The investigator's phone number is (202) 841-7391.
- If at any time I have comments, or concerns regarding the conduct of the research or questions about my rights as a research subject, I should contact the Teachers College, Columbia University Institutional Review Board /IRB. The phone number for the IRB is (212) 678-4105. Or, I can write to the IRB at Teachers College, Columbia University, 525 W. 120th Street, New York, NY, 10027, Box 151.
- I should receive a copy of the Research Description and this Participant's Rights document.
- My signature means that I agree to participate in this study.

Participant's signature: _____ Date: ____ / ____ / ____
Name: _____

Appendix E: Observation Participant Informed Consent Form

TEACHERS COLLEGE COLUMBIA UNIVERSITY

INFORMED CONSENT

Dear Teacher or Principal,

DESCRIPTION OF THE RESEARCH: I am a doctoral candidate at Teachers College, Columbia University, inviting you to participate in a research study on school leader support of teachers' data use. As an educator, you are actively involved in using data to make informed decisions. I am interested in learning how school leaders can best support their staff in understanding and using data to help make decisions to promote learning and improve student outcomes. In addition, I will look at data use across different data sources including state, school, and classroom data.

If you agree to participate in this study, your participation will be in the form two meeting observations approximately 45 minutes each.

RISKS AND BENEFITS: The risks and benefits associated with this study are minimal. It is unlikely that data collected from the survey could be used to prejudice others against the participants since all identifying information will not be included. All participants are anonymous assigned pseudonyms and the school district and schools are assigned code names like X, Y, Z, etc. In addition, at any time, you have the right to discontinue your participation if you feel any sense of discomfort. Your participation in this study is of great importance because you will be contributing to the knowledge base of teacher use of data to improve student outcomes. Research has shown that even though educational policy has emphasized data use in schools, we still do not know the best supports that lead to improved student outcomes. By participating in the research, you will perhaps be helping other schools and districts in the future by contributing to this knowledge base. Another benefit of participating is the sense of awareness of your own practices that will emerge from reflecting on the questions raised during the survey. Lastly, your school will receive an overview report on survey responses that may help you understand and improve your data use practices.

PAYMENTS: Although you will be allowing me to observe your meetings, I regret that there is no financial reward for your participation and time. Upon completion and approval of my dissertation by Teachers College, if you desire, I will gladly provide a copy of my dissertation for your review.

DATA STORAGE TO PROTECT CONFIDENTIALITY: I will preserve confidentiality throughout my research. Data will be stored on a password protected device. All identifying information will be coded. All data will be transcribed by a professional transcriber. Only the researcher and the professional transcriber will be able to listen to the audio recordings and read the transcribed texts. Once the data has been transcribed, the recorded data will be erased. I will preserve confidentiality throughout my research and will destroy all data and transcripts after a successful dissertation defense and acceptance by Teachers College.

TIME INVOLVEMENT: Your participation will take approximately 90 minutes for two 45-minute meeting observations.

HOW THE RESULTS WILL BE USED: The results of this study will be used for the development of my doctoral dissertation in partial fulfillment of the requirements for the Ed.D. degree at Teachers College, Columbia University. After using the research for my doctoral dissertation, the results may be used at educational conferences and published in educational journals and/or books.

TEACHERS COLLEGE COLUMBIA UNIVERSITY

PARTICIPANT'S RIGHTS

Principal Investigator: Jordan Anne Grant

Research Title: **How School Leaders Support Teachers' Data Use: A Case Study of New York Schools' Perception and Use of State, School and Classroom Data**

- I have read and discussed the Research Description with the researcher. I have had the opportunity to ask questions about the purposes and procedures regarding this study.
- My participation in research is voluntary. I may refuse to participate or withdraw from participation at any time without jeopardy to future medical care, employment, student status or other entitlements.
- The researcher may withdraw me from the research at his/her professional discretion.
- If, during the course of the study, significant new information that has been developed becomes available which may relate to my willingness to continue to participate, the investigator will provide this information to me.
- Any information derived from the research project that personally identifies me will not be voluntarily released or disclosed without my separate consent, except as specifically required by law.
- If at any time I have any questions regarding the research or my participation, I can contact the investigator, who will answer my questions. The investigator's phone number is (202) 841-7391.
- If at any time I have comments, or concerns regarding the conduct of the research or questions about my rights as a research subject, I should contact the Teachers College, Columbia University Institutional Review Board /IRB. The phone number for the IRB is (212) 678-4105. Or, I can write to the IRB at Teachers College, Columbia University, 525 W. 120th Street, New York, NY, 10027, Box 151.
- I should receive a copy of the Research Description and this Participant's Rights document.
- I () consent to be audio recorded. I () do NOT consent to being audio recorded. The written and/or audio recorded materials will be viewed only by the principal investigator and members of the research team.
- My signature means that I agree to participate in this study.

Participant's signature: _____ Date: ____/____/____
Name: _____

Appendix F: Observation Protocol

Competence in using data
<ol style="list-style-type: none">1. <i>Examine data</i>: teachers review and analyze data2. <i>Synthesize information</i>: teachers articulate key data inferences
Attitudes Toward Data
<ol style="list-style-type: none">3. <i>Positive perceptions</i>: teachers demonstrate a positive attitude towards the use of data
Collaboration
<ol style="list-style-type: none">4. <i>Make Decisions</i>: teachers work together to make decisions5. <i>Form Questions</i>: teachers openly share questions about student learning and instruction6. <i>Evaluate Problems</i>: teachers collaborate to evaluate problems
Organizational Supports
<ol style="list-style-type: none">7. <i>School leadership</i>: teachers share feeling supported by administration8. <i>Resources</i>: teachers acknowledge sufficient resources (time, materials) to implement data use

Appendix G: Interview Participant Informed Consent Form

TEACHERS COLLEGE COLUMBIA UNIVERSITY

INFORMED CONSENT

Dear Teacher or Principal,

DESCRIPTION OF THE RESEARCH: I am a doctoral candidate at Teachers College, Columbia University, inviting you to participate in a research study on school leader support of teachers' data use. As an educator, you are actively involved in using data to make informed decisions. I am interested in learning how school leaders can best support their staff in understanding and using data to help make decisions to promote learning and improve student outcomes. In addition, I will look at data use across different data sources including state, school, and classroom data.

If you agree to participate in this study, your participation will be in the form of one interview for approximately 45 minutes.

RISKS AND BENEFITS: The risks and benefits associated with this study are minimal. It is unlikely that data collected from the survey could be used to prejudice others against the participants since all identifying information will not be included. All participants are anonymous assigned pseudonyms and the school district and schools are assigned code names like X, Y, Z, etc. In addition, at any time, you have the right to discontinue your participation if you feel any sense of discomfort. Your participation in this study is of great importance because you will be contributing to the knowledge base of teacher use of data to improve student outcomes. Research has shown that even though educational policy has emphasized data use in schools, we still do not know the best supports that lead to improved student outcomes. By participating in the research, you will perhaps be helping other schools and districts in the future by contributing to this knowledge base. Another benefit of participating is the sense of awareness of your own practices that will emerge from reflecting on the questions raised during the interview. Lastly, your school will receive an overview report on survey responses that may help you understand and improve your data use practices.

PAYMENTS: Although you will be taking time from your busy schedule to complete the interview, I regret that there is no financial reward for your participation and time. Upon completion and approval of my dissertation by Teachers College, if you desire, I will gladly provide a copy of my dissertation for your review.

DATA STORAGE TO PROTECT CONFIDENTIALITY: I will preserve confidentiality throughout my research. Data will be stored on a password protected device. All identifying information will be coded. All data will be transcribed by a professional transcriber. Only the researcher and the professional transcriber will be able to listen to the audio recordings and read the transcribed texts. Once the data has been transcribed, the recorded data will be erased. I will preserve confidentiality throughout my research and will destroy all data and transcripts after a successful dissertation defense and acceptance by Teachers College.

TIME INVOLVEMENT: Your participation will take approximately 45-minutes for the interview.

HOW THE RESULTS WILL BE USED: The results of this study will be used for the development of my doctoral dissertation in partial fulfillment of the requirements for the Ed.D. degree at Teachers College, Columbia University. After using the research for my doctoral dissertation, the results may be used at educational conferences and published in educational journals and/or books.

TEACHERS COLLEGE COLUMBIA UNIVERSITY

PARTICIPANT'S RIGHTS

Principal Investigator: Jordan Anne Grant

Research Title: **How School Leaders Support Teachers' Data Use: A Case Study of New York Schools' Perception and Use of State, School and Classroom Data**

- I have read and discussed the Research Description with the researcher. I have had the opportunity to ask questions about the purposes and procedures regarding this study.
- My participation in research is voluntary. I may refuse to participate or withdraw from participation at any time without jeopardy to future medical care, employment, student status or other entitlements.
- The researcher may withdraw me from the research at his/her professional discretion.
- If, during the course of the study, significant new information that has been developed becomes available which may relate to my willingness to continue to participate, the investigator will provide this information to me.
- Any information derived from the research project that personally identifies me will not be voluntarily released or disclosed without my separate consent, except as specifically required by law.
- If at any time I have any questions regarding the research or my participation, I can contact the investigator, who will answer my questions. The investigator's phone number is (202) 841-7391.
- If at any time I have comments, or concerns regarding the conduct of the research or questions about my rights as a research subject, I should contact the Teachers College, Columbia University Institutional Review Board /IRB. The phone number for the IRB is (212) 678-4105. Or, I can write to the IRB at Teachers College, Columbia University, 525 W. 120th Street, New York, NY, 10027, Box 151.
- I should receive a copy of the Research Description and this Participant's Rights document.
- I () consent to be audio recorded. I () do NOT consent to being audio recorded. The written and/or audio recorded materials will be viewed only by the principal investigator and members of the research team.
- My signature means that I agree to participate in this study.

Participant's signature: _____ Date: ____/____/____
Name: _____

Appendix H: Interview Protocol

Selected Pseudonym of Interviewee: _____

Date: _____

Duration of Interview: _____

Interview Protocol

In order to get to know a little bit more about you, we're going to begin with some background questions. Is that ok with you?

1. How long have you been a teacher/principal at your current school?
2. How long have you been a teacher/principal in general?
3. Have you previously held any other roles at this school or other schools? a. IF YES: Can you tell me what those roles were and how long you were in those positions?

Teacher Data Use – Descriptions & Experiences

For this next part, I would like to get a sense of what types of data on student learning you have access to and what role these various types of evidence play in your district, school, and classroom.

Competence in Using Data:

4. Can you tell me a little bit about what kinds of evidence or data about your students and their learning you/your teachers have access to? *There are no right or wrong answers. This is really about all the different types of information you can access, regardless of how frequently you do.*
5. Which of these sources of information about your students do you/your teachers find most and least useful to your/their practice and why do you feel that way? a. Can you give me an example of that?
6. Tell me a little bit about what roles evidence and/or data may play in your school? a. Can you provide some specific examples of that kind of use at the school, grade or department level?
7. How about at the district level? Can you tell me about the role that evidence and/or data play in your district? a. Can you provide some specific examples?
8. How do you/your teachers use evidence and/or data to plan classroom activities?

[Probes: Grouping students? What to teach? Pacing? Assignment of extra practice/homework? Small group instruction? Differentiation?]

Collaboration:

9. Given all that you have described, I'm wondering if you can help me get a picture of what are the times you/your teachers are looking at the various types of evidence. Over the course of the school year, and in a typical week or month, when, where and with whom, if anyone, you/ your teachers are looking at the evidence you have named? a. IF REFERENCES

COLLABORATION: Can you tell me more about what happens when you/they meet with _____? (colleague/ co-teacher/ principal/ coach/ grade team/ department team/ inquiry team)

b. IF ONLY REFERENCES WORKING ALONE: Can you tell me more about what you/ your teachers are doing when you/they _____?

10. Do you feel your school has a shared vision or purpose for looking at data together? a. IF YES: Can you describe it? b. IF NO: What do you wish it was?

Organizational Supports:

11. Have you ever participated/provided in data-related professional development or coaching in your current (or previous) school or district or preservice training? a. IF YES: Can you describe that experience? [first prompt experience at school or district if mentioned] What did you/ your teachers take from that learning experience, and how, if at all, did you/they incorporate it into your/their everyday work?

b. IF NO: Ok, in reflecting on your/your teachers' own practice, what do you wish you/they could learn about data use?

12. Are there ways you/the principal encourages data use among teachers? If so, can you describe them?

13. Does your district or school have student and district data available through an online data warehouse? Do you/ your teachers use the warehouse?

a. IF YES: At what times during the school year are the information and resources available in the data warehouse the most useful for you/your teachers and your/their work? Why?

14. Do you believe that teachers are using this resource effectively? a. IF YES: Can you offer some specific examples of how you/your teachers are using this resource? [*Probes: Classroom data use? Testing preparation? Teacher teams for data?*]

b. IF NO: What do you believe are some of the barriers that exist that prevent teachers from using the data warehouse more effectively?
[*Probes: No professional development? No time? Intimidation of data warehouse? Confusion on where to look/click? No administrator or central office support?*]

Thank you for all the information you have shared about your practices and experiences within

your school and district. Before we conclude, I have just a few more questions to help us understand your perspective on the significance of teacher data use and the role of the school in supporting this work.

Attitudes Toward Data:

15. To what extent do you think it is important for educators to use evidence or data about their students to inform their practice?

a. What do you believe is the impact on students when a teacher's instruction is informed by data?

b. What is the impact on teachers to use data in their practice?

c. In what ways could data help you and other teachers address current instructional challenges that exist across the school or district?

I want to thank you for all that you have shared with me today. I really appreciate your time, your trust and your willingness to think so carefully about these important questions. Please know that what you shared will be a big contribution to the research around data use in schools.

Do you have anything else you would like to share?