2021

THE INFLUENCE OF SHIFTING LEARNING ENVIRONMENTS ON TEACHERS' DATA USE PRACTICES

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A dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of
Philosophy at Virginia Commonwealth University.

by

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November 2021

Acknowledgement

My older son, Matthew, described getting my Ph.D. as a "lifelong pursuit." After five and half years of work, during a pandemic, at the age of 52, it definitely feels that way. Earning a Ph.D. has been a goal since I was an undergraduate student. The road to completion has been long and took several unexpected paths. I often felt like giving up, but fortunately, there were many people who inspired and encouraged me to finish. Although I am not able to individually thank all who supported me, I would like to acknowledge some of those who specifically contributed to my ability to complete the journey.

First, I would like to thank the nine teachers who gave up their time to meet with me during one of the busiest years of their teaching careers. For a teacher, time is probably the most limited and most needed resource. I am grateful for their generosity with their time and willingness to share their knowledge and insights.

Dr. Lisa Abrams: As the professor for the first doctoral class that I took to the chair for my dissertation, you have been an integral part of this leg of my academic journey from beginning to end. Your support, knowledge, and expertise in teachers' data use practices guided me through this process and pushed me to produce more meaningful and relevant work.

The members of my dissertation committee: Dr. Jim McMillan and Dr. Michael Broda - You are exceptional educators, and I am grateful to have had the fortune of being your student. I appreciate your support, encouragement, and guidance throughout my time at VCU. Dr. Nancy Hoover - Thank you for your willingness to serve on my committee and share your vast knowledge.

My colleague and friend, Dr. Kimberly Ogden: Not only were you my primary consultant and chief editor during the writing of my dissertation, but you were also a consistent source of

encouragement. On the many occasions when I said that I couldn't do it, you told me I could, and I am grateful for your unwavering support.

My friends and family: You allowed me to talk about my topic, encouraged me to "stick with it", and gave me space to work when I needed it knowing that I would be a more active participant in our friendship and family events when finished.

My parents: Jimmy and Bettie Sue Mills - For as long as I can remember, you have told me there is nothing that I can't accomplish. This would not have been possible without your support.

Finally, I would like to thank my husband, Scott and my sons, Matthew, and Andrew. You have walked beside me on this journey over the past five and a half years. I spent countless hours with a book in hand or a computer on my lap, even during family events, when attending your games, or visiting you in college. I am grateful for your understanding and willingness to support a dream that took a long time to achieve. Thank you.

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Abstract

In March of 2020, schools in the United States closed for in-person learning due to the COVID-19 pandemic. When the school year began in the fall of 2020, many schools continued to operate virtually rather than in-person. In response, many teachers' practices were revised. Although data use has been widely explored, teachers' use of data in a virtual environment has received limited attention. This study contributes to the existing knowledge in this area by exploring the influence of the shifting learning environments on the data use practices of teachers in four schools in one school district during the 2020 -2021 school year.

Teachers in this school district began the year teaching virtually. In the spring, some students returned to school for in-person learning, shifting the learning environment to a hybrid space. Using survey data, interviews conducted while students were learning virtually, and interviews once the learning environment shifted to a hybrid learning environment, the influence of the shifting learning environments on teachers' data use practices was explored. Teachers discussed collaborating more frequently and differently, adjusting the sources of data used, and adapting their actions with data to support student learning.

The results of this study indicated that teachers consistently used data to measure and support student learning in the virtual environment. Teachers adjusted their practices throughout the year as the learning environments shifted to measure student understanding more accurately. To enhance these practices, teachers collaborated differently and more frequently. Additionally, teachers adapted their actions in response to data to respond more effectively to identified student learning needs in the virtual and hybrid environments.

Limitations of the study include the small sample size and unique learning environment in this school district during this school year

Chapter 1: Introduction

Statement of the Problem

On March 13, 2020, most public schools in the United States closed for in-person instruction for the remainder of the school year due to the Covid-19 health crisis. After that, all instruction and learning activities were conducted remotely for most school districts. However, in effect, the school year ended on March 13 for many students in the school district in which the research was conducted as the shift to online learning created challenges including lack of internet access for some students or lack of available resources for virtual instruction. Final grades were calculated at the end of the third nine weeks, and assignments and learning activities that were shared with students during the fourth nine weeks were optional for students (school district communication). With the continued uncertainty surrounding the COVID-19 pandemic, the 2020-2021 school year also began with many school districts opting for distance learning for all students. Therefore, changes to instruction and assessment were required. Although testing requirements for accreditation were waived during the 2019 - 2020 school year, students participated in standardized testing that was used for accountability purposes in the spring of 2021. While accreditation was waived for both school years, the standardized testing would be used to measure student performance and would be used during the 2021 - 2022 school year for accreditation, as a growth indicator in the areas of reading and mathematics. This shift in the teaching and learning environment provided a unique opportunity to investigate teachers' use of data.

Research on data use practices is well established. However, data use and decision making have rarely been explored in an environment where all instruction and learning were occurring virtually. Therefore, the learning environments during the 2020 – 2021 school year

created a unique opportunity for data use exploration, including identifying ways that teachers adapted their practices within the online environment. This raised the question, would a return to in-person or hybrid learning produce more changes to data use? Thus, several additional questions regarding data use in this environment were raised. Do teachers use data differently when all teachers are teaching online, and all students are learning online? Are there differences in the data that teachers use and how teachers use data when they are not teaching students in person? When some students returned to in-person learning, how was data use and decision-making impacted? Therefore, this study investigated the data teachers used, how teachers used data, and the factors impacting data use in virtual learning and hybrid learning environments.

Rationale for the Study

Data use in schools has been identified as a potential means to help schools increase student achievement. However, data use in schools is not always consistent or productive and may not have the desired effect. Therefore, it is important to understand the factors that influence data use. For the purpose of this study, data use was defined using the definition given by Wayman, Cho, Jimerson, and Spikes (2012). They defined data use as, "the actions in which educators engage as they collect these data, organize and analyze them, and draw meaning from them to inform practice" (Wayman, Cho, Jimerson, & Spikes, 2012, p. 5).

Teachers generally have multiple sources of assessment data available including standardized test data, classroom assessment data, and formative assessment data, as well as diagnostic data, in some cases. However, what teachers view as data, which data teachers have access to, and which data teachers use for instructional decision making can vary widely. While use of standardized test data can provide a broad overview of student understanding, the use of common assessment data, or school-wide assessment data, and classroom assessment data, or

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individual teacher assessment data, are needed to gain a more complete understanding of student strengths and needs (Supovitz & Klein, 2003). Additionally, these data provide greater information that is more-timely (Supovitz & Klein, 2003). For the purpose of this study, assessment data was considered common assessment data if teachers within a content or grade level use the same assessment that is created locally or by teachers and meet to review the data together (Supovitz & Klein, 2003). Classroom assessment data are data from assessments that teachers review individually whether the assessment is common to a group or specific to one teacher (Supovitz & Klein, 2003).

Wayman and colleagues (2012) found that data use was often concentrated on struggling students. While it is important to provide resources for these students, schools are tasked with increasing achievement of all students. Additionally, school districts can implement policies to encourage and support the use of formative assessment data and differentiation to benefit both high achieving and struggling students (Wayman, Cho, Jimerson, & Spikes, 2012). While much is known about what data have traditionally been used and how data were used in the traditional classroom to benefit all students, the impact of virtual and hybrid learning on data use within this context is emerging.

The implementation of new regulations for assessment and data use instruction in teacher preparation programs indicate that data use expectations are increasing rather than decreasing. The regulations include the NCLB requirements for using data to report student success and Virginia's legislation requiring instruction in assessment teacher preparation programs. As such, it is important to understand the interactions between effective data use and context to determine which data are being used and how they are being used. Supovitz and Klein (2003) found that often teachers do not know which data to use and how to use it. If Data-Driven Decision Making

(DDDM) is an increasing expectation and can improve student achievement, awareness of the factors and contexts that may promote effective data use can provide valuable information to guide school leadership in increasing the effective use of data. Additionally, with the possibility of virtual and hybrid teaching and learning environments continuing to exist, an understanding of the use of data in these environments is needed. For this study, the definition of DDDM identified by Mandinach will be used. She defines DDDM as, "The systematic collection, analysis, examination, and interpretation of data to inform practice and policy in educational settings" (Mandinach, 2012, p. 71). With increasing policy emphasis on data use and the potential for changes, such as virtual learning, it is important to determine whether these policies and the learning environment are having an impact on teachers' data use practices. Given these factors, additional understanding of the data that teachers use and teachers' data use practices in the virtual and hybrid environments when engaging in DDDM is needed.

Purpose of the Study

The purpose of the study was to explore the data teachers used and how they used data in the virtual and hybrid environments. Differences in the types of data that teachers use and the way in which they use these data in the virtual and hybrid environments were explored. This included identifying what data teachers use, the decisions they make about what data to use and how to use it, and the ways in which they use these data. Additionally, teachers shared a data artifact that was used in the virtual or hybrid environment and discussed the use of the selected type of data.

Although the factors promoting data use have been well researched, the specific ways that teachers use data are just beginning to be explored (Farley-Ripple, Jennings, & Buttram, 2019). As this learning environment was unique to the 2020 - 2021 school year, the ways in

which teachers use data in the virtual and hybrid environments warranted investigation. Therefore, the present study used information from survey data, individual interviews conducted, at two times during the school year, and a teacher-selected data artifact to identify the influence of these shifting environments on teachers' data use practices. This information can be used to provide specific professional development, guidance, and support to assist teachers in using data to improve teaching effectiveness that will lead to increased student achievement.

Background/Conceptual Framework

Accountability permeates all aspects of public education today. This shapes many policies and practices in K-12 schools and yearly testing of students in third grade through eighth grade, as well as some end-of-course testing in ninth grade through twelfth grade, is one way that schools are held accountable for student achievement. The Code of Virginia establishes regulations for accreditation to meet the requirements of the Every Student Succeeds Act of 2015. According to Chapter 131 of the Code of Virginia, "The Standards of Accreditation provide the foundation for the provision of a high-quality public education within a system of accountability and continuous improvement" (Code of Virginia, 8VAC20-131-10). Additionally, it is expected that students will learn the content for each course and that schools will identify strategies to assist students who struggle (Code of Virginia, 8VAC20-131-30).

The accreditation process in Virginia uses multiple factors to determine school quality. These factors include academic achievement in science, and academic achievement or growth in reading and mathematics. These performance indicators are measured for students collectively and for students within identified groups of students (Code of Virginia, 8VAC20-131-380). Indicators are reviewed, each year, to determine each school's accreditation status. However, if a school has achieved accreditation for three consecutive years, the indicators are reviewed yearly,

but accreditation status is reviewed every three years (Code of Virginia, 8VAC20-131-390). Therefore, the benefit to achieving accreditation increases as accreditation is earned in successive years. Thus, schools feel pressure to achieve and maintain accreditation.

As accountability pressures have increased, data use and data-driven decision making (DDDM) have been emphasized and encouraged as a means to improve student achievement. Expectations for data use and decision-making by schools and teachers were included in the 2002 reauthorization of The Elementary and Secondary Education Act (ESSA) (Means, Padilla, & Gallagher, 2010). Additionally, in Virginia, new regulations for teacher licensure include requirements for instruction in teacher preparation programs to develop "the ability to analyze assessment data to make decisions about how to improve instruction and student performance" (Code of Virginia, 8 VAC20-23-190). Consequently, school districts have implemented various programs and procedures to increase the effective use of data with mixed results.

Datnow, Park, and Kennedy-Lewis (2012) found that district-level guidance and support for data use were essential for creating an environment where teachers analyzed data and made instructional changes. Although the school leadership and availability of data were also important considerations, these factors alone did not produce changes to instruction. Using multiple forms of data, including teacher-created formative assessments, produced greater changes to instructional practices. The culture and collaboration of the content department as well as the pressures of accountability also impacted the effectiveness of teachers' use of data. Within these contexts, some teachers chose to rely on their personal evaluations of student understanding or did not know how to make instructional decisions based on data (Datnow et al., 2012).

Teachers' Use of Data

Teachers' uses of data vary widely. Some teachers actively use data for instructional decision-making and view the use of data as essential while others only use data when required, viewing the use of data as unnecessary. Many factors that contribute to this use of data have been identified including leadership, trust, collaboration, efficacy for data use, availability of resources, support systems, and perceptions.

Teacher beliefs about data impact the use of data (Booher-Jennings, 2005). Several factors contribute to teachers' attitudes about data and data use including trust, accountability, ability to analyze and use data, and beliefs about the value of data (Booher-Jennings, 2005; Coburn & Turner, 2011; Datnow & Hubbard, 2016; Dunn et al., 2013a; Grant, 2000; Jimerson, 2014). Teachers are more likely to use data when they believe in their capacity to use data and the potential of the data to provide useful information. After reviewing research studies, Datnow and Hubbard (2015) noted that teachers lack confidence in their ability to use data, which affects the use of data. Additionally, the use of data is impacted by teachers' beliefs about the value of the data (Datnow & Hubbard, 2015). Perceptions of data often differ between schools that are and are not fully accredited (Daly, 2009). In a study of two schools, one high-achieving and one low-achieving, differences in perceptions and the value of data were identified. Teachers in the high-achieving school viewed data positively while the teachers in the low-achieving school perceived data use as an unnecessary burden (Moriarty, 2013).

One of the most important factors impacting the positive use of data in schools is leadership (Coburn & Turner, 2011; Kerr et al., 2006; Marsh, Farrell & Bertrand, 2016; Wayman, Cho, Jimerson, & Spikes, 2012; Wayman & Jimerson, 2014). Often it is the principal, as the primary leader of the school, who establishes the conditions for data use (Datnow et al.,

2013; Yoon, 2016; Young, 2006). However, the principal does not have to serve in this capacity alone (Farley-Ripple & Buttram, 2015). Teacher leadership should be developed (Daly, 2012) and may help to increase productive data use practices (Gerzon, 2015).

The principal and school leadership can facilitate productive data use by providing time for teams to meet collaboratively (Datnow et al., 2013; Lange, Range, & Welch, 2012; Militello et al., 2013; Wayman, Cho, Jimerson, & Spikes, 2012; Young, 2006), encouraging and guiding productive data conversations about instruction using multiple sources of data (Young, 2006), connecting data use to student learning and instruction (Datnow et al., 2013; Schildkamp et al., 2017), building trust (Lange et al., 2012), ensuring access to data (Coburn & Turner, 2011; Lange et al., 2012), and providing professional learning (Lange et al., 2012; Militello et al., 2013; Schildkamp et al., 2017; Young, 2006) and support (Jacobs et al., 2009; Kerr, et al., 2006; Militello et al., 2013; Roderick, 2012; Wayman, Cho, Jimerson, & Spikes, 2012; Young, 2006), potentially from an instructional coach (Farley Ripple & Buttram, 2015; Wayman & Jimerson, 2014; Wayman, Cho, Jimerson, & Spikes, 2012; Young, 2006) as these factors have been shown to positively impact productive data use. Essentially, the principal must establish a "culture of data use" within the school (Bambrick-Santoyo, 2010; Gerzon, 2015; Yoon, 2016), where data use is viewed as a priority (Datnow et al., 2013; Young, 2006). Time, trust, professional learning and support, and collaboration are of particular importance for creating a productive and positive data environment which may also improve teacher perceptions and use of data.

The context in which data are used also matters. Data use is impacted by accountability pressures (Datnow & Hubbard, 2015). The purpose of accountability measures is to improve instruction in order to improve student achievement. However, this goal is not always achieved as these pressures can impact instruction in both positive and negative ways (Grant, 2000).

While accountability may encourage teachers to use data, this does not always result in positive uses of the data (Datnow & Hubbard, 2015; Jennings, 2012; Marsh et al., 2016). When teachers view the purpose of data use as a measure of accountability, rather than for continuous improvement, they are less motivated to engage in data analysis and make changes to their instructional practice (Young, 2006).

Data Sources

Various data are available for teachers to use. Supovitz and Klein (2003) separated student data into three categories: 1) External Assessments, 2) School-wide Assessment, and 3) Individual Teacher Assessments (p. 40). External assessments include state assessments and district assessments such as district created benchmarks. Common assessments that are given by content or grade level groups would be classified as school-wide assessments, and formative classroom assessments would be considered classroom assessments. Each of these data sources provides different information that can be used to increase understanding of student achievement and considering all three together will provide the most thorough information (Supovitz & Klein, 2003). Farrell and Marsh (2016b) found that teachers made greater changes to instructional practices when reviewing student work and teacher created assessments. They noted that this data "may direct teachers to consider how they may *improve* their teaching practice instead of how to *prove* student achievement or performance to external audiences" (Farrell & Marsh, 2016b, p. 449). Schnellert, Butler, and Higginson (2008) indicated similar findings, noting that when teachers participated in the creation of the assessments and were involved in accountability policies, greater changes to instruction occurred.

It is well established that many school-level contexts impact the effective use of data, including leadership, teacher efficacy, collaboration, trust, and the purpose of data. However,

research on the specific ways in which teachers use data has been minimally explored (Datnow & Hubbard, 2015) and what is meant by data "use" is inconsistent (Farley-Ripple et al., 2019). Therefore, it is important to investigate teachers' analysis and use of data and whether differences exist within this unique context.

Data Use in the Virtual Environment

Toppin and Toppin (2016) reported that a greater need for virtual instruction began in the 1990's. Reasons for this push included concerns over safety or dropout rates, and then evolved to include online instruction as a means to increase access such as for families who are mobile or students who desire to take courses that are not offered at their school, including college credit options (Toppin & Toppin, 2016). Although virtual instruction has increased, the research on K12 teaching and learning online is limited. Martin, Sun, and Westine (2020) reviewed 619 research articles on online teaching and learning published between 2009 and 2018. They found only 53 articles on K12 education. Data use was not listed as a topic for any of the studies and only five were related to assessment (Martin, Sun, & Westine, 2020).

While virtual instruction has been increasing, the massive shift of instruction from in person learning to online learning for the 2020 – 2021 school year due to COVID-19 was unprecedented. Although schools re-opened and students returned to in person learning for the 2021 – 2022 school year, many schools in the state in which the study was conducted continued to offer virtual learning options for students. Additionally, the push for online learning began in the 1990's (Toppin & Toppin, 2016); This is likely to continue.

A study conducted, during the 2011 – 2012 academic year, showed large discrepancies between the performance of students attending school online and students attending school in person. This study showed significant gaps in measures of AYP with only 27.4% of virtual

schools meeting AYP while 51.1% of traditional schools met AYP (Miron & Urschel, 2012). Given the disparities between student performance in virtual and in person learning environments, the limited investigation into the data use practices in this environment, and the evidence that effective data use can positively impact student learning, an understanding of teachers' data use practices in the virtual environment is needed.

Research Questions

The present study aimed to explore the influence of the shifting teaching and learning environments on data use practices within one diverse school district. The broad problem being investigated was how data use was impacted by the shift to virtual learning and then hybrid learning due to the COVID-19 school closures. The study was guided by the following research questions:

1. In what ways did the shifting learning environments influence teachers' data use practices?
2. What assessment data sources do teachers use in virtual and hybrid teaching environments?
3. What actions did teachers take in response to data in virtual and hybrid environments?

This study intended to extend the knowledge of the data use practices of teachers within the virtual and hybrid learning environments. The results of this study have practical implications for schools and school districts to further understand how the shifting learning environments influenced teachers' data use practices and ways that positive data use can be supported and enhanced. Investigating one school district helped to identify areas in need of support, as well as practices that should be encouraged.

Design and Methodology

This mixed methods case study design, included descriptive and comparative non-experimental quantitative survey research and qualitative interviews, conducted in two phases. The school district in which the study was conducted selected four middle schools for participation. Two of the middle schools were fully accredited and two of the middle schools were not. All middle school (grades 6 - 8) teachers of the four core content areas, mathematics, English/language arts, science, and social studies, in these schools were invited to complete the survey. The survey used for this study was Wayman, Wilkerson, Cho, Mandinach, and Supovitz's (2016) Teacher Data Use Survey. This survey includes forms for teachers, administrators, and support staff. The teacher form was used for this study. At the end of the survey, teachers were asked to share their email address if they were interested in participating in an individual interview.

After the quantitative survey data was collected, participants who agreed to participate in qualitative interviews were invited to participate in individual interviews using Zoom. Nine teachers agreed to participate in these interviews. After the first interviews, a second round of follow-up interviews were conducted with all nine teachers. During the second (follow-up) interview, teachers shared a data artifact that they selected to discuss.

By conducting a series of in-depth interviews, it was possible to gain a more thorough understanding of the teachers' uses of assessment data and the factors that impact data use. Including interviews was necessary as previous research has identified a need for interview data to understand how teachers use data. When conducting a mixed methods study, Jimerson (2014) found that survey comments, interviews, and focus groups were needed to provide a deeper understanding of the survey data as these data identified greater differences in teachers' answers

than were identified using survey data alone. Therefore, teachers' voices were needed to fully explain their individualized and varying uses of assessment data, particularly in the unique and shifting learning environments during the 2020 - 2021 school year. Combining both quantitative survey data and two phases of teacher interviews, supplemented by teacher artifacts, provided a needed layer of information that would have been missed using survey data alone.

Summary

While much research has focused on assessment and data use practices in a traditional environment, little is known about teachers' data use practices in the virtual environment. With widespread use of virtual learning and the discrepancies between student achievement in traditional and online classroom settings, it is important to understand how teachers' used data in the shifting learning environments.

Definition of Key Terms

Assessment: Tools used to measure and document student understanding.

Accreditation: The code of Virginia defines accreditation as "a process used by the Virginia Department of Education to evaluate the performance of public schools in accordance with this chapter" (Code of Virginia, 8VAC20-131-5).

Accreditation Rating/Status: A rating of whether a school has met school quality standards for student achievement. The school accreditation status falls into one of three categories: 1) Accredited, 2) Accredited with Conditions, or 3) Accreditation Denied (Code of Virginia, 8VAC20-131-400).

Classroom Assessment data: Classroom assessment data includes data (information) from formative and summative assessments that are used by individual teachers. This includes warm-ups, exit tickets, quizzes, tests, etc. that are chosen or created, and administered by individual teachers.

Common Assessment data: Common assessment data includes data (information) from formative and summative assessments that are given, and reviewed and/or analyzed collaboratively by teams of teachers. This includes benchmark tests and other assessments given by teachers in a content team. These assessments can be created by teachers, specialists, or others.

Data: Using a comprehensive definition of data that was developed by Wayman, Cho, Jimerson and Spikes (2012), data will be defined as "anything that helps educators know more about their students (e.g., formal assessments, tests, quizzes, and student background data) (p. 5)."

Data-Driven Decision Making: "The systematic collection, analysis, examination, and interpretation of data to inform practice and policy in educational settings" (Mandinach, 2012, p. 71).

Effective Data Use: Data use practices that are productive and beneficial to teachers and students (Wayman, Cho, Jimerson, & Spikes, 2012).

Formative Assessment: Assessment for learning.

Hybrid Learning: For this study, hybrid learning is when students are learning virtually, and students are learning in-person in the same class at the same time.

In-Person Learning: When students are physically present in the classroom in a traditional school building.

SOL test data: Information about group or individual student performance on the state standardized (Standards of Learning) test.

Summative Assessment: Assessment of learning.

Virtual or Remote Learning: When students are learning online, either synchronously or asynchronously.

Chapter 2: Review of Literature

Introduction

Data-driven decision making is one factor that has the potential to contribute to continuous improvement in schools. As such, it is important to understand how data are being used. This literature review discusses concepts related to teachers' use of data and identifies gaps in the knowledge that were addressed by the present study. The literature is organized to summarize the extant research on several different, but related strands within the data use field. Specifically, the review is organized to highlight how increases in teacher accountability for student achievement have prompted the use of data as a potential means of improvement. Next, factors that have been established as influences on data use will be identified followed by a discussion of teachers' use of data, including data use for improvement, sources of data, school context and accountability and equity. Finally, an overview of the limited research on data use during virtual instruction will be presented. Given the current emphasis on accountability for student achievement and increasing emphasis on the possibility of data use as a lever for improvement, this review will discuss the limited understanding of data use during virtual and hybrid instruction and how the present study can contribute to the knowledge base, investigating the intersection of policy and practice in an understudied environment.

Data use is encouraged as a tool to increase student achievement. However, for data to effectively be used to improve student achievement, teachers must accurately identify student needs and make changes to their instructional practice closely aligned with misconceptions. Therefore, understanding how data are used is important. This literature review will address how the current accountability context has encouraged data use as a potential way to improve student achievement and how data use may be implemented in virtual and hybrid learning environments.

Factors that have been well established to impact data use will be discussed as these factors were investigated to provide contextual information to help understand the results. Next, the impact of accountability on data use will be reviewed, including positive and negative factors.

Understanding the data that teachers use when engaging in these practices and differences that may exist due to virtual or hybrid learning environments will add to the knowledge base of data use and provide schools with information relevant to continuous improvement.

Data-Driven Decision Making

Since the 2001 passage of the No Child Left Behind Act (NCLB), public schools have been expected to use data to improve student achievement. This 2001 reauthorization of the *Elementary and Secondary Education Act (ESEA)* included expectations of data use by schools and teachers (Means et al., 2010), as data-driven decision-making (DDDM) has the potential to improve student achievement. Although the reauthorization of ESEA in 2015 scaled back some of the Federal accountability requirements, states are still expected to use data to report student achievement and progress. This new legislation also included new requirements for reporting disaggregated student achievement by subgroups (https://www2.ed.gov/policy/elsec/leg/essa/essaaccountstplans1129.pdf). Additionally, Virginia has added a requirement that teacher preparation programs include instruction on assessment and data use (8VAC20-23-190). Since studies have shown a relationship between data use and school improvement, school districts have implemented various programs and procedures to increase the effective use of data. The results of these programs and policies have been inconsistent. Not all use of data is productive, and research indicates that teacher perceptions and use of data vary widely. Much of the research has also shown that although a goal of NCLB was to increase equity, the opposite has occurred with teachers using data in ways that lead to unproductive

instructional methods (Horn, 2018). This can include using analysis of data to narrow the

curriculum, limit the distribution of resources to certain students, or identifying "bubble"

students (Booher-Jennings, 2005; Horn, 2018).

Factors Influencing Data Use

Many factors contribute to data use in schools, including perceptions of data, leadership,

teacher skills with data, collaboration, and time. These factors function independently, but also

may be connected (Schildkamp & Poortman, 2015). The impact of each of these factors on the

data use culture and teachers' use of data has been well established in the literature and some

examples of the wide range of research will be highlighted in this section. These characteristics

were included within the present study to provide contextual information about teachers' use of

data and the influence of these factors on data use in the virtual and hybrid environments.

<u>School Leadership</u>

 School leadership has been shown to be a primary factor impacting the use of data in

schools (Coburn & Turner, 2011; Kerr et al., 2006; Marsh et al., 2016; Wayman, Cho, Jimerson,

& Spikes, 2012; Wayman & Jimerson, 2014). This leadership can impact data use in both

positive and negative ways.

To promote a positive data culture, the leadership of the school needs to guide teachers to

focus on data use to increase student learning and improvement rather than for oversight (Earl &

Fullan, 2003; Wayman & Jimerson, 2014; Valli & Buese, 2007). Wayman and colleagues noted

that "...faculty struggles with data use were often connected to the leadership of their principals"

(Wayman, Cho, Jimerson, & Spikes, 2012, p. 16). In this study, some principals, particularly at

the elementary level, developed an environment of regular, collaborative data use. Often these

principals were active participants. Additionally, data savvy principals were more effective at helping teams to be successful (Wayman, Cho, Jimerson, & Spikes, 2012).

In this study, Wayman and colleagues found more examples of negative leadership than positive leadership. Teachers often indicated that the leadership did not have data analysis skills and only used the data for accountability purposes. Although the district provided time for collaboration, many leaders did not establish time or a framework for data use. Additionally, teachers felt that principals often required unnecessary and time-consuming tasks for monitoring purposes. Moreover, they described discussions with administrators that felt "punitive" or having their name on a public list if students did not achieve at least a 90% pass rate (Wayman, Cho, Jimerson, & Spikes, 2012, p. 17). The researchers identified a "disconnect" between teachers' and administrators' perceptions in these schools as teachers and administrators often described the environments in very different ways (Wayman, Cho, Jimerson, & Spikes, 2012, p. 18). Wayman, Cho, Jimerson, and Spikes (2012) found that barriers to data use could be decreased with district structures that encourage and facilitate data use, including training principals to be more effective in their leadership of data use.

Collaboration

Collaboration is an essential factor in the effective use of data in schools (Wayman & Jimerson, 2014). Wayman, Jimerson, and Cho (2012) describe data use as "an inherently social activity" (p. 173). Individuals may get information from measures but interactions with others will shape how that information is used (Coburn & Turner, 2011). Collaboration has also been connected to individual data use as teachers who collaborate more often also use data independently more often (Van Gasse, Vanlommel, Vanhoof & Van Petegem, 2017). However, simply placing teachers into groups to discuss data will not necessarily produce positive results.

Datnow (2011) noted that consistent change is not likely to happen if collaboration is forced or regulated rather than meaningful. Therefore, it is important to develop a positive environment for collaboration.

For collaboration to be effective, there must be a focus on data analysis for instructional improvement (Datnow et al., 2013) rather than simply data use for compliance or accountability. Collaboration is threatened when data are used to identify "good" or "bad" teachers or blame teachers for poor scores forcing teachers to compete rather than cooperate (Booher-Jennings, 2005).

Building Trust

Research indicates that teachers need to feel "safe" to discuss data (Marsh, 2012). Schools must establish an environment where data are used for instructional improvement rather than for compliance, monitoring teachers, or placing blame (Datnow et al., 2013; Earl & Fullan, 2003; Wayman & Jimerson, 2014). School leadership can create a sense of "collective responsibility" to decrease feelings of individual blame and help to increase productive use of data (Datnow et al., 2013). Datnow (2011) noted that in schools that moved from less productive to more productive collaboration, school leaders made establishing trust a priority. Teachers were consistently reassured about how the data would be used and data use was presented in a positive light. Thus, it is essential for teachers to trust the leadership and their colleagues. Without trust, members are more reluctant to discuss data beyond a superficial level and are less likely to identify weaknesses in their own practice, instead blaming students for deficits and lower scores.

Time

Time is an important factor for creating a positive collaborative environment (Datnow et al., 2013) and contributes to data use (Coburn & Turner, 2011; Young, 2006). Teachers need time to meet to review data as well as time to learn, and enact new methods or ideas (Datnow et al., 2013). Protected time must be set aside specifically for collaborative data use as simply establishing a time for teachers to meet will not ensure that data are discussed. This time should be protected by the school leadership (Datnow et al., 2013). Additionally, an expectation of data use within these meetings should be clearly established (Wayman, Cho, Jimerson, & Spikes, 2012).

Developing norms and routines for data meetings can facilitate productive data discussions (Datnow et al., 2013; Horn & Little, 2010; Marsh, 2012; Young, 2006). However, norms alone do not guarantee that teachers will value data or engage in data analysis (Young, 2006). Teachers must be included in the decision-making process and meetings should focus on meaningful activities (Young, 2006). Conversely, a lack of time to evaluate data can have a negative impact on teachers' perceptions of data (Wayman, Cho, Jimerson, & Spikes, 2012). Schools with positive records of achievement and growth in student learning prioritized time for data use, both individually and collaboratively.

Teacher Perceptions of Data

Teacher beliefs about data impact the use of data (Booher-Jennings, 2005). Several factors contribute to teachers' attitudes about data and data use including trust, accountability, ability to analyze and use data, and beliefs about the value of data (Booher-Jennings, 2005; Coburn & Turner, 2011; Datnow & Hubbard, 2016; Dunn, et al., 2013a; Grant, 2000; Jimerson, 2014). Roderick (2012) noted that teachers will use data if they know how and believe that it will

have an impact. Additionally, the use of data is impacted by teachers' beliefs about the value of the data (Datnow & Hubbard, 2015). Some teachers do not regard assessments created by external sources as a valuable source of information about student performance. This may contribute to the use, or lack of use, of these data (Farrell & Marsh, 2016b). As teachers are more likely to make changes to instruction when evaluating teacher created assessments, student outcomes may also be impacted

In a mixed methods study involving three school districts, Wayman and colleagues (2012) found that teachers in a high achieving school focused on state tests and believed that they did not need to use data since students were successful on the state tests. Therefore, data use in that school was limited. Teachers in all three school districts had generally positive attitudes about data, but not as positive as the attitudes of administrators, support staff and central office personnel. Interestingly, they also rated the effectiveness of data higher than their personal attitude about data (Wayman, Cho, Jimerson, Spikes, 2012).

In a study of teachers' attitudes about data use, Jimerson (2014) used survey data along with interviews and focus groups. While the schools in this diverse school district were improving, two of the four schools were identified as "Unacceptable." Some participants in each job category investigated viewed data positively, but negative feelings toward data were less evenly distributed among jobs. Teachers were much more likely to view data negatively than were school leaders. It is also important to recognize that teachers in the study associated data with accountability, even when their aim was to use data for improvement. Jimerson (2014) noted that "...their answers to questions about "data use" suggested that even where improvement is a desired orientation, the shadow of testing and accountability loomed large when the terms "data use" is part of the conversation" (Jimerson, 2014, p. 10). This is particularly important

because a focus on accountability may create an environment where data are misused (Jimerson, 2014).

Teacher Capacity

While teachers generally have access to data, this alone will not guarantee improvement (Datnow et al., 2012). Teachers' capacity to use data is an important factor contributing to positive data use. Some researchers encourage the development of data literacy (Datnow et al., 2012; Mandinach, 2012), while others prefer an emphasis on inquiry methods over data literacy skills (Bocala & Boudett, 2015). In either case, teachers' capacity to effectively use data must be developed and supported as teachers are more likely to use data when they believe that they are able to use data and they believe in the potential of the data to provide useful information. After reviewing the existing research, Datnow and Hubbard (2015) noted that teachers lack confidence in their ability to use data which affects the use of data. Teachers often feel confident in their ability to analyze and interpret data, but do not feel skilled in using that information to make instructional changes (Datnow et al., 2013).

Teacher Autonomy

Teacher autonomy and empowerment contribute to how data are used (Datnow, 2011). Moriarty (2013) identified a relationship between autonomy and data use to inform instruction. Teachers who felt a greater sense of control in decision-making were more likely to take responsibility for student performance and use data for classroom decisions. Conversely, teachers who did not feel empowered were less likely to view data use as beneficial (Moriarty, 2013). Teacher empowerment may encourage more productive uses of data. After reviewing the data from teacher created assessments, teachers in Farrell and Marsh's (2016b) study made

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changes to the assessments to include questions designed to gain a greater understanding of student knowledge.

Data Use Practices

Teachers use data in a variety of ways, both individually and collaboratively. In a review of literature, Datnow and Hubbard (2015) found that while teachers were consistently asked to review data to make instructional changes, the impact of the analysis was diverse. Teachers used a variety of assessments but tended to focus on benchmark tests. Although these tests were easy to compare across grade levels, they often included only selected response items making deeper analysis more challenging (Datnow & Hubbard, 2015). Hoover and Abrams (2013) work is consistent with this, revealing that teachers assessed regularly but did not analyze the data regularly or deeply.

Farley-Ripple and Buttram (2014) identified ways that teachers use data when they investigated the impact of a policy initiative requiring the use of collaboration focused on data in PLCs in Delaware. In this study, the authors identified a need to separate data use practices into two categories, "analysis-oriented" tasks and "action-oriented" tasks. Analysis-oriented tasks include activities such as: Discuss how a lesson went, Discuss school wide goals, Discuss whether students are getting it, Evaluate curriculum content or pacing, and Evaluate what instructional strategies are working. Action-oriented tasks include the following: Discuss pacing of curriculum/instruction, Address individual student issues, Map the curriculum to an assessment, Plan particular lessons, Share instructional strategies, and Share materials and resources (Farley-Ripple & Buttram, 2014, p. 47).

Previous research generally investigated data use overall and did not separate teacher activities in this manner. However, when teacher activities were disaggregated in this manner,

the authors noticed a difference in the frequency of the tasks. This is important because teachers must engage in both analysis-oriented and action-oriented tasks to produce positive changes in student learning. The authors noted that the most successful school focused on analysis more than the others which led them to question whether teacher actions were based on data analysis (Farley-Ripple & Buttram, 2014). Bocala and Boudett (2015) identified related issues when considering teachers' data use practices. They found that often teachers failed to evaluate their action plans or made inferences around data without sufficient evidence or analysis to support the claims. Although other research has indicated that teachers are comfortable with analysis but do not always feel able to make instructional decisions based on the analysis (Datnow et al., 2013), the need for both analysis and action seems clear,

This research is important to the present study both in investigation of data and the context. The Farley-Ripple and Buttram (2014) study was conducted in four elementary schools that were identified by superintendents. Half of the schools were considered to have strengths with using data and half were considered to need improvement, although the criteria used to determine the effectiveness of data use was not given. Additionally, all schools in the state were required to collaborate in PLCs for 90 minutes weekly, where data use was a focus (Farley-Ripple & Buttram, 2014). The present study expanded on this previous research by investigating teachers' analysis-oriented and action-oriented tasks within a different context. While both the Farley-Ripple and Buttram (2014) study and the present study are situated in an accountability context, the requirement for collaborative data use was not a factor in the present study. Additionally, this research was conducted in middle schools that had not been evaluated for the effectiveness of data use and interviews in the present study were conducted with teachers whereas interviews in the Farley-Ripple and Buttram (2014) study were conducted with district

and school leaders. Teacher leaders were the only teachers who were included (Farley-Ripple &

Buttram, 2014).

This research was needed as Datnow and Hubbard's (2015) review of literature indicated

a need for additional study of the actions teachers take based on data analysis. Farley-Ripple and

Buttram (2014) identified a similar need, noting that research often reviews data use collectively

rather than separating the use into two parts, analysis-oriented tasks and action-oriented tasks.

The present study provides additional information about teachers' actions in response to data

within the virtual and hybrid learning environments,

Productive and Unproductive Uses

Teachers use data in a variety of ways, including more positive uses such as identifying

topics for reteaching and making instructional changes (Datnow, 2011; Farrell & Marsh, 2016b),

to unproductive uses of data such as focusing on test-taking skills or narrowing the curriculum

(Booher-Jennings, 2005; Marsh et al., 2016; Stephens et al., 1995). While teachers generally

have access to data for the purpose of analysis (Roderick, 2012), for data-driven decision making

to be used effectively to improve student achievement, teachers need to make changes to their

instructional practices (Dunn, Airola, Lo, & Garrison 2013b). Technology and data systems have

provided greater and faster access to data; however, research suggests that teachers feel they

have too much data, often without enough knowledge of what to do to make instructional

changes (Roderick, 2012; Wayman, Cho, Jimerson, & Spikes, 2012). Farrell and Marsh (2016b)

noted that teachers tended to focus on "what" was taught rather than "how" it was taught.

Additionally, although teachers were expected to use data to identify areas of need and change

instructional practices, they also felt pressure to stay on pace (Kerr et al., 2006). Therefore, data

use efforts do not always produce the increases in student achievement that are anticipated.

Although the goal of data use is to improve instruction and student achievement, often that does not occur. Studies have shown that accountability may increase the use of data. However, this use is not always positive (Datnow & Hubbard, 2015; Jennings, 2012; Marsh et al., 2016) and can be impacted by teachers' perceptions of the purpose of data use. Teachers are generally less motivated to analyze data and make instructional changes when they view data use as an accountability measure rather than a means to encourage improvement (Young, 2006). Additionally, often when schools use data, the emphasis is on struggling students; However, schools should function to benefit all students (Wayman, Cho, Jimerson, and Spikes, 2012).

Data analysis focused on state test results is less likely to produce changes to instructional practices (Supovitz & Klein, 2003). When using data from the previous year's tests or other external data sources, the instruction is often so far removed from the testing that it is difficult to align results with instructional practices. Therefore, other factors are often the focus of analysis. When data from teacher created assessments and student work are considered, teachers are more likely to make changes to instruction (Kerr et al., 2006; Farrell & Marsh, 2016b). This may be, in part, due to teachers' beliefs that these data produce more meaningful and valid results (Kerr et al., 2006). Additionally, to have a more complete understanding of student performance, teachers need to use multiple sources of data (Jacobs et al., 2009; Kerr et al., 2006) and have access to measures that highlight student understanding in addition to achievement (Roderick, 2012; Supovitz, 2012). A qualitative study conducted by Abrams, Varier, and Jackson (2016) is consistent with these findings. This study found that teachers' use of data from multiple assessment types, including formative assessments, benchmark assessments, and previous standardized tests results in a more complete picture of student understanding (Abrams et al., 2016).

Often, teachers perceive that data analysis is only for the purpose of accountability or compliance (Young, 2006). Although the purpose of accountability is to increase student achievement, the associated pressures may unintentionally encourage unproductive or reductive forms of data use. In an effort to improve scores quickly, schools may choose to use the data to focus on test-taking strategies, cheat, or identify "bubble" students, students who have not met proficiency standards but are close to the standards (Booher-Jennings, 2005; Grant, 2000). These behaviors are particularly evident when schools are underperforming and have scores that are significantly below the state goals (Jennings, 2012; Marsh et al., 2016). Teachers may identify student characteristics as the source of poor student scores rather than investigating instructional choices to deflect "blame". In contrast, when data analysis is focused on improving student achievement and instruction, data use tends to be more productive.

In a study of four school districts, Stephens et al. (1995) noted that some districts using assessment for instructional decision-making included practices such as test preparation, pre-assessing standardized test skills, and pacing pressures to teach content prior to testing. Smith's (1991) study indicated similar findings, noting that teachers, feeling pressure for students to pass tests, often resorted to a narrowing of the curriculum, and using test preparation strategies, even when they felt that the tests were not good indicators of student ability. This created additional anxiety for teachers who felt that this was not in the best interest of the students (Smith, 1991).

Under pressure to improve scores quickly, teachers may focus on quick, short-term strategies rather than making instructional changes (Garner, Thorne, & Horn, 2017). Garner et al. (2017) found that when faced with accountability pressure, teachers often focused on remediation and providing students with similar problem types, rather than identifying student misconceptions or making changes to instructional practices. Farrell and Marsh (2016b) also

found that accountability impacted the ways in which data were used. Teachers often grouped students according to the performance categories that were set by the state and retaught curriculum, without making changes to instructional practices. Farrell and Marsh (2016b) noted that "data valuable for accountability purposes may not be valuable for instructional guidance" (p. 451).

Use of data-based decision making, however, can be a powerful tool for school improvement. In 2001, Feldman and Tung conducted qualitative research on data-based decision-making (DBDM) with teams of teachers from six public schools (two high schools, three middle schools, and one elementary school) in Massachusetts that implemented DBDM. Using interviews, observations, and a case study of one of the middle schools, the researchers found that when using data, the focus of teacher conversations often shifted from discussions of students to discussions of instructional issues. Using data-based decision making encouraged richer and more professional conversations, as well as deeper reflection. Teachers were able to recognize the need for verifiable information, beyond what could be understood from observation and anecdotal notes. Additionally, teachers were less likely to assume that student achievement issues were the result of external factors, such as behavior and previous teachers. The teachers began to ask questions and look for reasons that students were struggling rather than making assumptions about the areas of concern (Feldman & Tung, 2001).

Teachers in Feldman and Tung's (2001) study indicated that they believed the process of data-based decision making was important. During this process, multiple sources of data were evaluated. Additionally, teachers began looking at student work to identify student needs more often. Issues of equity were a concern for five of the six schools that participated in the study and

the authors noted that DBDM can help to identify issues of equity and helps teachers to reflect on ways to address those issues (Feldman & Tung).

The Feldman and Tung (2001) study identified the benefits to DBDM and teachers' perceptions about the process. However, this study is limited by the use of schools that are already implementing a DBDM process.

Data Use for Instructional Improvement

The goal of data use is to improve instruction and student learning. When conducting research with schools in California, Herman & Gribbons (2001) determined that data inquiry and analysis can be conducted at the school level using basic statistics and technology as long as student data are available. However, having available data and data systems does not always lead to a change in instructional practices or student learning. Means, Padilla, and Gallagher (2010) found that when teachers analyzed and interpreted data, this process did not always lead to instructional change. This may be due to a lack of understanding about how to use the information gained in data analysis. Wayman and Jimerson (2014) similarly found that teachers were generally able to analyze data but did not know how to use the data to change instructional practices. Mandinach (2012) noted that before teachers are able to use data effectively, they must become "data literate" (Mandinach, 2012, p. 73). This includes using multiple forms of data to make instructional changes, as well as an ability to interpret the data and develop an action plan based on the data (Mandinach, 2012).

The school context may also impact data use. In a study of three school districts, Wayman and others found that the two school districts that did not have as high scores on state tests, discussed using data to make instructional changes whereas the teachers in the high achieving district spoke more generally about using data to know how to help students

(Wayman, Cho, Jimerson, and Spikes, 2012). For teachers to use data effectively to inform instructional practices, they must use data to gain a greater understanding of student thinking (Supovitz, 2012).

In 2012, Datnow, Park and Kennedy-Lewis conducted a qualitative study of four public, minority and low-income high schools, two urban schools and two urban charter schools, in four different states. The schools selected were considered to be effective in their use of data. The leaders in each of the schools emphasized the importance of using data to improve instruction and increase student achievement. Teachers in each of the schools received support for data use that included time, data systems, or principal support, and used multiple forms of data for analysis including benchmark test data and classroom assessment data. Often, teachers reported making changes to their instruction to meet student needs based on data analysis. These changes were often tied to analysis of teacher created formative assessments. However, other teachers indicated that they were unsure of how to use the data appropriately or simply attempted to ensure that students would pass state standardized tests. The authors noted some differences in the success of data initiatives in secondary schools that may be different from elementary schools. Since secondary teachers are separated into departments, the collaboration and culture of the departments impacted the teachers' use of data. Simply having access to data did not guarantee changes to instruction or improvement in student achievement. Collaboration and knowledge of how to use data were necessary conditions for improvement (Datnow et al., 2012).

The present study will extend this work, investigating teachers' data use practices in different a context. Rather than high schools that are leaders in data use implementation, this study was conducted in middle schools that have not been identified based on successful use of data. Additionally, the schools in Datnow, Park and Kennedy-Lewis' (2012) study were limited

to lower socioeconomic schools whereas the schools selected for participation in the present study were not restricted in this way.

<u>Sources of Data</u>

It is important for teachers to use data that are aligned and that will provide relevant information they can use for interpretation and decision-making (Mandinach, 2012). Multiple sources of data are available to teachers and schools. With increases in internet-based testing systems, the data are often readily available and easily accessible. However, much of the data that is available is not used (Supovitz & Klein, 2003). How data are presented to teachers can impact the use. The use of simple graphs and color-coding data generally make the data more accessible and easier to understand and use (Herman and Gribbons, 2001)

In a study of five schools that were implementing America's Choice for their school reform and using data effectively, Supovitz and Klein (2003) created a "framework to help education leaders develop more robust systems for collecting, synthesizing, and analyzing student performance data in a variety of forms in order to improve teaching and learning" (p. 2). The authors separated assessment data into three types: External Assessments, School-wide Assessments, and Individual Teacher Assessments (p. 40) and noted that the most effective use of data would incorporate using all three forms of data to provide a more complete picture of student understanding (Supovitz & Klein, 2003).

Using interviews, site visits, and surveys, Supovitz and Klein (2003) were able to identify the types of data that were used by teachers and the ways in which the data were used. The state tests, which were classified as external data, were considered to be "minimally" to "moderately" useful. While state tests must be used to show student progress, it is difficult to use these data to inform instruction as the results of these tests are not always timely or do not provide enough

information to teachers. While some teachers found these tests useful as a "starting point", others did not use the results of the state tests at all because they did not believe that these results were an accurate reflection of student ability. Others indicated that these tests were used to verify what they already knew about their students (Supovitz & Klein, 2003). According to Wiliam (2010), standardized tests, including state assessments, may not be helpful for making instructional decisions.

School-wide assessments were defined as " assessments that are not only administered systematically across groups of students within a school, but whose results are aggregated and systematically analyzed for patterns that are then used to guide school and individual teacher decision-making" (Supovitz & Klein, 2003, p. 10). The authors noted that these assessments were the most useful but were used with less frequency than other sources of data. These data allow teachers to compare student performance across classes. This can lead to teacher discussions of instructional strategies and collaboration to improve student performance that can lead to changes in instructional practice (Supovitz & Klein, 2003).

Supovitz and Klein (2003) considered assessments that are used individually by teachers to be Individual Teacher Assessments. That is, even if teachers gave the same assessments but used the data individually, they were considered to be individual teacher assessments. Teachers in Supovitz and Klein's study used these data to evaluate their instructional practices and to identify students who may need additional support (Supovitz & Klein, 2003).

Formative classroom assessments would be included within this category. Research has shown the benefit of using formative assessment data to increase student performance (Black & Wiliam, 2010). Their review of studies showed that improving formative assessment is associated with improvement in student test scores (Black & Wiliam, 2010). Kerr and colleagues

(2006) found that when teachers used multiple sources of data including state assessments and benchmark tests, they identified classroom assessments and reviews of student work to be more helpful and meaningful sources of information than other forms of assessment (Kerr et al., 2006). Additionally, Black and Wiliam (2010) found the use of formative assessment data benefits all students but is particularly beneficial for struggling students.

Farrell and Marsh (2016b) conducted a comparative case study of five low-income, high needs middle schools in three districts over 1-year, including interviews, focus groups, observations, activity logs, and document review. Teachers in this study used various sources of data including standardized tests, benchmark tests, common grade level assessments, classroom assessments, and student work. Overall, benchmark tests were used most often, but this varied by school. The data from these assessments was primarily used to group students, to reteach, for student reflection, and to provide additional academic support to students. Teachers only made changes to instructional practices based on the data sixteen percent of the time. These changes were most often connected to classroom assessments and reviews of student work (Farrell & Marsh, 2016b).

In the Farrell and Marsh (2016b) study, state tests were primarily used at the beginning of the year to group students. Reporting of the state results using proficiency levels and the accountability context of the schools may have contributed to this practice. These data seemed to become less useful during the school year as teachers had additional student achievement data. Teachers used benchmark data for reteaching and retesting, grouping students, and for student self-reflection. Teachers' opinions about the value of the benchmark data varied; some found the information helpful while others did not find the data to be valuable or trustworthy. The

researchers noted, "Often, the onus of improvement was placed on the student, with no new instruction from the teacher" (Farrell & Marsh, 2016b, p. 442).

The teachers' views about the benchmark test likely contributed to the limited use of the data. Teachers were more likely to view common assessments positively and make changes to instruction. Since teachers created these assessments and they were given in close proximity to the instruction, teachers may have found it easier to use the data to reflect on their instruction. Additionally, teachers made changes to the format and the content of the assessments when their analysis identified a need for additional data.

Classroom assessments and reviews of student work were viewed positively and more frequently resulted in changes in instruction. These data were closely connected to content and instruction and were timely. Student work was particularly useful for identifying student misunderstandings and thought processes. Teachers may have been more eager to use these types of data because they are not tied to accountability measures. As Farrell and Marsh noted, "Student work and classroom assessment data may direct teachers to consider how they may *improve* their teaching practice instead of how to *prove* student achievement or performance to external audiences" (Farrell & Marsh, 2016b, p. 449).

This research provided needed information to expand our understanding of the types of data that are used by teachers as well as the ways that the data are used. However, there are gaps in understanding that remain. This study is limited because only low-income, high needs schools were included. Additionally, schools were intentionally selected from schools that had been engaging with data for at least two years and were identified as schools that "demonstrated a strong use of data" (Farrell & Marsh, 2016b, p. 430). However, these schools also had not met accountability standards for at least 5 years. The case study teachers were selected for

participation by the school leadership and were primarily Language Arts teachers who participated in professional learning communities (PLC) and/or worked with a coach Farrell & Marsh, 2016b). The present study extends the information learned in this study by including teachers in additional content areas as well as schools that have and have not met accountability standards. The need for this additional research was noted in the implications section of the Farrell & Marsh (2016b) study. Additionally, it is important to understand the action and analysis tasks in which teachers engage (Farley-Ripple & Buttram, 2014) and the specific ways that teachers use data (Farley-Ripple et al., 2019).

<u>School Context</u>

The school context impacts the types of data that are used and the importance of data use. Teachers in high achieving and low achieving schools differ in their opinions of the value of data use as well as in their practice of using data. Wayman and colleagues (2012) conducted a mixed methods study including focus groups, interviews, and survey data from teachers in three school districts in Texas that volunteered to participate in the study with the hope of improving data use. Interviews with teachers in a high achieving school indicated that teachers focused on state tests. Since students were successful on these tests, teachers believed that data use was not necessary (Wayman, Cho, Jimerson, & Spikes, 2012; Wayman & Jimerson, 2014). The school district encouraged teachers to use formative assessment data, but the success with this effort was limited (Wayman, Cho, Jimerson, & Spikes, 2012). In the district that had the lowest state scores of the three districts in the study, teachers used multiple data sources but also viewed the state test scores as very important (Wayman & Jimerson, 2014). Teachers in all three districts felt that if they were able to increase their ability to use formative assessment data, they would be able to make better instructional decisions to benefit students (Wayman & Jimerson, 2014). Although

the principals chose the teacher participants for the focus group interviews, which may have limited the range of voices, the results are consistent with teacher perspectives in other studies.

Kerr and colleagues (2006) conducted a comparative case and mixed methods study of three school districts that had been working with the Institute for Learning (IFL) for at least one year. For each of these districts, school improvement was a high priority. Two of the school districts emphasized the use of data for decision-making more than the third school district. One of those districts focused on using data for planning and the other focused on analysis of interim assessments. These two districts also provided more professional development on data analysis and interpretation (Kerr et al., 2006)

Although two of the school districts in this study focused on data use, their methods differed. One school district, Monroe, that focused on data use, chose to emphasize interim assessments. This use of assessments was different from the formative assessments used in the other two districts because they were more formal. Kerr and colleagues described these assessments as "a comprehensive set of standards-aligned assessments in all grades and core subjects linked to a sophisticated data management system" (Kerr et al., 2006, p. 508). These assessments were given two to three times per year and were described as "something between formative and accountability data" (Kerr et al., 2006, p. 508-509). While administrators and district leaders viewed these data as useful, teachers had mixed feelings. Although some teachers used the data to make instructional changes, many felt that their own classroom assessments were more beneficial and that these data did not provide any additional information that was not already identified using the classroom assessments. Additionally, they felt that including another test took away from instructional time (Kerr et al., 2006).

The other school district, Jefferson, emphasized data use within the school improvement planning (SIP). School leadership and coaches helped teachers to use grade level assessments to identify student needs and develop instructional strategies to improve student performance. Higher need schools received additional support. Teachers indicated that although the process was time-consuming, they felt that it was helpful for determining student needs. The teachers noted that this process, which they felt utilized the knowledge of the staff, impacted their collaboration with colleagues, as well as their instructional practices. This view of data use for instruction was very different from the teachers in the other districts who viewed school improvement plans as "compliance documents" (Kerr et al., 2006, p. 508).

Other studies have also shown differences in the use of data based on the school context, particularly showing differences between schools that were high achieving or had met accountability standards and schools that were low achieving or had not met accountability standards. In some lower achieving school districts, the emphasis on accountability distracted from the importance of changing instructional practices. Accountability impacted higher performing schools, as well, but not in the same way. Teachers reported that they felt data use was only for accountability, which meant that they did not need to use data since their school was successful on standardized tests (Wayman, Cho, Jimerson, & Spikes, 2012). This was the only context that had a substantial impact on teachers' opinions of data between districts (Wayman, Cho, Jimerson, & Spikes, 2012). Herman and Gribbons (2001) found that teachers in a high achieving school believed in their ability to use data to improve student learning, while teachers in a low achieving school were afraid that the data would be used punitively.

In their 2001 study, Herman and Gribbons consulted with two school groups, including a high school, a middle school, and elementary schools, during their data inquiry process. The two

school groups were vastly different in their approaches, their use of data, and the results of their data investigations. School group A was in a high socioeconomic status community but had a diverse population due to voluntary bussing. The standardized test scores for this group were generally high. School group B was in a low socioeconomic status community and served primarily minority students. Administrators were under intense pressure to improve the state test scores because they were low. Both school groups were participating in a data inquiry process, but in very different ways and with different results (Herman and Gribbons, 2001).

In this study, the inquiry team for school group A consisted mainly of teachers, but also included administrators. The team met frequently and was led by an experienced and knowledgeable assistant principal. In contrast, the inquiry team for school group B met less often and included only principals, although teachers were included in the content teams. The authors noted that in the initial phase of data inquiry only the principal who led the team participated in the process (Herman and Gribbons, 2001).

School group A began the process by focusing on the standardized test results that were used as public indicators of student learning. After an initial review indicated that overall student performance was strong but that some subgroups were not performing as well as other groups in the school, the team decided to focus on mathematics, hoping to improve student learning and increase the number of students in advanced coursework. Through a series of analyses, additional questioning, and requests for additional data, the team was able to use data to identify some potential barriers to student success for the subgroups of students as well as develop a plan to support student success. Additionally, the team planned to evaluate the effectiveness of their plan (Herman & Gribbons, 2001).

The data use process for school group B was significantly different. The preliminary analysis of data for school group B indicated that students overall, and within the subgroups, were performing poorly. Since a single area of need was not identified from the initial data, this school group decided to focus on literacy, using additional assessments that were developed to track student performance. A group of teachers volunteered to participate and use multiple sources of data including a teacher created writing assessment, an external diagnostic reading test, and the standardized test used for accountability purposes. Rather than using the data from these assessments to identify areas of concern or solutions, the team dismissed the results and identified reasons why the assessments were not appropriate, and students would presumably not improve. Even after selecting an assignment to use with their classes, most team members did not bring the student work to the meeting for review (Herman & Gribbons, 2001).

The results of this study showed the importance of the school context to the manner in which the data are used. While the leadership and the culture of the two schools affected the ways in which the data were used, the authors noted the impact of the political context:

> In one case, the school team felt empowered by data and the planning process; they felt confident they could use the data to improve opportunities for their students. In the second case, the teachers felt disenfranchised and devalued by the data. They feared that the data would be used against them and felt little sense of efficacy.
> Herman & Gribbons, 2001, p.25

The authors also noted that schools must ensure there is a sense of community and have common goals (Herman & Gribbons, 2001).

Farrell and Marsh (2016a) conducted a comparative analysis of five middle schools over one year during the 2011 - 2012 school year. The schools selected were in three districts in one

state and had been engaged with data use initiatives for at least two years. They found that various factors contributed to teachers' responses to data. When using external data or the culture of data use in the school was compliance oriented, teachers did not change their delivery of instruction based on data. The only condition that produced a change in instruction was having internal and external data as well as supports, such as a coach or PLC, combined with a lack of a culture of compliance,

Given the relationship between school context and data use, additional studies of the factors influencing data use in various environments was needed. The unique virtual learning environment coupled with the lack of standardized testing in the previous year provided an opportunity to expand the understanding of school context and data use.

Impact of Accountability on Data Use

The literature in this section describes the influence accountability-based policies and practices have on data use in schools. This literature shows that the accountability pressures can have unanticipated and undesirable effects such as promoting adverse uses of data. The impact of accountability on instruction and equity will also be addressed.

Accountability has increased the use of data in an effort to improve student achievement. Mandinach (2012) has noted that the requirements for data use in No Child Left Behind (NCLB) have increased the focus on assessing student learning as a measure of accountability. The emphasis for schools is on making adequate yearly progress (AYP) as measured by yearly state assessments that are, often, not directly linked to daily classroom practices. Therefore, this accountability context does not always encourage teachers to use the data to change instructional practices for the purpose of improving individual student understanding. Recognizing this disconnect, there were changes to policy designed to shift the focus of data practices from

accountability to guiding instructional decisions (Mandinach, 2012). However, much of the research indicates a focus on using data to meet accountability standards, often at the expense of student learning.

<u>Accountability and Teacher Practices</u>

Negative views toward test scores and decreased feelings of autonomy and empowerment may inhibit the productive use of data to inform decisions in schools that are facing accountability pressures. Daly (2009) indicated several factors that impacted teacher's responses to accountability including empowerment, involvement, and trust. Teachers reported feeling a lack of power over their classroom decisions and a lack of support for trying new methods. In the schools identified as program improvement (PI), teachers and administrators felt a greater emphasis on test scores and a decreased emphasis on teacher professionalism and judgement (Daly, 2009).

Under pressure from accountability, teachers or schools may choose to engage in practices that will produce short-term gains (Herman & Gribbons, 2001). This could include reducing the content taught, low-level instructional methods such as "drill and kill", or even cheating. These practices are likely to be harmful over time. In extreme cases, schools may not test all students, particularly if they will not perform well, or use selective practices in reporting scores (Herman & Gribbons, 2001). The authors noted, "Under pressure to show improvement, improving test scores, rather than improving learning, can easily become the target" (Herman & Gribbons, 2001, p. 30).

In a 2005 study, Booher-Jennings conducted a qualitative case study in an elementary school in Texas to identify reasons why testing and accountability have produced changes to teachers practices when the other initiatives have not. Both the Texas Education Agency (TEA)

and the media promoted the idea that improvement in test scores is directly related to data-driven decision making. Although the TEA did not require a specific procedure for improving student performance, the school district believed that engaging in data processes would provide a measure of protection. For this district, data-driven decision making did not become another strategy used with other reform strategies, it became the primary strategy. However, the author noted that "teachers use data to facilitate educational triage in an effort to create the impression, if not the reality, of improvement" (Booher-Jennings, 2005, p. 233).

Although teachers in this study were not evaluated based on student scores, they still felt pressure to raise student scores. This may have been, at least partially, due to the promotion of the idea that the measure of good teaching is high test scores. Under this pressure, teachers engaged in some questionable data use practices where some students were given more resources than others. Although use of multiple sources of data was encouraged, the district only used the practice tests that were given to prepare for end of the year tests. This was likely due to the singular focus on this test for accountability. After scores were analyzed, students were separated into three groups, "safe cases, suitable cases for treatment, and hopeless cases" (Booher-Jennings, 2005, p. 232 - 233). Teachers, and the district, chose to focus on the "accountables" and "bubble" students. In some cases, this included identifying students for special education so that they would not be included for accountability. Teacher attention, state remediation funds, and programs for struggling readers were regularly diverted to students who were likely to pass. Although the district did not support referring students for special education to decrease the number of "accountables", other teacher decisions were supported as data-driven decision making (Booher-Jennings, 2005). Ultimately, teachers felt intense pressure to ensure that students would pass the state test. Not only was this viewed as the single factor that separates

good from bad teachers, the test scores were shared publicly in a faculty meeting and the teachers did not want to be associated with a low pass rate. One teacher stated. "The impact of this test is fear - for everybody, teachers and students. Everyone feels like they work all year just to pass this test" (Booher-Jennings, 2005, p. 252).

Although this study investigated only one elementary school in Texas, it provides significant and meaningful information about the potential impact of accountability and testing on data use. Since accountability can impact teacher responses to data, this study provides important context for the present study. This study, however, included schools that are accredited and those that are not accredited. Additionally, the accountability context is different in the present study as students are not required to pass the standardized tests to move to the next grade and tests were not used for accreditation status during the school year investigated. Therefore, the present study added additional information about the impact of accountability within a very different context.

In a study of 150 fourth and fifth grade reading and mathematics teachers, Valli and Buese (2007) investigated how teachers assist struggling students. Over a four-year period, the researchers observed teachers and conducted focus groups. The teachers included in the study taught in 25 lower or middle socioeconomic status schools. The data for this study were primarily from interviews with principals, teachers, specialists, and staff developers. The researchers determined that teachers predominantly used assessments and accountability measures for instructional decision-making. As accountability pressures and requirements increased, teachers were often so busy with tasks such as grouping, remediation, completing data meeting paperwork, and learning to use data that they did not have time to focus on improving instruction. These tasks often required them to spend less time in student interactions resulting in

less knowledge of students rather than greater knowledge. The instructional focus changed as well, as teachers began to focus more on basic skills and test preparation after testing pressures increased (Valli & Buese, 2007).

As the emphasis on accountability increased, teachers tested students regularly and had large amounts of student data available. However, there was little time to learn to analyze or use the data and the teachers felt that the increased testing negatively impacted their relationships with their students. Moreover, teachers questioned the value of student information gained through testing data believing that their interactions with students produced equally valuable information. For many teachers, regular data meetings took place, which some teachers found to be helpful for collaborating with colleagues. Others viewed these meetings as an accountability measure and felt that they were too time consuming. The impact of this accountability pressure was felt more acutely in schools with greater populations of struggling students (Valli & Buese, 2007).

This study increased the knowledge about how data use within an accountability context may impact instruction. The present study will seek to add to this knowledge by including different grade levels and additional content areas as well as shifting learning environments.

Accountability and Equity

Standards of accountability include provisions for closing "achievement gaps" for specified groups including low-income students, minority students, and English learners. Datnow and Park (2018) identify both benefits and challenges with this system. Although it can be helpful to recognize inequalities, this can lead to undesirable data use practices to "close the gaps" (Datnow & Park, 2018). Even the use of the term "achievement gap" has been associated with identifying students or groups of students as inferior (Datnow & Park, 2018; Ladson-

Billings, 2006). Additionally, accountability pressures often have a greater impact on schools with high poverty and greater populations of minority students and research indicates that schools with greater populations of lower socioeconomic status and minority students are more likely to fail to meet accreditation standards (Kim & Sunderman, 2005). Therefore, the impact of accountability pressures may be more acutely felt in schools with larger populations of students who are identified as minorities or lower socioeconomic status (Kim & Sunderman, 2005; Valli & Buese, 2007). Teacher turnover also becomes an issue as teachers leave lower socioeconomic status schools to go to higher socioeconomic status schools where the accountability pressures and stress are lower (Valli & Buese, 2007). The authors further note, "Although too many fast-paced policy demands can affect teachers' roles in all schools, the demands that come from high-stakes accountability disproportionately affect teachers in at-risk schools, typically those with higher rates of poor, minority, and ELL students" (Valli & Buese, 2007, p. 553). Therefore, policies that were designed to increase equity may have the opposite effect and unproductive uses of data may increase rather than decrease inequity (Garner et al., 2017). Datnow and Park (2018) argue that equity issues should receive increased consideration stating, "We argue that an equity agenda needs to be at the forefront of the field's understanding and study of data use in schools" (p. 133).

In a 2018 study of middle school mathematics education, Horn found that when educators were working within the policy guidelines, inequity was often increased rather than decreased. Although their aim was to meet the NCLB expectations of equitable student achievement, negative stereotypes were reinforced, and inequitable practices were undertaken. Teacher teams used data to group students and provide additional resources to the students on the border of passing. Even within the group of students who were on the border of passing, not all were given

the opportunity to participate in supplementary instruction as teachers were instructed to ensure that the "right [kids]" were selected for math camp. Although the intent was likely to promote achievement, the designation of the African American subgroup as the "most difficult sub-pop" may have unintentionally reinforced deficit thinking and negative stereotypes (Horn, 2018).

Teachers in Horn's (2018) study generally relied on assessment data over teacher judgement without question. In this study, teachers noted that student performance on the assessment differed from what teachers expected based on classroom performance. Teachers assumed that the assessment results, rather than their expectations based on classroom performance, were correct, without considering other possibilities such as test misalignment or faulty test items. With one noted exception, the math coach and teachers felt it was more important to spend an entire day retesting students than to teach students based on the information already known. Although one teacher believed the assessment was being given to practice test taking, other teachers felt that additional testing was more important than additional instruction (Horn, 2018).

These methods, though not desirable, are inadvertently encouraged by the threat of sanctions, limited resources, and the expectations of immediate improvement (Horn, 2018). Additionally, by only measuring student learning through the lens of a singular standardized test, the evaluation of effective teaching is potentially reduced to the ability to produce results on that test further encouraging practices that earn test scores rather than change instruction (Horn, 2018). Associating test scores and good teaching can be taken to the extreme. Horn (2018) described how a database ranking New York City's teachers based on test scores prompted the New York Post to identify the teacher with the lowest scores including her name, picture, and salary. At no time did the newspaper consider the small sample size or the students involved,

English learners who often took 6th grade tests after only a few months of English instruction (Horn, 2018).

Accountability pressures may cause teachers to resort to actions that are less productive in order to raise scores. The authors stated, "...the pressure associated with assessments creates perverse incentives for improving test scores rather than instruction" (Garner et al., 2017, p. 422), which can include the use of one measure to determine a student's ability. If multiple choice is used, it is particularly difficult to determine student understanding and may impact marginalized students more than others since these tests may not be an accurate reflection of marginalized students' strengths due to the test itself. Additionally, focus on the content and form of standardized tests limits discussions of student understanding and student work, and removes any possibility of consideration of cultural relevance or equity within instruction (Garner et al., 2017). Additionally, the expectations of significant improvement within a short time, create unintended consequences. Low performing schools, which generally have disproportionate percentages of low socioeconomic status and minority students, often focus on remediation or preparing students for success with test items rather than changing instructional practices and promoting deeper learning (Garner et al., 2017).

A qualitative case study of two middle schools and one high school with one district that were "meeting expectations", evaluated the impact of data-driven reforms on equity in science classes (Braaten, Bradford, Kirchgasler, & Barocas, 2017). In this study, the data use initiatives designed to improve student achievement on state tests were "bundled" to try to reduce "initiative fatigue"; however, this was not successful. Teachers felt overwhelmed by the multiple expectations and did not feel a clear sense of focus. The school improvement plan (SIP) included specific ways that science teachers would support math and literacy, including teaching science

concepts through close reading and using AVID Cornell notes. One teacher indicated that due to

the added burdens, she "...lost a little bit of my passion for teaching because I felt that I wasn't

trusted (Braaten et al., 2017, p. 435). The clear purpose of data use was for accountability, and

the framework for the data use was given to the teachers. This limited the teachers' use of the

data to the predetermined tools. Discussions of student understanding of science were limited, at

least partially, due to science teachers' evaluations being tied to math and literacy scores rather

than science scores (Braaten et al., 2017).

Teachers felt that these bundled initiatives increased some aspects of inequity (Braaten et

al., 2017). Teachers were concerned about the focus on some students and an exclusion of others.

Additionally, they expressed frustration with the limited forms of data. Teachers were expected

to use data from student performance in math or literacy. However, some teachers indicated that

this did not help, or even hindered, their ability to understand what their students were doing.

Equity was also considered to be an issue as the instructional practices were designed to teach

skills rather than focus on inquiry or other effective practices. Teachers continued to try to

integrate effective teaching practices, but these instances decreased over the two years of the

study. The authors noted that "students were spending the bulk of their time "learning about" and

very little time "figuring things out" for themselves (Braaten et al., 2017, p. 441).

School accreditation is a measure of accountability. Perceptions of data often differ

between schools that are and are not fully accredited (Daly, 2009) and the ways in which data are

used may increase or decrease equity within and between schools (Datnow & Park, 2018).

Herman and Gribbons (2001) identified differences between teacher perceptions of data use

based on the achievement level of the schools. Similarly, in a study of two schools, one high-

achieving and one low-achieving, differences in perceptions and the value of data were identified

(Moriarty, 2013). Teachers in the high-achieving school viewed data positively while the teachers in the low-achieving school perceived data use as an unnecessary burden (Moriarty, 2013).

The present study will add to the current understanding of the relationship between data use and accreditation status. Previous research has often been focused on schools that either were or were not meeting accountability standards. Conducting a mixed methods study of whether differences exist in the data use practices of middle school teachers in both accredited and non-accredited schools in one school district provides additional knowledge of these contextual factors that impact data use.

Data Use in the Virtual Environment

The 1990's saw an increase in the need for online learning, This initially began in response to concerns such as dropout rates and safety. Later, online learning was used to respond to other needs or provide access. This included providing instruction for families whose work or other factors required mobility, such as military families, or creating opportunities for students to take courses that are not offered at their school (Toppin & Toppin, 2016).

Research on data use in the virtual environment is limited and predominantly focused on higher education. A review of 619 online learning studies conducted between 2009 and 2018 identified only 53 studies related to K12 instruction. Of those studies, only five (5) or just over 0.8% of the 619 studies were related to course assessment. Topics listed that might be included in that subgroup included online exams, proctoring online exams, peer assessment and feedback, and alternative assessments. Data use was not mentioned (Martin, Sun, & Westine, 2020).

When moving from traditional instruction to online instruction, more than simply the environment must change. DeNisco (2013) notes, "With online instruction comes a change in the

nature of teaching, communicating with and assessing students" (pp. 38-39). Some suggestions included ensuring that students understand expectations and grading criteria and using different assessment strategies to gauge student understanding (DeNisco, 2013). While these important aspects of assessment were included, effective practices for data use in a virtual environment were not shared.

With the unprecedented closure of schools in March of 2020 due to the COVID-19 pandemic and the shift to virtual instruction, an instructional design model was developed by Wang (2021) to support K12 teachers with online instruction. To determine teachers' needs, an eight-question survey was sent to K12 teachers. Eighteen responses were received from public and private school teachers in China and the United States. Phone interviews were also conducted with teachers. "How do I know my students are learning?" was an area of need identified by the teachers. Suggestions were shared in a table and feedback was solicited from teachers. Revisions were made and feedback was sought again. For the third revision, experts in instructional design were also contacted. The experts shared that teachers adapted quickly to the new environment and likely needed pedagogical assistance in addition to the fundamentals of remote learning. Evaluation was included within this model. Suggestions for evaluation included using the Learning Management System to evaluate student learning with a variety of measures or metrics, encouraging peer and parent evaluation of work, using assessment to promote learning, and providing opportunities for students to reflect and self- assess. Additionally, instructors were encouraged to share regular feedback with students and hold office hours to provide assistance (Wang, 2021). Although this is not a research study on virtual learning or data use, the model of support for effective learning shows a desire and need for teachers to effectively measure and improve student learning. The present study will expand the

understanding of effective practice, identifying ways in which teachers adapted their data use practices within this environment.

A National Education Policy Center study of demographics, revenues, and expenditures of the 48 full-time virtual public schools managed by K12 during the 2011 – 2012 school year was conducted by Miron & Urschel (2012). This showed that students in the virtual schools performed significantly lower than traditional schools on the measure of AYP with 51.1% of traditional schools meeting AYP and 27.4% of virtual schools meeting AYP. It should also be noted that the population of students identified with a disability was similar for the traditional and virtual schools, and the virtual schools typically served fewer students identified as English Language Learners (Miron & Urschel, 2012). Although this is only one measure of potential student performance, this large gap should not be disregarded.

Since data use was not specifically investigated in these studies, the present study will add a new layer of information to provide support for teachers' instructional and assessment practices in the virtual environment. This is particularly important given the research supporting data use as a means of student improvement.

Summary

The purpose of this literature review is to situate the research questions in the theoretical and empirical research. The extensive literature on data use identifies the impact of accountability, school context, and school level factors on data use. However, much of the previous research to date has focused on elementary schools and limited studies exist investigating data use in virtual and hybrid environments. This study will add to this knowledge base by investigating data use in shifting learning environments in middle schools with both survey research and interviews to provide additional insights.

Data use has been encouraged or required by policymakers for almost 20 years beginning with data use expectations that were included in the No Child Left Behind legislation in 2001 (Means et al., 2010). In 2012, Education Secretary Arne Duncan encouraged education schools to include instruction in data use (Mandinach, 2012). Additionally, beginning in 2019, Virginia has included requirements for assessment and data use in teacher preparation programs (Code of Virginia, 8 VAC. 20-23-190). Although an emphasis has been placed on data use, the extent to which data are being used is not clear.

Theoretical Framework

Based on the work of Schildkamp, Poortman, Luyten, and Ebbeler (2017), the present study is situated in a framework of data use for accountability, school improvement, and instruction. Although their research was conducted in The Netherlands where teachers have greater autonomy and accountability is generally decentralized, this framework is still relevant when considering data use for continuous improvement. This research considered accountability and improvement together, and the researchers noted that the results could be applied to other countries that may have different accountability pressures (Schildkamp et al., 2017). Given the lack of state standardized testing in the year prior to the present study (2019 – 2020) due to the school closures during the COVID-19 pandemic and the state standardized testing without attachment to accreditation at the end of the 2020-2021, this research is particularly applicable.

Federal accountability legislation has encouraged the use of data and, more recently, state legislation in Virginia added a requirement for instruction in the use of data in preservice programs. Ideally, teachers will use data to make instructional changes that will increase student achievement. However, the pressure from accountability can encourage teachers to use data in both positive and negative ways and may unintentionally push teachers to resort to unproductive

data practices in an effort to improve scores on accountability measures (Booher-Jennings, 2005; Grant, 2000). In the current environment, accountability testing will occur without the additional pressures associated with linking test results to accreditation status. Although accountability will be considered, the primary intent of this study is not to identify the impact of accountability on teacher's data use practices, but to examine how teachers used data in response to shifting learning environments within this accountability context.

Chapter 3: Methodology

Purpose

The purpose of this study was to examine teachers' data use practices in the shifting learning environments caused by the COVID-19 pandemic within one diverse school district in Virginia. The chapter is organized to detail the procedures used to address the research questions.

Research Design: Mixed Methods Case Study Design

The present study utilized a mixed methods case study design, including descriptive and comparative non-experimental quantitative survey research, qualitative interviews, and data artifacts. In reference to mixed methods designs, Creswell and Plano Clark (2018) stated, "The primary intent of this design is to use a qualitative strand to explain initial quantitative results" (p. 77). The survey data provided an incomplete picture of the ways teachers use data and the factors that impact data use. The limited questions and constructs measured did not fully capture the nuanced and contextual nature of data use, particularly in the virtual learning environment of the 2020 - 2021 school year. Additionally, teachers may use data in different ways or have additional insight about data use that are not addressed in the survey. The unique learning environment presented additional challenges to using survey data to gain a thorough understanding of the challenges and opportunities presented by this shift, and data use surveys were not developed to specifically address virtual learning. Therefore, the survey alone would not provide adequate information to fully understand how teachers engage with data, particularly in the online environment. Thus, a qualitative aspect of this study was needed.

Case Study Design

Decisions about the type of research that is most appropriate for a study are connected to the form of the research questions, the amount of control over the events and the focus of the

research (Yin, 2018). As a study designed to identify how participants responded to current events without control over the events, case study design is most appropriate for the present study (Yin, 2018).

The form of the research question is the primary factor used to determine the research design. Yin (2018) notes that case study research is generally guided by "how" and "why" research questions. He states, "This is because such questions deal with the tracing of operational processes over time, rather than mere frequencies or incidence" (Yin, p. 10). When defining a case, an individual is often the only consideration. However, Yin (2018) states, " Of course, the "case" also can be some event or entity other than a single person" (p. 29). Further, Maxwell (2013) notes that in case study research a particular group is selected for study rather than sampling from the larger population as is the procedure in a sampling study. The present study was designed to understand the ways data use practices of the teachers in one diverse school district were influenced by the shifting learning environments caused by the COVID-19 pandemic. Therefore, as a study designed to describe one group or "case" of teachers within the context of the virtual and hybrid learning environments, case study methods were utilized.

<u>Survey Research</u>

Survey research allows for greater understanding of the research topic by including a large group of participants. According to McMillan (2016), "Surveys are versatile in being able to address a wide range of problems or questions, especially when the purpose is to describe the attitudes, perspectives, and beliefs of a large population…" (McMillan, 2016. p. 226). Mitchell and Jolley (2013) identified similar benefits to survey research noting, "A survey can be a fast and inexpensive way to collect a lot of information about a sample's attitudes, beliefs, and self-reported behaviors" (Mitchell & Jolley, 2013, p. 286). Thus, a survey was ideal as an initial

measure of teachers' reported data practices for the present study. Although the research was limited to four schools in one school district, including all core content teachers from schools in this large and diverse school district allowed for a variety of responses.

Positionality

Researcher bias is a threat to the validity of conclusions in qualitative research. Thus, it is important to acknowledge and address my positionality as is related to the study. As Maxwell (2013) states, "Explaining your possible biases and how you will deal with these is a key task of your research proposal. As one qualitative researcher, Fred Hess (personal communication), phrased it, validity in qualitative research is not the result of indifference, but of integrity" (p. 124).

Although I no longer work in the K12 environment, much of my career has included working in schools as a teacher or supporting role, such as an instructional coach. Even though I no longer work in K12 schools, in my current position as the Assistant Director of a Career Switcher program, I participate in training and mentoring adults who want to become teachers or who have accepted a position as a teacher. As a former employee of the school district involved in the study, it was important to be aware of and caution against any biases, both conscious and unconscious. Additionally, I knew some of the interview participants prior to the interview. This allowed for ease in establishing trust, but it was important to guard against any preconceived notions that I might have. Consistent journaling and detailed field notes to document thoughts, actions, and questions were used to routinely check for assumptions and guard against bias. The unique nature of this teaching environment, one in which I did not work and has not existed at this level previously, allowed for some separation from any preconceived notions I may have had. Moreover, I have a vested interest in accurately understanding teachers' data use practices

and the factors that influence these practices so that I am able to identify ways to create learning experiences that promote effective data use to positively impact student learning.

Research Questions

The study was guided by the following research question:

1. In what ways did the shifting learning environments influence teachers' data use practices?

2. What assessment data sources do teachers use in virtual and hybrid teaching environments?

3. What actions did teachers take in response to data in virtual and hybrid environments?

Study Setting

The school district in which the research was conducted is a large, suburban school district in a southeastern state with more than 50,000 students and 3,995 teachers. There are 12 middle schools with close to 12,000 students. In this school district, 37.9% of the students are white, 35.9% of the students are African American, 11% of the students are Asian, 10% of the students are Hispanic, 5% of the students are multiethnic, 0.2% of the students are American Indian, and 0.1% of the students are Pacific Islander. More than 42% of the students are classified as economically disadvantaged and 10.1% of students are English Language Learners.

The 2020 – 2021 school year began with almost all students in the participating school district learning virtually. For some students, including some PK – 3 grade students, some students in special education, some English learners, and some students in special programs, there were options for some limited in-person instruction. All other students were learning virtually, with both synchronous and asynchronous learning activities occurring. The school day for students began at 8:30 am and ended at 3:00 pm, with 30 minutes after the end of the day

identified as time for instructional support or office hours. For students to be considered present in the virtual environment, they were required to interact with the teacher or complete an assigned task by midnight on the day of the class. In early fall, the school day was reduced by one hour, with the school day ending at 2:00 pm. Class times were also reduced to 60 minutes (school district communication).

Beginning in March of 2021, all students were given the option to return to school for in-person learning four days each week, with one day reserved for virtual learning. Some students returned to school while most students remained virtual. Therefore, teachers were providing instruction to students who were learning in-person as well as students who were learning virtually in the same class. On the virtual learning day, all students participated in 30 minutes of social emotional learning activities. The remainder of the day was reserved for asynchronous learning, including completing previously assigned coursework. Teachers also held office hours to support student learning (school district communication).

Sampling, Recruitment and Participants

In a teaching and learning environment that is increasingly rooted in accountability and equity, sampling methods were designed to capture teachers' data use practices in schools that were accredited and schools that were not accredited in one school district. The participants for this study were middle school teachers from four schools in one diverse school district. Two of the schools were fully accredited and two of the schools were not fully accredited. Teachers who teach one of the four primary contents, mathematics, English/language arts, science, and social studies, were invited to participate. Including all four core content teachers provided varied perspectives since different subjects are impacted by accreditation and use data in various ways. Some courses in each of these contents have required standardized tests at the end of the year

and some courses do not. Some of these standardized test scores are included when determining the accreditation status of the school and some of the standardized tests are not included. Further, accreditation for mathematics and English include growth indicators as well as passing or failing scores. Therefore, teachers' use of data may reflect some of these differences, as well.

Based on the work of Ebbeler, Poortman, Schildkamp, and Pieters (2016), the participants were selected from one school district. The data use expectations and information from the central leadership is more consistent when comparing groups within one school district than would be if schools were compared across school districts. This helped to control for variation that may occur due to different policies and expectations at the district level (Ebbeler et al., 2016). Differences at the school level may still exist due to the school leadership. However, the use of a singular school district allowed for a greater understanding of differences between schools that are not based on district level policy. Wayman et al. (2016) also cautioned against using the survey for comparisons across school districts. They stated, "Instead of comparing the survey findings with outside sources, it is better to conduct comparisons within a particular context" (Wayman et al., 2016, p. 23).

Recruitment of participants occurred in two phases. The school district in which the study was conducted controlled all aspects of recruitment of participants for the survey. Once the survey was approved by both the school district and the University IRB committee, the school district sent an email with the link to the survey to the potential participants. Teachers in all four core content areas, English, mathematics, science, and social studies, in four schools were invited to participate. Teachers from two schools that are fully accredited and two schools that are not fully accredited were selected to receive the survey. The school district selected the schools and identified the teachers who should receive the email based on the selection criteria. Two follow-

up emails were sent by the school district to try to increase participation and the principals of the schools also sent emails requesting participation.

The survey was initially open from October 19, 2020, until October 30, 2020. After the initial email and reminder email were sent, the response rate was very low. The school district agreed to send another follow-up email and the survey remained open until the middle of November. Even with the additional follow-up email, the response rate remained low. The survey was sent to 129 potential participants. Twenty-two teachers completed the entire survey or almost the entire survey, resulting in a 17% response rate. Even though the response rate was lower than expected, the survey data provided useful contextual information about teachers' use of data in the study sites, thus providing additional context for the other forms of data collection. The number of teachers by accreditation status of the school are shown in Table 1.

Table 1

Survey Participants

	Accredited	Non-accredited	Total
Number of Teachers	9	13	22

At the end of the survey, participants were asked if they would like to participate in an interview. Participants who selected yes were prompted to complete an interview interest form to provide their email contact information. All participants who indicated a willingness to participate in an interview were emailed and invited for interviews. All participants agreed. The interview recruitment email is in Appendix B.

The interview participants included mathematics, science, and English teachers from the four middle schools. Two science teachers, four math teachers, and three English teachers volunteered to participate in interviews. No social studies teachers volunteer to participate in

interviews. Five of the nine participants hold leadership positions in the school or their content area. Pseudonyms were used to mask participant identities. Interview participant pseudonyms and teaching experience are shown in Table 2.

Table 2

Interview Participant Experience

Participant Pseudonym	Teaching Experience
Jessie	Early Career
Hunter	Early Career
Reese	Early Career
Peyton	Experienced
Morgan	Experienced
Jordan	Experienced
Jamie	Experienced
Kris	Experienced
Kerry	Experienced

Measures

For the present study, survey data and interviews were used to measure teachers' use of data in middle schools. While survey research often indicates practices used by teachers, most surveys do not provide a full picture of data use (Farley-Ripple & Buttram, 2014). The authors noted that almost half of the teachers surveyed by Hoover and Abrams (2013) used data in ways that were not included in the survey (Farley-Ripple & Buttram, 2014). Therefore, it is important to include interview data with the survey data. The data from the survey and the interviews were

combined to provide a more complete picture of the types of data that are used in schools and the ways in which the data are used.

<u>Teacher Survey</u>

The survey used for this study was the Teacher Data Use Survey developed by Wayman and colleagues (Wayman et al., 2016). This survey includes versions for teachers, administrators, and support personnel to measure teachers' data use practices. For this study, only the teacher survey was used. Unless teachers shared an email address to volunteer to participate in an interview, no identifying information about the participants was collected. Participants were assured of the confidentiality of their results.

The teacher survey is separated into nine scales measuring the five components. The five major components for the survey are: teacher actions with data, teacher competence with data, teacher attitudes about data usefulness, teacher collaboration around data, and the organizational support that is available. After review, the school district requested decreasing the length of the survey. To shorten the survey, most or all of the organizational support that is available, the collaboration around data, and the attitudes toward data usefulness were removed from the survey given to teachers to decrease the amount of time needed to complete the survey. These portions were selected for removal because the lack of inclusion would not impact the researcher's ability to answer the research questions.

The survey is designed to be adapted to measure the teachers' data use practices around specific data that is selected by the researcher based on the types of data that are available and may be used by teachers. For this study, the forms of data that were considered were: 1) Standards of Learning (SOL) test data (state test), 2) Common Assessments (Local or school-based assessments), and 3) Classroom Assessments (Teacher created formative assessments that

are used individually). The pilot tests conducted when developing the survey indicated high reliability for the scales with a Cronbach's alpha of 0.85 or higher (Wayman et al., 2016).

The Standards of Learning (SOL) test is a state test used in accreditation ratings at both the state and federal level. SOL tests are given in reading and mathematics to all sixth grade, seventh grade, and eighth grade students. Students also take SOL tests in Writing in Grade 8, Physical Science (Grade 8 science) and Civics (Grade 8 social studies). Students enrolled in Earth Science or World History, which are high school credit courses, take an SOL test at the end of the course, as well. Students take SOL tests in the spring, generally in May and June. Unofficial individual student test scores are available to the schools quickly for most tests, generally within a few days and often within hours. Official individual student scores are usually available over the summer and official school accreditation status reports are available in the fall.

Common assessments are assessments that are given and reviewed by a content or grade level group. These assessments are created locally, usually within the school. Ideally these assessments are developed by the team of teachers giving the assessment but may be created by a specialist or coach within the school district. For this study, a benchmark test that is developed and required by the school district would be considered a common assessment. Additionally, teachers must compare and analyze the data from the common assessment with other teachers who teach the same content. For example, teachers who teach Physical Science (Grade 8 science) would give the same assessment and then, compare and analyze the data together whether they teach the content to eighth grade students or seventh grade students.

The third assessment data type investigated was classroom assessment data. Any assessment that a teacher uses in class but does not compare with others in the content team is

considered a classroom assessment. This includes both formal and informal classroom assessments.

A pilot of the survey was conducted with two volunteers prior to collecting data from the sample population. After completing the survey, the volunteers were asked to evaluate the clarity and meaningfulness of the questions and directions and provided an estimate of the amount of time required to complete the survey. They were also asked if there was any additional information about the survey they would like to share. Both reviewers felt the definitions were clear and made sense and that the order was logical. One volunteer suggested adding an option for "do not use" to the questions related to frequency of use. However, if a participant selected that they did not use a particular type of data, that section was skipped for them. Another suggestion was to include the definitions with the questions rather than at the beginning of the survey. The definitions were included with the questions based on this suggestion. One volunteer completed the survey in seven (7) minutes. The other volunteer completed the survey in 20 minutes. Both volunteers felt like it was a reasonable amount of time.

The survey questions were separated into sections. Sample questions for each section are listed below.

Availability and Frequency: Survey questions asked about data that are available, as well as how often each type of data is used.

Frequency of specified actions related to data use: How often do you use data to identify instructional content to use in class, use data to identify instructional content to use in class, and meet with a specialist or another teacher about data?

Attitudes about ability to use data: I am good at using data to diagnose student learning needs. I am good at adjusting instruction based on data.

Collaboration: How often do you and your collaborative team(s) do the following? We approach an issue by looking at data. We explore data by looking for patterns and trends. We identify actionable solutions based on our conclusions.

Open-Ended Question: What else would you like to share with me about data use?

The survey that was used, as well as the initial and reminder emails that were sent, are shown in Appendix A.

Initial Interviews

A semi-structured interview protocol was developed using questions related to the survey, current research, and the research questions. The interview questions were shared with two volunteers who reviewed the questions and then provided feedback. The researcher discussed the feedback with the volunteers and made minor revisions to the questions to improve the clarity. After the survey was conducted and analyzed, the researcher noted a need to ensure that the questions related to the use of standardized test data and the frequency of data use were asked and follow-up questions were asked, if needed. A question asking participants if there are ways that data use has been different this year and if so, how, was added to the interview protocol. Due to the small sample size of interview participants, a question asking participants if they would be willing to participate in a follow-up interview to discuss a data artifact of their choice was added.

Questions were grouped according to topics: Data Sources, Data Use and Supports, Data Analysis and Actions, and Conclusion. Sample questions for topics include the following:

Data Sources: What data do you use? (Follow-up questions addressed the specific data sources being investigated.) How do you decide what data to review?

Data Use and Supports: What impacts the frequency of your data review and use? What are the benefits and constraints to individual and collaborative data review and use?

Data Analysis and Actions: How do you analyze data? What do you do with the analysis?

Conclusion: Would you like to share any other thoughts related to using data that I did not cover during this interview?

At the end of the interview, participants were thanked for their participation and asked if they would be willing to participate in a follow up interview. They were also asked if they would be willing to bring a data artifact to share.

The initial interview protocol is shown in Appendix C.

<u>Follow-Up Interviews</u>

After the initial interviews, follow-up interviews were conducted, later in the school year. For this interview, teachers were asked to bring a data artifact to discuss. The semi-structured interview protocol included follow-up questions that were developed in response to the analysis of the first interviews as well as questions based on a research study conducted by Farrell and Marsh (2016a). In this study, participants were asked to select a data artifact to discuss.

Questions for the follow-up interview were grouped into four sections by topic: Data Artifact, General Follow-up, Individual Follow-up, and Conclusion. Sample questions are shown below.

Data Artifact: Please describe the data artifact you selected. What did you learn about your students' knowledge/skills from your review and analysis of this artifact? How valuable do you find this data? Why?

General Follow-up: Are there any differences in how you use data now that students are back in school after almost a year of remote learning and teaching? If so, what are those

differences? How are you using the data to make decisions? When reviewing data, what are your main goals?

Individual Follow-up: Individual questions were asked based on participant responses in the initial interviews, including questions about requirements, collaboration, and measuring student learning,

Conclusion: How many years of teaching experience do you have? How many years have you been at your school? Would you like to share any additional thoughts related to using data that we haven't addressed?

At the end of the interview, participants were thanked for their participation. At the beginning or the end of the interview, participants were also asked if they would be willing to share their data artifact. All participants agreed.

The follow-up interview protocol is shown in Appendix D.

Data Collection

Both school district approval and university IRB approval were received prior to data collection.

Phase I: Survey

Middle school teachers in one suburban school district in a mid-Atlantic state were asked to complete part of the Teacher Data Use Survey (Wayman, Wilkerson, Cho, Mandinach, & Supovitz, 2016), reflecting on SOL test data, Common Assessment data, and Classroom Assessment data. All teachers who teach one of the four core content areas, mathematics, English, science, and social studies, received an email requesting participation. Two follow-up emails were sent to increase participation. Demographic data asking teachers to identify the content taught, whether an SOL test is given, and whether or not the school is accredited were

added to the survey. Additionally, at the end of the survey, teachers were invited to participate in interviews, providing additional information to enhance the understanding of teachers' data use gained from the survey.

Survey data was collected using an electronic survey delivered by RedCap, a secure internet-based tool for creating and distributing surveys. An internet-based survey was selected because it allowed for an efficient means of data collection. The researchers who developed the survey noted that one benefit to using an online form of the survey is the ability to skip to relevant questions automatically (Wayman et al., 2016). As that is an aspect of this survey, the online form was beneficial. Moreover, this form of survey research was acceptable for the school district.

Phase II: Initial Interviews

From this pool of teachers, nine volunteered for interviews. Participants were invited to participate via the email address that was provided at the end of the survey. The pool of interview participants consisted of four math teachers, three English teachers, and two science teachers. Rapport was established with each teacher at the beginning of the interview to increase the comfort level of the participant. Interviews were conducted by Zoom at a time that was convenient for the participants between December 14, 2020, and January 11, 2021. Interviews lasted from 19 minutes and 42 seconds (19:42) to 49 minutes and 40 seconds (49:40). The total time for the nine interviews was five (5) hours, 7 minutes, and 45 seconds (5:07:45). Interviews were audio recorded and transcribed verbatim by the interviewer, yielding 112 pages of interview transcripts. At the end of the interview, participants were asked if they were willing to participate in a follow-up interview and bring a data artifact to discuss. All participants agreed.

Phase III: Follow-up Interviews

Initial interview participants were invited by email, to participate in follow-up interviews. All nine participants agreed. Rapport was re-established with each teacher at the beginning of the interview to increase the comfort level of the participant. Interviews were conducted by Zoom at a time that was convenient for the participants between March 31, 2021, and April 27, 2021. Interviews lasted from 28 minutes and 17 seconds (28:17) to one hour, 19 minutes and 17 seconds (1:19:17). The total time for the nine follow-up interviews was seven (7) hours, 56 minutes, and 16 seconds. Interviews were audio recorded and transcribed verbatim by a professional transcription service, yielding 163 pages of interview transcripts. During the follow-up interviews, teachers selected a data artifact to discuss. Data artifacts included warm-ups, classwork activities, and summative assessments and the data collected using these assessment sources. No additional interviews were requested after the follow-up interviews.

Data Management: Participant Privacy and Data Storage

Participant information and privacy are being protected. No identifying information was collected for the survey unless participants chose to participate in an interview, in which case, they added an email address. Teachers' email addresses were removed from the data file and stored separately so that identifying information was no longer directly connected to participant answers. Email addresses were replaced with an identification number and the document matching emails to identification numbers was stored separately. Next, each participant number was replaced with a pseudonym. The participant numbers with pseudonyms are stored separately from the other files. All files are stored on a password protected computer.

Once the audio recordings of the interviews were downloaded from the recording device, the recordings were deleted from the device. The files were saved on a computer that is password

protected. The transcribed interview files only identify participants by number. The data artifacts are also labeled with the participant number rather than a name. The transcripts and data artifacts are saved on a computer that is password protected.

Per university guidelines, the files will be disposed of according to Virginia Commonwealth University's protocol once all aspects of the study and dissemination have been completed.

Data Analysis

The quantitative survey data was collected and analyzed first, followed by the qualitative interview and artifact data. Finally, the data were combined, and an analysis of the integrated data was completed. The data analysis for the quantitative data included reporting demographic and descriptive statistics. Stata was used to calculate the frequencies of responses.

Phase I: Survey Data

After the survey data was collected, the data set was cleaned. Thirty-one teachers started the survey. Five teachers did not answer any questions. Out of the fifty-one questions, including demographic questions, two teachers answered fewer than one-fourth of the questions and two other teachers answered fewer than 40% of the questions. During the data cleaning process, the responses for these nine teachers were removed. Two additional teachers did not complete the survey, but answered all question sets except for the questions about their collaborative team. These responses were retained, leaving 22 surveys to review. Stata was used to calculate the frequency of responses for the twenty-two participants, separated into the frequency of responses for teachers who teach in a school that is accredited and teachers who teach in a school that is not accredited.

<u>Phase II: Initial Interviews</u>

Once each interview was complete, the researcher transcribed the recorded interview verbatim. Notes on the interviews were recorded after each interview as well as during the transcribing process. These notes included both reflection on what participants said and questions about what was said. Using these notes, the interview protocol was refined, and additional questions were included in subsequent interviews. Once all interviews were complete, the coding process began.

When analyzing case study data, Yin (2018) states, " Whether using computer-assisted software or not, one starting point for any analysis is to "play" with your data. You are searching for patterns, insights, or concepts that seem promising" (p. 167). Similarly, Maxwell (2013) recommends that the analysis process begin with reading the transcripts and notes. He states, "During this listening and reading, you should write notes and memos on what you see or hear in your data and develop tentative ideas about categories and relationships" (Maxwell, 2013, p. 105). Therefore, the transcripts were read to have an overall understanding of the participants' responses as well as to identify any patterns or themes that may be emerging. The potential themes were documented along with notes related to the participant responses. Next, the transcripts were read and coded. Initial coding was completed on paper and then coding was completed using Atlas.ti. Both a priori and inductive codes were used. Initial deductive codes were developed based on current research on data use and similar codes were clustered together. While reviewing the transcripts and notes, additional codes were added. From this process a codebook was developed. The a priori codes and inductive codes by topic are shown in Table 3 and the initial codebook is in Appendix E.

Table 3

Initial Interview Codes

Cluster	A priori codes	Initial Interview Codes
Access	Availability	Educational Technology Data
Actions	Collaborative Differences Individual	
Analysis	Collaborative Differences Individual	Constraints Documentation Literacy
Collaboration	Benefits Constraints General	Data Meetings Equity
Leadership		Leadership
Requirements	General	Meetings
Use	Attitudes Benefits Constraints Decisions Frequency Procedures Time Virtual	Data Used
Virtual	Benefits Constraints	Collaboration

Since this research was completed by a single researcher, it was important to include a second researcher to code a sample of the interview transcripts. This process ensures the accuracy and credibility of the coding completed individually. Three transcripts were read and coded by a second researcher using the codebook. Any discrepancies in coding were related to different interpretations of the codes. Therefore, as the coding was being compared, the

definitions for the codes were clarified and refined to ensure that codes were clear and unambiguous.

When comparing codes for the first transcript, the researchers agreed completely for 54% of the codes. Of the 45% where the researchers selected different codes, 43% were in the same cluster of codes. The researchers discussed the codes and determined that for many of the differences, the researchers were interpreting the code differently. After discussion, the definitions for the codes were revised to reflect the more complete and clear definitions.

For the second transcript reviewed, 69% of the codes were the same. In 30% of the cases, the codes were applied differently. For this review, 45% of the different codes that were applied were in the same coding family. Again, the researchers met and discussed the differences, and the codebook was refined to reflect this discussion.

When reviewing the third transcript, the researchers applied the same codes 85% of the time. For the 15% of codes that were applied differently, 38% were in the same coding family. Only slight revisions were made to the code book at this time as the coding was very similar. After the co-coding of the third transcript was completed and a sufficient level of agreement was achieved, independent coding and thematic analysis was completed.

Phase III: Follow-Up Interviews

Once each follow-up interview was completed, the recorded interview was transcribed verbatim by a professional transcription service. The transcripts were read while listening to the recorded interview to ensure accuracy and errors were corrected. During this process, notes, questions, and potential themes that were emerging were recorded.

After reviewing the transcripts and completing preliminary coding, coding was completed using Atlas.ti. During the coding process, additional codes that emerged during

analysis were added to the previous code list. During the follow-up interviews, teachers shared situations related to data use in the hybrid environment, so a code was added to reflect this new topic. Goals teachers have related to data use also required the addition of a new code. A code for analysis questions was added, since teachers were specifically discussing the questions that were raised when analyzing the data from their selected artifact. Teachers also noted that data may be shared with students for them to use. Therefore, a code identifying the data that are shared with students and how the individual data is shared for students to use was also added. Teachers discussed any changes to data use they might make when students returned to the classroom after virtual learning as well as insights specific to data use in the virtual environment. Codes for virtual changes and insights were added for these topics. In some cases, the existing code was sufficient, but the definition needed to be refined. Once all coding was completed and reviewed, a narrative of the themes that emerged was written.

The coding changes are shown in Table 4 and the final codebook is in Appendix F.

Table 4

Follow-up Interview Codes

Cluster	A priori codes	Initial Interview Codes	Follow-up Interview Codes
Access	Availability	Educational Technology Data	
Actions	Collaborative Differences Individual		
Analysis	Collaborative Differences Individual	Constraints Documentation Literacy	Questions
Collaboration	Benefits Constraints General	Data Meetings Equity	
Hybrid			Insights
Leadership		Leadership	
Requirements	General	Meetings	
Use	Attitudes Benefits Constraints Decisions Frequency Procedures Time Virtual	Data Used	Goals Hybrid Students
Virtual	Benefits Constraints	Collaboration	Changes Insights

Data Integration

Data integration occurred at multiple points in this study. The integration first occurred

after the quantitative data were collected and analyzed. Through this analysis, participants for

qualitative interviews were identified, and the interview questions were revised based on the

analysis of the quantitative data. After the initial interviews, follow-up questions were developed based on the analysis of the Phase I interviews. Once all data were analyzed, the quantitative and qualitative results were considered together. From this integration of data, a more complete picture of data use emerged. A narrative of the integrated findings was developed.

Rigor and Credibility

Rigor was established throughout the study, including the design, the procedures during data collection, and the procedures during the analysis, as well as reflection on the process throughout. Aspects of the study that increased rigor are highlighted below.

<u>Study Design</u>

The study was designed to provide multiple sources of data at three different points. Including a survey, interviews with participants on two separate occasions, and including a participant selected data artifact increases the quantity of data reviewed to identify themes. The initial survey supplied basic information on data use that gave a frame of reference for the interviews. Jimerson (2014) was able to use interviews to identify differences in responses that were not evident from surveys alone. Therefore, including initial and follow-up individual interviews created the opportunity to solicit additional information, producing a more complete understanding of teachers' uses of data. This was particularly important in this unique teaching and learning environment.

Individual interviews allow for more nuanced responses where teachers have the opportunity to discuss data in ways that the survey could not capture. Because the survey data was so limited and the teaching environment was unprecedented, the interviews were essential to providing a full awareness of teachers' experiences. Interviewing teachers in two phases, at different points in the school year, including different teaching and learning environments,

afforded an additional layer of information that increased the depth of understanding about teachers' practices and beliefs about data.

There are both benefits and constraints to using interviews. While interviews can allow the researcher to clarify and better understand participant responses, the researcher may inadvertently encourage certain answers or types of answers (Mitchell & Jolley, 2013). To avoid this issue, leading questions were avoided, and questions were asked in a manner that should not encourage particular responses. Participants were assured that identifying information would not be shared and seemed comfortable and willing to discuss topics freely.

Collecting Data Artifacts

Asking participants to self-report their data use practices is potentially threatened by social desirability. Most teachers are aware that data use is considered to be beneficial for increasing student achievement. Therefore, participants could answer in ways that will make them appear to use data effectively, even if what they describe is not an actual practice. Modeled after the work of Farrell and Marsh (2016a), participants were asked to bring a data artifact to the follow-up interview. Teachers described the artifact, the way in which it was used, information about student learning that was discovered, and next steps based on the data. Inviting participants to share and discuss a data artifact adds rigor to the study as teachers are discussing a specific data item and the ways in which it was used. When discussing their data artifacts, participants were enthusiastic and seemed proud of the product they selected and how it was used. Participants sent copies of the data artifacts to the research for collection.

Reflection and Quality Reviews

Journaling, memos, and looking for alternate conclusions are strategies for ensuring the credibility of qualitative findings. Throughout the study, self-reflection was used to guard against

researcher bias. A recognition of my positionality and personal lens required constant reflection and questioning of all decisions. Journaling and memo writing were used throughout the study to document thoughts and questions related to the study procedures and findings. Maxwell (2013) discusses the importance of memo writing during data analysis stating, "You should regularly write memos while you are doing data analysis; memos not only capture your analytic thinking about your data, but also facilitate such thinking, stimulating analytic insights" (p. 105). These notes were used to both ground and challenge my thinking about the data.

The process of journaling and writing memos included looking for alternate interpretations and trying to identify how my lens could be impacting the emerging findings. When discussing the checklist of strategies to evaluate validity threats, Maxwell (2013) states, "The fundamental process in all of these tests is looking for evidence that could challenge your conclusions, or that bears on the plausibility of the potential threats" (p. 125). At each point in the process, I returned to the data sources to identify specific information that led to conclusions or could be used to challenge them. When findings emerged, questions such as "What data supports this finding?" and "What data challenges this finding?" helped to guard against bias that may have been conscious or unconscious. Additionally, I discussed my thoughts and interpretations with others to gain additional insight. This included seeking input on my conclusions and identifying areas that needed further review or explanation. This is an important part of the process as "Asking others for feedback on your conclusions is a valuable way to identify your biases and assumptions and to check for flaws in your logic or methods" (Maxwell, 2013, p. 127).

Intercoder Reliability. Thirty percent of the initial interviews were read and coded by a second researcher. After each interview was read and coded independently, the agreement was

calculated. The researchers discussed the similarities and differences and came to agreement on the coding to increase the rigor of the analysis. Saldana (2016) states, "Team members can both code their own and others' data gathered in the field to cast a wider analytic net and provide a "crowd-sourcing reality check" for each other" (p. 37). This process also ensured that codes were being applied methodically and meaningfully, decreasing the bias that can come from singular interpretations. Additionally, the definitions for the codes were refined to enhance clarity.

Transparency

Documentation of steps in each process as well as decisions that were made during the collection and analysis of data add rigor to the study. Since the concern with qualitative research is to understand rather than eliminate bias that may exist (Maxwell, 2013), transparency in reporting the steps in the process as well as the decisions that were made provide specific insight to the considerations and thought process for the data collection and analysis. These procedures can be reviewed and evaluated by others.

Summary

Several strategies were used to increase the rigor of the study and the credibility of the study. These included: design to collect multiple forms of data, the inclusion of a specific data artifact, co-coding of data, journaling, memos, and considering alternate possibilities. Additionally, transparency in the procedures used for data collection and analysis increase the quality of the research study.

<center>**Chapter 4: Findings**</center>

The present study used survey data and a case study approach to explore teachers' data use practices in the shifting learning environments during the 2020 - 2021 school year. This design is ideal for this study as Yin (2018) describes case study research as "an empirical method that investigates a contemporary phenomenon (the "case") in depth and within its real-world context" (p. 15). Additionally, case study research employs the use of multiple sources of data. Therefore, the use of interviews conducted at two time periods, and the discussion and collection of data artifacts along with the survey data require this approach. Yin (2018) further states that "survey research can try to deal with phenomenon and context, but a survey's ability to investigate the context is extremely limited" (p. 15). Therefore, both survey data and a case study design for qualitative data were needed to fully explore this topic.

Yin (2018) identifies several approaches to reporting case studies. As mixed methods case study research with data collection occurring during three distinct time periods, the findings will be presented chronologically. Since the research methods are connected and complementary, Yin (2018) suggests analyzing and reporting each aspect separately before combining the findings. Therefore, analysis was conducted after each phase, the survey, the initial interviews, and the follow-up interviews, and the results are reported separately as suggested by Yin (2018).

Research Questions

The purpose of the study was to explore how teachers' data use was impacted by the shift to virtual learning and then hybrid learning due to the COVID-19 school closures. The study was guided by the following research question:

1. In what ways did the shifting learning environments influence teachers' data use practices?

2. What assessment data sources did teachers use in virtual and hybrid teaching environments?

3. What actions did teachers take in response to data in virtual and hybrid environments?

Initial information about data use by mathematics, science, English/language arts, and social studies teachers was collected using an abridged version of the Teacher Data Use Survey (Wayman, Wilkerson, Cho, Mandinach, & Supovitz, 2016). At the end of the survey, teachers interested in participating in interviews were asked to share their email addresses. These teachers were then invited to participate in virtual interviews through Zoom to discuss their data use further. Nine teachers indicated an interest, and all nine were interviewed when all students were learning virtually and then again once some students returned to in-person learning.

Data collection occurred in three phases: Survey administration, initial interviews, and follow-up interviews. The results of the survey administration are reported descriptively and are used to establish the school and data use context for the nine participating teachers. The results of the initial interviews and follow-up interviews are presented as themes that emerged from the qualitative data analysis. Last, the results of the integrated findings across the three data sources are explained.

Phase I: Survey Results

After the data set was cleaned, demographic and descriptive data were calculated. Of the 22 teachers who completed the survey, 13 taught in a school that was not fully accredited and nine taught in a school that was fully accredited. Therefore, fewer than half of the respondents (41%) taught in a school that was fully accredited. The data are shown in Table 5.

Table 5:

Accreditation Status of School for Teachers Completing the Survey

	Teachers Completing Survey (n = 22)
Accredited	9 (41%)
Not Accredited	13 (59%)

Most of the teachers who completed the survey taught students who take an SOL test, with 85% of teachers in schools that are not accredited administering an SOL test and 77% of teachers in schools that are accredited administering an SOL test. Almost 82% of the teachers who completed the survey taught students who take an SOL test at the end of the year. The data are shown in Table 6.

Table 6

SOL Test Rates

	Students Take SOL Test (n = 18)	Students Do Not Take SOL Test (n = 4)
Accredited	7 (77%)	2 (22%)
Not Accredited	11 (85%)	2 (15%)

Teachers were asked to identify whether SOL test data, common assessment data, classroom assessment data were available to them. They were also asked if other assessment data was available. For the survey, common assessment data was defined as data that includes data (information) from formative and summative assessments that are given and reviewed and/or analyzed collaboratively by teams of teachers. This includes benchmark tests and other

assessments given by teachers in a content team. These assessments can be created by teachers, specialists, or others. Classroom assessment data was defined as data that includes data (information) from formative and summative assessments that are used by individual teachers. This includes warm-ups, exit tickets, quizzes, tests, etc. that are chosen or created, and administered by individual teachers. One teacher in a school that was not accredited reported not having access to SOL test data. One participant in a school that was fully accredited reported not having access to common assessment data. All participants reported access to classroom assessment data and three teachers reported access to other assessment data. The data are shown in Table 7.

Table 7

Access to Assessment Data

	SOL Data	Common Assessment Data	Classroom Assessment Data	Other
	(n = 21)	(n = 21)	(n = 22)	(n = 3)
Accredited	9 (100%)	8 (88%)	9 (100%)	2 (22%)
Not Accredited	12 (92%)	13 (100%)	13 (100%)	1 (7.7%)

The survey data indicated that teachers use common assessment data and classroom assessment data more often than SOL test data. All teachers reported using classroom assessment data, and only one teacher reported not using common assessment data. Six teachers reported not using SOL test data. Since SOL tests were not administered in the previous year (2020) due to the COVID-19 school closures, the lack of use of SOL test data needed additional exploration during the interviews to determine whether this was common practice or due to the lack of testing. The survey results also indicated that teachers use common assessment data and

classroom assessment data regularly. More than 80% of teachers surveyed reported using

common assessment data almost weekly to once or twice a month and more than 90% of teachers

reported using classroom assessment data almost weekly to a few times a week. The frequency

of data use is shown in Table 8.

Table 8

Frequency of Data Use

	SOL Data			Common Assessment Data			Classroom Assessment Data			Other		
	Accredited	Not Accredited	Total	Accredited	Not Accredited	Total	Accredited	Not Accredited	Total	Accredited	Not Accredited	Total
	(n = 8)	(n = 14)	(n = 22)	(n = 9)	(n = 13)	(n = 22)	(n = 9)	(n = 13)	(n = 22)	(n = 2)	(n = 1)	(n = 3)
A few times a week	0 (0%)	1 (7.1%)	1 (4.5%)	2 (22.2%)	0 (0%)	2 (9.1%)	3 (33.3%)	5 (38.5%)	8 (36.4%)	0 (0%)	0 (0%)	0 (0%)
Weekly or almost weekly	1 (12.5%)	1 (7.1%)	2 (9.1%)	3 (33.3%)	6 (46.2%)	9 (40.9%)	5 (55.5%)	7 (53.8%)	12 (54.5%)	1 (50.0%)	0 (0%)	1 (33.3%)
Once or twice a month	0 (0%)	1 (7.1%)	1 (4.5%)	3 (33.3%)	6 (46.2%)	9 (40.9%)	1 (11.1%)	1 (7.7%)	2 (9.1%)	0 (0%)	0 (0%)	0 (0%)
Less than once a month	3 (37.5%)	9 (64.3%)	12 (54.5%)	0 (0%)	1 (7.7%)	1 (4.5%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Do not use	4 (50.0%)	2 (14.3%)	6 (27.3%)	1 (11.1%)	0 (0%)	1 (4.5%)	0 (0%)	0 (0%)	0 (0%)	1 (50.0%)	1 (100%)	2 (66.7%)

Teachers in both schools that were accredited and schools that were not fully accredited reported using SOL test data, common assessment data, and classroom assessment data in multiple ways including identifying and responding to student needs as well as meeting with specialists and other teachers. Teachers in both schools that are accredited and not accredited reported using classroom assessment data more frequently than common assessment data to make decisions with teachers in schools that are not accredited reporting using data slightly more frequently. Almost 86% of teachers reported using classroom assessment data and 52% of teachers reported using common assessment data to identify instructional content to use in class weekly to a few times a week. Eighty-one percent (81%) of teachers reported using classroom assessment data and 52% of teachers reported using common assessment data to tailor instruction to individual students' needs while 66% of teachers in accredited schools and 83% of teachers in schools that are not accredited used classroom assessment data to develop recommendations for additional instructional support weekly to a few times a week. Teachers also reported meeting with another teacher about classroom assessment data weekly to a few times a week. There was a noticeable difference between the use of common assessment data and classroom assessment data when sharing data with students. This occurred much more frequently with classroom assessment data than with common assessment data. Since teachers were teaching completely virtually at the time of the survey administration (fall 2020) and the first interviews (December 2020 and January 2021), a question was added to the interview protocols to explore whether these data use actions were different based on this environment. The results for SOL test data, common assessment data, and classroom assessment data are shown in Table 9, Table 10, and Table 11.

Table 9

SOL Test Data Use

	One or two times a year			A few times a year			Monthly			Weekly		
	Accredited	Not Accredited	Total	Accredited	Not Accredited	Total	Accredited	Not Accredited	Total	Accredited	Not Accredited	Total
a. Use SOL test data to identify instructional content to use in class.	1 (20.0%)	4 (36.4%)	5 (31.3%)	2 (40.0%)	2 (18.2%)	4 (25.0%)	2 (40.0%)	4 (36.4%)	6 (37.5%)	0 (0%)	1 (9.1%)	1 (6.3%)
b. Use SOL test data to tailor instruction to individual students' needs.	3 (60.0%)	4 (36.4%)	7 (43.8%)	0 (0%)	3 (27.3%)	3 (18.8%)	2 (40.0%)	3 (27.3%)	5 (31.3%)	0 (0%)	1 (9.1%)	1 (6.3%)
c. Use SOL test data to develop recommendations for additional instructional support.	2 (40.0%)	4 (36.4%)	6 (37.5%)	2 (40.0%)	3 (27.3%)	5 (31.3%)	1 (10.0%)	3 (27.3%)	4 (25%)	0 (0%)	1 (9.1%)	1 (6.3%)
d. Use SOL test data to form small groups for targeted instruction.	2 (50.0%)	5 (45.5%)	7 (46.7%)	1 (25.0%)	3 (27.3%)	4 (26.7%)	1 (25.0%)	2 (18.2%)	3 (20.0%)	0 (0%)	1 (9.1%)	1 (6.7%)
e. Discuss SOL test data with a parent or guardian.	3 (60.0%)	7 (70.0%)	10 (66.7%)	2 (40.0%)	2 (20.0%)	4 (26.7%)	0 (0%)	1 (10.0%)	1 (6.7%)	0 (0%)	0 (0%)	0 (0%)
f. Discuss SOL test data with a student.	5 (100%)	7 (70.0%)	12 (80.0%)	0 (0%)	2 (20.0%)	2 (13.3%)	0 (0%)	1 (10.0%)	1 (6.7%)	0 (0%)	0 (0%)	0 (0%)
g. Meet with a specialist (e.g., instructional coach or content coach) about SOL test data.	3 (60.0%)	4 (40.0%)	7 (46.7%)	2 (40.0%)	3 (30.0%)	5 (33.3%)	0 (0%)	2 (20.0%)	2 (13.3%)	0 (0%)	1 (10.0%)	1 (6.7%)
h. Meet with another teacher about SOL test data.	2 (40.0%)	4 (40.0%)	6 (40.0%)	2 (40.0%)	4 (40.0%)	6 (40.0%)	1 (20.0%)	1 (10.0%)	2 (13.3%)	0 (0%)	1 (10.0%)	1 (6.7%)

Table 10

Common Assessment Data Use

	Less than once a month			Once or twice a month			Weekly or almost weekly			A few times a week		
	Accred.	Not Accred.	Total	Accred.	Not Accred.	Total	Accred.	Not Accred.	Total	Accred.	Not Accred.	Total
Use Common Assessment data to identify instructional content to use in class	2 (25%)	1 (7.7%)	3 (14.3%)	3 (37.5%)	4 (30.8%)	7 (33.3%)	2 (25%)	4 (30.8%)	6 (28.6%)	1 (12.5%)	4 (30.8%)	5 (23.8%)
Use Common Assessment data to tailor instruction to individual students' needs	0 (0%)	1 (7.7%)	1 (4.8%)	5 (62.5%)	4 (30.8%)	9 (42.9%)	1 (12.5%)	5 (38.5%)	6 (28.6%)	2 (25%)	3 (23.1%)	5 (23.8%)
Use Common Assessment data to develop recommendations for additional instructional support	0 (0%)	1 (7.7%)	1 (4.8%)	5 (62.5%)	5 (38.5%)	10 (47.6%)	2 (25%)	3 (23.1%)	5 (23.8%)	1 (12.5%)	4 (30.8%)	5 (23.8%)
Use Common Assessment data to form small groups for targeted instruction	3 (37.5%)	2 (15.4%)	5 (23.8%)	2 (25%)	4 (30.8%)	6 (28.6%)	2 (25%)	5 (38.5%)	7 (33.3%)	1 (12.5%)	2 (15.4%)	3 (14.3%)
Discuss Common Assessment data with a parent or guardian	4 (50%)	4 (33.3%)	8 (40%)	3 (37.5%)	6 (50%)	9 (45%)	1 (12.5%)	2 (16.7%)	3 15%)	0 (0%)	0 (0%)	0 (0%)
Discuss Common Assessment data with a student	4 (50%)	2 (16.7%)	6 (30%)	1 (12.5%)	6 (50%)	7 (35%)	3 (37.5%)	4 (33.3%)	7 (35%)	0 (0%)	0 (0%)	0 (0%)
Meet with a specialist (e.g., instructional coach or content coach) about Common Assessment data.	7 (87.5%)	3 (23.1%)	10 (47.6%)	1 (37.5%)	4 (30.8%)	5 (23.8%)	0 (0%)	5 (38.5%)	5 (23.8%)	0 (0%)	1 (7.7%)	1 (4.8%)
Meet with another teacher about Common Assessment data	3 (37.5%)	1 (7.7%)	4 (19.0%)	3 (37.5%)	3 (23.1%)	6 (28.6%)	1 (12.5%)	6 (46.2%)	7 (33.3%)	1 (12.5%)	3 (23.1%)	4 (19.0%)

Table 11

Classroom Assessment Data

	Less than once a month			Once or twice a month			Weekly or almost weekly			A few times a week		
	Accred.	Not Accred.	Total	Accred.	Not Accred.	Total	Accred.	Not Accred.	Total	Accred.	Not Accred.	Total
Use Classroom Assessment data to identify instructional content to use in class	3 (33.3%)	0 (0%)	3 (14.3%)	0 (0%)	0 (0%)	0 (0%)	4 (44.4%)	5 (41.7%)	9 (42.9%)	2 (22.2%)	7 (58.3%)	9 (42.9%)
Use Classroom Assessment data to tailor instruction to individual students' needs	2 (22.2%)	0 (0%)	2 (9.5%)	1 (11.1%)	1 (8.3%)	2 (9.5%)	5 (55.5%)	4 (33.3%)	9 (42.9%)	1 (11.1%)	7 (58.3%)	8 (38.1%)
Use Classroom Assessment data to develop recommendations for additional instructional support	1 (11.1%)	0 (0%)	1 (5%)	2 (22.2%)	1 (9.1%)	3 (15%)	6 (66.6%)	4 (36.4%)	10 (50%)	0 (0%)	6 (54.5%)	6 (30%)
Use Classroom Assessment data to form small groups for targeted instruction	1 (11.1%)	0 (0%)	1 (4.5%)	3 (33.3%)	3 (23.1%)	6 (27.3%)	5 (55.5%)	3 (23.1%)	8 (36.4%)	0 (0%)	7 (53.8%)	7 (31.8%)
Discuss Classroom Assessment data with a parent or guardian	5 (55.5%)	5 (38.5%)	10 (45.5%)	3 (33.3%)	2 (15.4%)	5 (22.7%)	1 (11.1%)	4 (30.8%)	5 (22.7%)	0 (0%)	2 (15.4%)	2 (9.1%)
Discuss Classroom Assessment data with a student	2 (22.2%)	0 (0%)	2 (9.1%)	5 (55.5%)	5 (38.5%)	10 (45,5%)	2 (22.2%)	4 (30.8%)	6 (27.3%)	0 (0%)	4 (30.8%)	4 (18.2%)
Meet with a specialist (e.g., instructional coach or content coach) about Classroom Assessment data.	8 (88/8%)	0 (0%)	8 (40%)	1 (11.1%)	3 (27.3%)	4 (20%)	0 (0%)	3 (27.3%)	3 (15%)	0 (0%)	5 (45.5%)	5 (15%)
Meet with another teacher about Classroom Assessment data	2 (33.3%)	0 (0%)	2 (9.1%)	0 (0%)	5 (31.3%)	5 (22.7%)	4 (66.7%)	6 (37.5%)	10 (45.5%)	0 (0%)	5 (31.3%)	5 (22.7%)

90

Teachers reported confidence in their ability to use data. Most teachers agreed or strongly agreed with statements about using data effectively, with only one participant strongly disagreeing with feeling confident about their ability to set goals. More teachers in fully accredited schools strongly agreed with statements about their ability to use data effectively compared to those who teach in schools that are not fully accredited. These results are shown in Table 12.

Table 12

Teacher Confidence with Using Data

	Strongly disagree			Disagree			Agree			Strongly agree		
	Accred.	Not Accred.	Total	Accred.	Not Accred.	Total	Accred.	Not Accred.	Total	Accred.	Not Accred.	Total
a. I am good at using data to diagnose student learning needs.	0 (0%)	0 (0%)	0 (0%)	1 (11.1%)	1 (7.7%)	2 (9.1%)	5 (55.5%)	8 61.5%)	13 (59.1%)	3 (33.3%)	4 (30.8%)	7 (31.8%)
b. I am good at adjusting instruction based on data.	0 (0%)	0 (0%)	0 (0%)	1 (11.1%)	0 (0%)	1 (4.8%)	3 (33.3%)	10 (83.3%)	13 (61.9%)	5 (55.5%)	2 (16.7%)	7 (33.3%)
c. I am good at using data to plan lessons.	0 (0%)	0 (0%)	0 (0%)	1 (11.1%)	0 (0%)	1 (4.5%)	4 (44.4%)	10 (76.9%)	14 (63.6%)	4 (44.4%)	3 (23.1%)	7 (31.8%)
d. I am good at using data to set student learning goals.	1 (12.5%)	0 (0%)	1 (5%)	2 (25%)	1 (8.3%)	3 (15%)	3 (37.5%)	9 (75%)	12 (60%)	2 (25%)	2 (16.7%)	4 (20%)

Although teachers who teach in schools that are not fully accredited were more likely to report collaborating a lot, all teachers reported some collaboration with data. Most teachers reported approaching an issue by looking at data, drawing conclusions based on data, using data to make links between instruction and student outcomes, and predicting possible student outcomes when making changes to practice. The interview protocols included questions about collaboration and data use actions which helped to explore these topics. The results are shown in Table 13.

Table 13

Collaboration with Data

	Never			Sometimes			Often			A lot		
	Accred.	Not Accred.	Total	Accred.	Not Accred.	Total	Accred.	Not Accred.	Total	Accred.	Not Accred.	Total
a. We approach an issue by looking at data.	1 (11.1%)	0 (0%)	1 (5%)	3 (33.3%)	0 (0%)	3 (15%)	4 (44.4%)	5 (45.5%)	9 (45%)	1 (11.1%)	6 (54.5%)	7 (35%)
b. We discuss our preconceived beliefs about an issue.	1 (11.1%)	0 (0%)	1 (5%)	3 (33.3%)	2 (18.2%)	5 (25%)	4 (44.4%)	6 (54.5%)	10 (50%)	1 (11.1%)	3 (27.3%)	4 (20%)
c. We identify questions that we will seek to answer using data.	3 (33.3%)	0 (0%)	3 (15%)	2 (22.2%)	2 (18.2%)	4 (20%)	3 (33.3%)	5 (45.5%)	8 (40%)	1 (11.1%)	4 (36.4%)	5 (25%)
d. We explore data by looking for patterns and trends.	1 (11.1%)	0 (0%)	1 (5%)	2 (22.2%)	0 (0%)	2 (10%)	5 (55.6%)	6 (54.5%)	11 (55%)	1 (11.1%)	5 (45.5%)	6 (30%)
e. We draw conclusions based on data.	0 (0%)	0 (0%)	0 (0%)	2 (22.2%)	0 (0%)	2 (10%)	5 (55.6%)	4 (36.4%)	9 (45%)	2 (22.2%)	7 (63.6%)	9 (45%)

f. We identify additional data to offer a clearer picture of the issue.	1 (11.1%)	0 (0%)	1 (5%)	5 (55.6%)	3 (27.3%)	8 (40%)	2 (22.2%)	5 (45.5%)	7 (35%)	1 (11.1%)	3 (27.3%)	4 (20%)
g. We use data to make links between instruction and student outcomes	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	7 (77.8%)	6 (54.5%)	13 (65%)	2 (22.2%)	5 (45.5%)	7 (35%)
h. When we consider changes in practice, we predict possible student outcomes.	1 (11.1%)	0 (0%)	1 (5%)	0 (0%)	1 (9.1%)	1 (5%)	7 (77.8%)	5 (45.5%)	12 (60%)	1 (11.1%)	5 (45.5%)	6 (30%)
i. We revisit predictions made in previous meetings.	2 (22.2%)	0 (0%)	2 (10%)	4 (44.4%)	5 (45.5%)	9 (45%)	2 (22.2%)	2 (18.2%)	4 (20%)	1 (11.1%)	4 (36.4%)	5 (25%)
j. We identify actionable solutions based on our conclusions.	0 (0%)	0 (0%)	0 (0%)	6 (66.7%)	1 (9.1%)	7 (35%)	2 (22.2%)	6 (54.5%)	8 (40%)	1 (11.1%)	4 (36.4%)	5 (25%)

An open response question was also included. Four teachers provided comments related to data. In these comments, teachers noted concerns with time needed to effectively use data to make changes to instruction or provide remediation based on student needs. Another teacher shared how their team documents their collaborative data analysis.

Overall, the survey data indicated that teachers use common and classroom assessment data more frequently than SOL test data. Common and classroom assessment data are used regularly and in multiple ways, including to identify instructional content, tailor instruction to students' needs, and discuss data with students. Most teachers reported confidence with using data including ability with diagnosing student learning needs, adjusting instruction, and using data to plan lessons. Additionally, teachers reported participating in collaborative practices including approaching issues by looking at data, looking for patterns and trends, and making links between instruction and student outcomes.

After analyzing the survey data, the interview protocol was reviewed. Although the initial questions were not changed based on the survey data, the potential need for follow-up questions related to collaborative actions, time spent on data use, specific actions based on data analysis, the use of common and classroom assessment data, and documentation of collaboration were noted based on the results. Questions related to these topics were already included, but additional follow up questions would be included if needed. Although the sampling included schools that are accredited and schools that are not accredited and the survey data was reported using these categories, this was not explored in the interviews because the focus in the interviews was on data use in the virtual and hybrid learning environments rather than accountability structures.

Phase II: Initial Interview Findings

As suggested by Yin (2018), the interviews were initially read to look for patterns or themes that may exist. Immediately following interviews, while transcribing, and during the initial reading, analytic memos were written to facilitate data analysis, document initial patterns, and preliminary themes (Maxwell, 2013). Four themes emerged from the initial interviews and are shown in Table 14.

Table 14

Initial Interview Themes

Theme 1: Teachers used more data and adjusted their data use in response to the virtual space.
Theme 2: Teachers were concerned about the accuracy of data, particularly in the virtual environment.
Theme 3: Teachers used individual and common sources of data to make decisions.
Theme 4: Teachers collaborated more frequently, both formally and informally, due to virtual learning.

Theme 1: Teachers used more data and adjusted their data use in response to the virtual space

Teachers discussed having additional assessment and data requirements this year due to virtual teaching, but also choosing to use more data in the virtual space. The requirements included using specific assessments or using a specified number of assessments for data. Kris discussed that, due to the virtual environment, they are required to have at least one grade each day, which led to using more data for decision making this year than in previous years. Kris stated, "At the moment, I'm using more data than I have probably ever used before, just because I am required to have a graded assignment every class, and there's only so much you can do to avoid watering it down." All teachers stated that this school year (2020 - 2021) they were

required to administer an assessment created by the school district approximately every four and a half weeks, roughly twice every nine-week grading period. Although these assessments were similar to the benchmark assessments, or yearly school district assessments designed to gauge preparedness for standardized testing used in the past, most teachers reported additional flexibility with these assessments, including waiting to give parts of the test until students were ready. For most, the results from these assessments were discussed during their team meetings. Others were also required to report these data to administration or school district personnel for school improvement meetings. However, beyond benchmark assessment data, teachers described having the flexibility to select the data reviewed by their content team. Jessie reported that they were required to use data but allowed to select the data themselves. Jessie stated, my "administration says you need three common quiz assessments, three common test assessments and you need to review the data. Past that it's, we get to decide what the assessments are. We get to decide what data we look at."

Teachers had autonomy for data use

Teachers predominantly made the decisions about data use. Although many teachers explained that there were specific administrative requirements for using data, there was some flexibility and teacher autonomy in their specific approach to data use. Teachers noted requirements to give specific numbers of assessments, to give a daily grade, or to have data to report. Still, most also stated that they had the flexibility to choose the assessments and data that they wanted to review. Although some teachers reported having input from coaches or administrators, they also discussed being able to contribute to decisions about the data they used. Jessie shared that the administration set parameters on the number of assessments given but allowed the team of teachers to select the data to review. When discussing how their team

reported and examined data, Hunter stated, "There's nothing as a school that says we need to do the data this way." One teacher shared that for their content area at the school, reviewing data as a team was introduced by the teachers. Although there was originally some pushback from some teachers, all teachers in the department embraced the idea over time. Kris stated, "We had item analysis documents. It's still something we use. I brought that to Ocean Middle School last year, and they about revolted, but now, this year, it's like, "Where's the analysis document? When are we doing that?" Some teachers reported having specific times set aside for required data conversations, but that was unique to some schools and not a requirement for all teachers.

These aspects of data use were not unique to the virtual environment but seemed to occur more often and produce greater and more frequent changes to instruction. For example, Jamie stated, "We're reviewing data every day to adjust everything for the next day."

Teachers needed additional sources of data

The shift to virtual learning prompted a need for new and additional sources of information on student learning. In the traditional classroom, teachers often used informal questioning and visual cues from students to know when adjustments to instruction were needed. Teachers noted that they often relied on student reactions and glances at student work to guide their instruction. Since they were not in the traditional classroom setting and students' cameras were frequently turned off, they had to adjust how they gauged understanding. Thus, teachers described needing additional data, including both formal data and informal data from instructional activities, in the virtual space. Kris said, "So, you can't just rely on, 'Do you get it, and it's on your face that you're confused?' You need hard data to kind of know where they are."

Similarly, Jessie commented:

> So, I do rely on data a little bit more this year than previous years to try to guide where I'm going the next class or the next lesson when I'm planning out, just because that's the only signal I'm getting from my students of, "Oh, I don't understand this." So, sometimes we're going through the instruction faster than we should because I don't see the signals of "Hey. Slow down. I don't understand this." (Jessie)

Due to the new teaching and learning environment, Kris also described conducting more frequent check-ins with students, asking questions about their well-being and the pace of the content since they were less able to evaluate this without seeing students.

Reviewing student work was also easier and yielded greater understanding in the in-person classroom where they were able to move around the room and identify mistakes or misunderstandings throughout the learning activity. Since this approach was no longer an option in the virtual classroom, teachers shared that more data was needed to gauge and monitor student understanding. Reese explained that even when they are able to see student work by having them display their work using the camera, it was still limited. "There's a lag there, and it's like, 'OK. I don't know how you got to this point because I didn't see how you got to that point'." (Reese).

Although most teachers described using additional data as well as using data more frequently in the virtual environment, this was not true for all teachers. Peyton said that they did not make many changes to the data collected. However, this teacher's instruction was regularly technology-based data prior to this year, which may have made the transition to virtual learning easier.

<u>Teachers adjusted their data collection methods</u>

With the constraints to data collection and the need for additional data, teachers found various ways to adjust their data collection methods to gauge student understanding in real-time during online learning. One teacher found Google docs, Google draw, and Google slides helpful since that created a way to "see" student work. Other teachers relied on the chatbox feature in Google meet, the "yes-no" buttons, or emojis to get a quick response from students about their levels of understanding. When using the chatbox feature, one teacher described that it was beneficial to have the students type their answers but delay submitting for a designated period of time to allow students time to respond. Then, after students submitted their answers, they could read and respond to other students, which they enjoyed, while also allowing the teacher to gauge student understanding. Other teachers selected activities, such as questions on online websites or the school district's learning management system, that were graded automatically so they would have immediate results from each student and could make decisions based on the data. Morgan stated that warm-up data could be reviewed before students submitted it in the in-person classroom, producing an understanding of student learning. However, in the virtual classroom, Morgan explained, "I don't see them, and so I'm relying on those numbers on the computer to show me, 'Hey, they don't know this'." Kris stated it succinctly, stating, "So, we're still reaching out and seeking those things but, again, it looks very different than it has in the past."

<u>Teachers adjusted their actions in response to data</u>

In the virtual environment, participating teachers described how they had to make changes to their actions based on data, as they were not always able to respond to data in the ways they had previously. Kris noted that after summative tests, they liked to pair up students for them to discuss differences in their answers as a way to encourage greater understanding.

Unfortunately, it was not possible to use this strategy in the virtual environment. Kris stated, "To have that in an in-person setting is amazing. To do it virtually…[I] haven't found a way to have that happen yet."

Some teachers made adjustments to how they met students' learning needs by having students attend "office hours" or "instructional support," a time at the end of the day that was set aside for teachers to provide academic support to students. This time was not previously available but was created in response to the shift to remote learning. During this time, some teachers reviewed concepts with students who had been specifically invited to attend or provided support for students who chose to attend. Reese stated:

> And, based on the data [formative or summative] that I see, I either personally, when I say personally, I send them an invitation to say...um, based on your...Formally when I do it, I say, based on your last test or based on your last quiz (I don't use big words like assessment with the students. They don't know what that is.), I say, based on your last quiz, you need to come to tutoring on this day. (Reese)

Effective data use is time consuming and necessary

Teachers discussed concerns about the time required for effective data use, but also shared that it was important enough to take the necessary time. Kris stated:

> I think the trickiest thing about data in this day and age, is how to make it work for you efficiently. I still don't think anybody has a good answer for it, because if we did, we'd be doing it. So, you know, it seems daunting. It seems overwhelming. It seems like a lot to do, to do it, to talk about it. Who has that time? The more students that are added to your roster, the more time it takes. (Kris)

Similarly, Jamie discussed the time involved with data use. However, this was also considered essential. Jamie stated, "So I think one of the constraints is that it takes a lot of time. I feel like it's a necessary, I mean it is a constraint, but I feel like it is a necessary one." Kris also shared that although they felt more confident in their ability to use data, it didn't take less time. Instead, the improved ability to analyze the data promoted *using* data rather than only analyzing it. Kris stated:

> I've gotten better at it, but better at it hasn't made it take less time. It just means I'm actually doing something with it versus just collecting it and never looking at it. Collecting it and looking at it is time-consuming. (Kris)

When discussing the time involved to review data, Jamie suggested providing additional support and instruction for how to use data effectively and Kerry noted that additional structure for data discussions would be beneficial. Without instruction on how to use data, teachers can feel like they are completing a task for documentation purposes only. Jamie stated:

> If there's not any instruction on how to effectively use data... we are saying data, data, data, data, but we're not saying here's how you could use it effectively. So, I think that ends up being a hindrance in some way because a lot of the time, it feels like it's hoops to jump through. (Jamie)

However, Jamie also felt that when data is used effectively, it has a positive impact on instruction. "I think it's, one of the positive things of data is, you can gain so much from it if you take the time to go through and effectively look at it and use it to kind of guide what you're doing" (Jamie). Although teachers discussed the time involved with data use, they also shared a willingness to take the time as they saw the benefits that data-informed actions had on student learning.

Theme 2: Teachers were concerned about the accuracy of data, particularly in the virtual environment.

Teachers also discussed their concerns about the accuracy of the data they were collecting. These concerns included the assessments, the testing environment, help students may be receiving, and whether students were motivated to do their best work. Jamie discussed the importance of using assessments that produce meaningful data, stating:

> So, I try to have a lot of intention in what I'm putting together in terms of our materials, our classworks, warm-up questions, exit tickets, to make sure that it's fair to the students, to be sure that data is accurate. It wouldn't make any sense to give them an exit ticket on something I didn't go over that day because that's not going to give me good data. I'm not going to gain anything from it. (Jamie)

Jamie also noted that in their collaborative team meetings, teachers were having more discussions about "authentic data points" that would give them an accurate understanding of student learning. They wanted to ensure that they measured student learning and that students were not using apps or assistance to give correct answers even though they didn't understand. Jamie said, "I think a lot more conversation this year in terms of how can we get real-time... and how can I see the work that they're doing so that I can watch the steps that they're taking and see if they're really understanding it versus just getting an answer." When using some available assessments, Jordan was concerned about the inferences that could be made when a strand was measured using only one question. Jordan stated, "We do have some issues where they'll test a strand with one question. So then... is it that they don't understand? Or was it just this one question that they missed?" This teacher also noted that a question could be marked incorrect due to the way it was answered. Jordan added, "We noticed that if the students didn't type in the

answers a certain way, it marked it as incorrect. So then that data became invalid for us." Another teacher noted that students might simply make mistakes and select the wrong answer. Although this can happen when learning remotely or in-person, the teacher stated that it is easier to determine that when reviewing student papers in the classroom. Jamie also identified challenges to not seeing student work when making inferences based on data. Jamie said, "But I think when you're not sitting with students and monitoring all these different things, you could end up getting a lot of data that looks really good when maybe it doesn't give you any type of valid information."

<u>Teachers wanted data to be an accurate representation of student learning</u>

Participating teachers also described concerns about student data that may not be an accurate reflection of the individual students' learning or may skew the overall class data. They described these results as outliers in their class data. One teacher questioned what to do when students finished assessments more quickly than was likely needed or if the students stated that they just guessed when answering questions. Reese said, "...how do we factor in students who did not take the assessment seriously and they just put anything down which would skew our data?" Reese did not "have a category for that" and was concerned about how best to respond to the student as it could not be determined whether or not the student understood the content. Jessie had similar concerns stating:

> ...because they're virtual, either just don't take the assessment or they just go in, and they click and so they're more of an outlier of - OK. This isn't really representative of what they know. Or it's skewing the data because they're just going in and randomly clicking to get it done with, to say that they did a test. So, I know that kind of skews the data. (Jessie)

Due to these constraints, teachers generally felt it was more challenging to know what students truly knew.

When reporting data at the school or district level, teachers wanted to report accurate and meaningful data. For some teachers, the assessments that were available on the district's testing platform were easy to score and the data could easily be disaggregated in the manner required for school improvement meetings. However, these assessments were not fully aligned to their standards. Jessie noted that if the assessments are not fully aligned to the standards, "the data doesn't tell a full picture." Therefore, teachers were using fully aligned assessments that were more difficult to report and then developing ways to present the required data, as the team felt that it was important to have accurate data.

Theme 3: Teachers used individual and common sources of data to make decisions.

Teachers reported using both individual and collaborative data to make instructional decisions. Whereas collaborative review for most of these teachers was broad and general, individual data review was more detailed and student focused. The collaborative discussions afforded teachers the opportunity to review data overall and compare performance on assessment questions across classrooms and teachers. Collaboratively, teachers discussed overall student performance as well as the performance of subgroups of students on the assessment questions and content topics. Teachers discussed why students struggled with the assessment overall, specific content strands, or on specific questions, but often did not discuss individual student performance. However, student work was reviewed at times. For some, this involved discussions of the "extreme" cases, very strong examples, or very weak examples. Kris stated:

I would say if we're talking about student work, somebody might pull something up, virtual or not. Like pull up, "Hey. Let me look at this, show this, but definitely not, not

widespread, not every time, and probably the extremes of like, "Whoa. Look at this. It was amazing, or holy cow. What? How did this happen? How did we miss the mark so badly? And what can we do about it? (Kris)

When reviewing data individually teachers described knowing the students personally and making decisions based on individual performance. This included considering specific student needs and the actions needed to benefit those students academically. Several discussed that reviewing their own classroom data yielded more specific results than reviewing collaboratively because teachers knew about the individual students and circumstances. Teachers also discussed reviewing individual student performance on assessments or individual student work, at times with students, when reviewing individual data.

Teachers used data to respond to student learning needs

Teachers analyzed data to determine specific issues that may have been problematic for students. This may include a particular concept, skill, question-level, or question type. Pacing was a concern for teachers, so this was considered when determining student misconceptions and how to respond to data. One teacher shared a desire to maximize their review efforts and did not want to review all concepts related to a topic if only some areas were challenging for students. Kerry explained:

For example, [specified content has] multiple layers that we have to target, and then if we tried to remediate the whole [specified content], it's going to take a whole lot of time. So, trying to figure out what particular part of the SOL within the same SOL strand, what we need to focus on, to remediate. (Kerry)

Some teachers discussed reviewing student performance data from prior years. For Kris, this was to determine what needed emphasis before teaching in addition to answering the question, "What do we need to go back and fix and adjust with our instruction?" Kris also stated:

> We wanted to keep track of year-to-year what our assessments look like. Is this assessment holding true? Is it staying valid? Is it reliable? Is it consistent? Can we predict that this question they're going to struggle with every single year? (Kris)

Other teachers stated that they tried to make changes to assessments or notes about changes to assessments needed for the following year.

> Teachers used the data collected to determine their next steps. Jessie noted:
>
> ...every time we talk about it, we do come up, as a team, of a remediation plan, what each teacher or as a content team, how are we going to review this information going into the next lesson. Is it...we're going to do a review day and make sure they have it, or can we integrate it in the next topic? Can we make sure that we add that into the next couple lessons or the next couple warm-ups, and depending on what the strand is, it's been different almost every single time. (Jessie)

This teacher also discussed identifying whether the whole class exhibited misunderstandings centered around one topic or whether challenges were spread out among multiple topics and multiple students. This analysis impacted the decisions about how to respond. Jamie discussed trying to determine whether the learning problem was reading comprehension issues, the content, or how the content was presented and then responding based on what the analysis identified. At times, teachers responded to informal student data immediately, adjusting instruction during a class when an instructional problem was identified.

After determining the concepts that needed review, reteaching, or additional reinforcement, teacher actions included placing students in groups for review, reteaching whole class or small groups using different instructional methods, and providing students with additional practice or resources through worksheets, reviews, adding the content to future lessons, and/or using educational technology. Jordan stated:

> As we go through it we talk about the next steps and ways that we can remediate. Do we have to remediate / reteach? And how we'll pull them into small groups and integrate different technology that we have such as, like, [specified programs]. It just depends on what they're actually missing. (Jordan)

Often, concepts were reviewed during warm-ups. Some teachers even tracked this data by giving warm-ups on the same topic two days in the same week to determine growth on the identified concepts and other potential areas of concern. Jamie stated:

> We're tracking warm-up data from one day to the next in terms of specific skills we're trying to target. So, if we have two warm-up questions on a Tuesday and two on a Thursday, question one will be the same skill on Tuesday and Thursday, and question two would be the same skill on a Tuesday and Thursday. Different questions. Just to be able to show did we progress at all on that skill. (Jamie)

When reviewing the warm-up data, Jamie's team considered additional data, such as classwork assignments and exit tickets, along with the warm-ups to provide a greater understanding of student learning. It was also noted that if there are differences in how students performed on the same concept, the team tried to identify what may have caused the differences. This required determining specific skill areas where student students were successful and where they needed

support. Jamie discussed identifying why students were successful and using that information

along with the areas in need of improvement for instructional decision making. Jamie stated:

> And we also look at strengths, I think. Just to see, what did we get through to them really,
>
> really well, that they were really successful on? And why were they able to be successful
>
> on that but maybe not on something else? (Jamie)

Teachers made instructional changes based on data

Teachers made instructional changes, based on data, during class as well as in later

classes. Teachers used their own classroom formative assessment data such as warm-ups, exit

tickets, and classwork activities, as checks for understanding during class to determine changes

that need to be made during class or in the next few days. These data were used proactively to

adjust their instruction so students would be successful on summative assessments. Adjustments

included providing students with different forms of instruction, varying question types, and

additional emphasis on difficult concepts.

For example, Morgan noted that when teaching a concept, if students did not have the

background knowledge to be successful, a change was made, and the missing background

knowledge was taught immediately. If that was not needed in another class, it did not happen.

Morgan stated:

> We do a little bit of data review every day and then that kind of determines the direction
>
> my class is going in and the direction. For example, today we were [practicing specified
>
> content], and I noticed that a lot of the kids got one of them wrong when they were
>
> [completing an activity]. And so, I talked about [specific content] today which was not
>
> something I wrote down to do. But that's where I saw that they needed help. (Morgan)

Morgan continued, "So, I did a quick review of that today. I did that in one of my blocks and then another one of my blocks of kids I didn't do any of that with." Another teacher used warm-ups, or short formative assessments at the beginning of class, that are scored by a computer immediately and used the results in real time to determine whether to review concepts during the class based on the results. Other times, teachers reviewed individual data and made adjustments for subsequent instruction during a later class. They may have also discussed these data with colleagues.

Theme 4: Teachers collaborated more frequently, both formally and informally, due to virtual learning.

Teaching in the virtual environment was more time-consuming than teaching in a traditional environment. Thus, teachers adjusted by collaborating with their colleagues more than ever to collectively plan and adjust instruction. When asked if there was more collaboration this year, Kris responded, "A hundred times over. A hundred times over." This teacher added, "It's definitely… from a professional side, it's more than I've experienced at Ocean Middle School, and that's a really good thing." Teachers noted that they collaborated in previous years but seemed almost to feel that necessity was driving the collaboration this year. Jamie stated,

> We review data every day. I think, especially in the virtual environment, it takes a lot of time to stop and do that, but things that you think will land and go over really well often times don't. Certain things that you think they should be able to fly through, they can't. Certain things you think will take a long time. Maybe it doesn't. So, I think because we're doing it in a virtual environment now for the first time, we're reviewing data every day to adjust everything for the next day. (Jamie)

Jamie also added, "Some of those adjustments we would make day-to-day there, but I think the virtual environment means we have to do it. In a day. All the time."

Several teachers noted that almost all instruction and assessment this year is the same for all teachers in the content area from class to class due to the virtual environment. In some cases, this was so that all students would have received the same instruction when they returned to in-person learning. In other cases, it was an attempt to share the workload since so much more time is required to teach virtually. When discussing using common assessments, Kris stated, "...that was something we implemented and just continued this year, and it's only gotten stronger because no one wants to do more work in virtual learning. We are already doing so much more." All teachers felt that using common assessments and making instructional decisions collaboratively was beneficial. The school district also provided the teachers with common assessments this year. Since they are required, all teachers were using them as part of their data use practices.

Teachers collaborated more frequently in the virtual environment

Teachers described more frequent, informal collaboration, as well. Since teaching virtually was new, they connected to compare student understanding during instruction and student performance during assessments. Teachers discussed checking with their colleagues throughout the day. During classes, this took the form of running chats using the chatbox feature, text messages, and emails. Reese stated that they send messages regularly to check in with each other rather than waiting for official meetings.

> Even when we're not officially in a meeting, we do send each other text messages as a
>
> team, as a group, and we go, "Hey. I covered this today. Did anybody else do that? Who
>
> is ready for the quiz on Friday? It's Wednesday, who thinks they're ready for the quiz on

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Friday?" You know, not waiting until we get to a data meeting all of a sudden to have

this big thing that landed on our plate. (Reese)

Jamie gave an example of sending an email during class when the instruction was not going as

planned to see if others were having the same issues. This teacher felt that this helped determine

how to respond. Jamie stated:

Today is a great example, where we were starting a topic with prior knowledge they

should have had, and after the first block, I was sending an email out saying we didn't get

through half of this today, and everyone else is responding. So now we know everything

for the rest of the week has to get changed, starting tomorrow because everyone was kind

of in the same place. If they had not been, it probably would have given me an idea. Oh.

What did I do that maybe wasn't as effective as everybody else? Or what did they do?

Did they move too fast when they were doing it?' But I think we have... we're touching

base at least once a day just to kind of keep a finger on the pulse of where everybody is.

(Jamie)

These regular check-ins helped teachers to stay connected and support each other while

teaching virtually.

<u>Teachers formally collaborated with colleagues</u>

In addition to the informal collaboration, teachers met to discuss data and plan their next

steps. When meeting collaboratively, teachers discussed a variety of data, including warm-up

data, exit ticket data, and quiz and test data to identify common themes. Then, they developed

plans for their instructional next steps as a content team. These team meetings included

evaluations of their individual instruction, identifying student misconceptions, sharing ideas for

how to teach concepts, and making decisions to guide instruction.

Teachers reviewed assessments by question to determine misconceptions students may have had, learning objectives or concepts that needed review, and question types that may have been challenging. This included comparing data on pass rates, overall scores, and specific questions across classes and teachers. Additionally, teachers discussed why students did well or poorly on questions, the Bloom's level of taxonomy of questions, and any trends or surprises in the data. Some teams also compared the data to their instruction to match successes and weaknesses to instructional practices. Reese stated:

> We look at them collaboratively. We share information, as far as like percentages, like what was the best question, what was the worst question, what was the most answered incorrectly, what was the incorrect, you know, all of those things that fall in those trends so that, again, we can understand what we need to look at as far as understanding or lack thereof or what needs to be worked on or reinforced or even retaught. (Reese)

Generally, these discussions focused on classes or concepts rather than individual students. Teachers also described using data to identify trends or patterns as well as areas where they need more information about student learning to make informed conclusions. Jamie stated:

> I think there's not one right or wrong answer to it. I think it's a lot of just going back and then saying maybe I don't know, maybe I don't have enough to figure out exactly what it is that they'd be struggling with there. (Jamie)

After analyzing the data together, teachers used the data to guide their instruction. In their collaborative meetings, they created or compared plans for their next steps. This included identifying topics to be remediated, reinforced, revisited, or retaught as well as comparing instructional strategies to be able to reteach differently. Often, students were grouped according to need to participate in remediation, enrichment, or in some cases, peer teaching. Additionally,

some teachers discussed creating assessments together and identifying changes that needed to be made to assessments for subsequent years if assessments were not producing the data needed or questions were not high-quality.

<u>Teachers guided the collaborative data review</u>

When meeting collaboratively, the teacher groups determined the data to be reviewed, often under the guidance of a teacher leader. Supporting instructional leaders may also be invited to participate in these collaborative meetings. Peyton stated, "...we will often invite the coaches and they kind of, the [instructional or content] coaches let us know what they can help us with in the beginning of the year and then we often invite them into the meeting." Similarly, Jessie stated, "I actually have a note that I've got to contact our coaches because we do want them to start coming in and talking about assessments and data and streamlining how to look at the data and make a plan." Generally, teachers felt positively about the support from leadership, but one teacher shared that some questions from leadership can push the discussions from sharing strategies to tracking data or questions that feel like they are defending themselves.

In most cases, teachers reviewed data before the collaborative meetings and were prepared to discuss their analysis and ideas for next steps. The collaborative discussions that participants described varied in structure. Some teacher groups had a formal reporting system, such as a data spreadsheet, others followed a protocol or agenda for discussion, and others had more informal discussions. However, all teachers reported collaborating with colleagues using assessment data. One teacher noted that not all teachers review the data prior to meeting collaboratively and that additional structure and support to promote this would be beneficial.

Summary

During the first interviews teachers discussed the ways in which their data use practices were similar to previous years as well as the changes that were made in the virtual space. Since teachers were not able to interact with students in person, they found new ways to measure student understanding and use that information to positively impact student learning. These changes included collaborating differently and more frequently, using additional common assessments, and using more and different data sources.

The themes from the initial interviews guided the development of questions for discussion in the follow-up interviews. As teachers had transitioned to a hybrid learning environment, the discussions included how the data use practices described in the initial interviews were refined or changed with this shift in the learning environment.

Phase III: Follow-up Interview Findings

During the follow-up interviews, teachers shared additional information about data use in the virtual and hybrid environments and discussed a data artifact that they selected to share. Almost all teachers shared a common assessment data artifact that was used by their content team of teachers. These data artifacts included formative assessments used during instruction as well as to measure student learning, summative assessment data that were reviewed collaboratively, and online assessment tools that provided data to students. The ways in which they were used differed. Some items were created specifically for use in the virtual environment. Some were adapted for the virtual environment. One item was used prior to virtual learning but was found to be an effective tool for online learning making the transition easier for this teacher. A description of the data artifacts is shown in Table 15.

Table 15

Data Artifacts

Participant	Data Artifact Description	How or Why it was Used
Kris	A data tracking sheet that the department uses after giving a summative assessment.	All teachers enter data and identify questions that were difficult for students. Then, as a team, they decide what to do based on the data.
Hunter	A document that is used by the team of teachers to record data after assessments.	After recording the data, the team meets to discuss the data and create an action plan.
Jessie	Common warm-ups that are given weekly by their content team of teachers.	Teachers use the warm-up data to identify student understanding. The team began this practice in response to an administrative requirement for data use. However, the teacher wanted to use common assessments prior to the requirement, and this provided an incentive to begin.
Jamie	A classwork assignment/ formative assessment that was used during the instructional process.	The data from this assignment was used to identify misconceptions, which the teacher was able to address immediately.
Morgan	A contract activity that was used as a summative assessment by the content team of teachers.	Students can complete assessment activities as many times as they want to earn the grade they want. The teacher monitors student progress as they are completing the assessments within the contract.
Jordan	The data from a 15-question district wide assessment given in the middle of MP3.	This was discussed collaboratively and used to identify student needs.
Kerry	The data from a 10-question district wide checkpoint that was required and used by the content team of teachers.	The teachers created a review to prepare students for the assessment that did not require a large amount of class time. Therefore, they tried a new method of review involving video embedded with formative assessment.
Reese	A four-question common exit ticket given on an online platform.	The teacher noted that a shorter assessment was used because students put forth more effort on shorter assignments leading to better information.
Peyton	A tool that tracks student performance on assessments throughout the year, including common assessments and classroom assessments.	Students have access to the data along with the teacher. Both the teacher and student can see the student's growth throughout the year and together they develop action plans for any areas of difficulty.

During the discussions of the data artifacts and follow-up questions, four themes emerged. These themes are listed in Table 16.

Table 16

Follow-up Interview Themes

Theme 1: Teachers Adapted their Instruction and Assessments as the Environment Shifted
Theme 2: Teachers Continued Collaborative Data Practices
Theme 3: Teachers Expanded Data Use to Include Students
Theme 4: Data Use is Important to Teachers

Theme 1: Teachers adapted their instruction and assessments as the environment shifted.

Throughout the year, the learning environment changed; sometimes the changes were small, and at other times, they were large. At the beginning of the year, all students were learning virtually. At the time of the follow-up interviews, some students had returned to school while most students continued to learn at home. Therefore, teachers were teaching hybrid classes at this time with some students in person and others online in the same class. All, except for one, of the teachers returned to school to teach in person.

Teachers adapted their instructional and assessment practices to better meet student needs in each of the environments, becoming more effective at teaching and assessing virtually, as the year progressed. Not being able to see students or their work, as they could when they were in a classroom, led these teachers to identify new ways for the students to share their thinking and the teachers to measure their understanding. As limited numbers of students returned to the

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classroom, teachers continued to adjust their practices and found additional ways to benefit students learning virtually and in person.

<u>The influence of students returning for in-person learning differed among participants</u>

The changes to instructional and assessment practices when students returned to in-person learning differed among participants. Teachers noted that since the instruction was hybrid, they were still generally teaching in the same way they did during all virtual instruction. However, having students in person often, but not always, increased opportunities to impact student learning.

Some barriers to identifying student learning were decreased with the return to in-person instruction. Teachers discussed having in-person students complete assignments on paper or white boards. Although the student work could not be collected, teachers were able to view the students' work to better understand areas where students needed additional support. Additionally, teachers were better able to make decisions about student learning based on the in-person students. This included the time needed to complete activities and assessments, and questions students may have on content. When working with students virtually, the teacher often had to guess whether students were finished as well as whether they understood the content. Often the in-person students were more vocal with questions, but teachers discussed gaining information about student understanding by reading cues from facial expressions for quiet students. To involve and measure learning for all students, students were still asked to share their screens to ensure that both in-person and virtual students could see the work. Additionally, the assessment scores of the virtual and in-person students could be compared to identify any differences and use this information for decision making.

In contrast, student engagement did not always increase for students who were learning in person. Even with small classes, social distancing restrictions made it more difficult to re-engage students than it would have been in previous years. The return to in-person learning also brought additional changes, including having to ensure students were social distancing in addition to the normal classroom considerations. This took time away from normal teaching and assessment routines, decreasing opportunities to positively impact student learning.

Reduced class times prompted adjustments

In addition to not having many students in person and COVID related guidelines, teachers regularly expressed concerns about the limited instructional time as class time was reduced from approximately 90 minutes to approximately 60 minutes during the 2020 - 2021 school year. With the return to in-person learning, students were also only attending school in four days each week, which caused an additional reduction in instructional time. Due to the reduced time, and virtual instruction taking longer, participants noted making decisions that allowed them to maximize their instructional time while continuing to measure student learning.

In response to the shortened classes, some teachers discussed reviewing learning topics and objectives in small chunks or using more quick review activities. Limited time made it even more important to specifically identify student misconceptions and address them immediately. This practice routinely included connecting previous skills that may have been challenging. Teachers also used data from targeted formative assessment to guide instruction and activities, which saved valuable class time and focused on areas where content had not yet been mastered.

Jamie said:

> I think especially now when our classes have been shortened, if we can save five minutes
> here because they don't need it here, but they do need it here. That little five-minute
> reassignment or re-allotment of time is really important sometimes. (Jamie)

Jamie also noted being very intentional about what students were asked to do. This included limiting the number or length of assignments, since students could log out of the class or shut their computer if they didn't see value in what they have been asked to do. Jessie stated,

> I'm looking at the data more often and more closely. So, instead of longer periods with
> more topics, and trying to sift through all the data, it's a smaller amount of data which is a
> lot more manageable and on one topic at a time. And so reteaching doesn't take very
> long, I don't have to take a whole class period to do it. It's targeted for those specific
> students instead of taking up an entire class time for maybe half the students, but the
> other half are getting it. So, they're not sitting there bored. But yeah, it's being able to do
> it once a week and per topic has really helped me understand what they do and don't
> understand. And I think it's because we have Wellness Wednesdays, it's been easier to
> reteach them without losing class time. (Jessie)

Kerry discussed "getting creative" and making changes to their process for reviewing for a district-wide benchmark assessment. Since the upcoming assessment was on a topic taught earlier in the year, the teachers wanted to review for the assessment but also needed to continue new instruction since they were behind on pacing. Rather than taking valuable class time to review this topic before the assessment, teachers provided students with videos. Formative assessment was embedded within the videos, and at the end of the week, the teacher assessed student understanding using Kahoot!, an educational technology assessment platform. While

continuing to teach new topics, students were asked to watch one video each week for three weeks and complete a formative assessment after each video. At the end of three weeks, the teachers reviewed for one day, then gave the district wide checkpoint assessment. The teacher noted that the team of teachers wasn't sure whether this approach would work but felt that they needed to try something different. Kerry said that students who typically struggled tended to perform better than usual while other students, who typically did well in class, did not perform as well on the assessment. It was also stated that the students who watched the videos did well and those who did not watch the videos did poorly. The teacher also shared that the teachers did not spend much time reviewing the data during the three weeks students were reviewing and they also did not make many changes to their instruction based on the data.

Morgan, who also noted the time constraints, developed a contract activity to be used as a summative assessment. Since students completed the activity outside of the regular class block, this activity allowed the teacher to measure student learning without giving a traditional in-class assessment. Students completed separate activities on each topic to meet the requirements of the contract and received immediate feedback. The teacher reviewed the student results and used the information to provide support for student learning on each individual topic. The students were also allowed to re-do the assessments, as many times as they wished, in order to achieve the grade they wanted. This eliminated the need to assess during class time and ensured that the students were getting timely feedback and instructional support. Morgan noted that since the classes had been shortened to an hour and students were only in school four days each week, class time was particularly valuable, stating, "I'm teaching, and I don't want to take up time for them to take a test that they may ultimately fail and then not get any immediate feedback from."

<u>Teachers used technology to identify and respond to student learning needs</u>

Teachers also improved their ability to use technology in meaningful ways throughout the year. This included increases in using educational technology tools such as digital notebooks, Nearpod, Google, and Study Island, and the data collected from these tools. Since most students were still learning virtually, teachers continued to find ways to gain insight on which students were not actively participating or consistently struggling so that additional support could be provided, and instructional changes could be made. This included using educational technology to complete practice activities, reinforce topics that were more difficult for students, provide immediate feedback to students, and allow students to practice with question types that were challenging. Additionally, teachers were able to identify students who were taking longer to complete activities. Morgan stated, "So, I can see all of these as they're doing it, which helps. So, then I can see if they didn't get the first two done in the first hour we got some work to do." At times, formative assessments were used to identify students who had a strong understanding of the content. Those students were asked to share their screen and explain the concept to the class, since students may be more engaged and better understand explanations from classmates.

With some applications, teachers were able to check for understanding and use the information to identify misconceptions and provide immediate support. Jamie color coded Google slides for independent student work. This made it easier for students to ask for assistance, and since each slide was created to measure a specific skill, it was also easy for teachers to support students' learning. Jamie said:

I think we have gotten to a pretty good spot where, in the virtual world, if we color code them or we're doing things on different slides, they are able to a little more easily, kind of be able to say — I don't understand the blue side, I don't understand the pink side. We

found that if we can color code, then that's a little easier for them to be able to say what it is. And we know the blue side was targeting this skill, the pink slides were targeting this skill. (Jamie)

This process gave the teacher data on specific concepts to better provide assistance to students.

Teachers created or used formative assessments to identify student understanding

Teachers' goals for using data included checking for understanding, identifying gaps in understanding, and identifying misconceptions. Since students were often quiet or asked few questions in the virtual environment, teachers used formative assessments that would identify the gaps, misconceptions, and specific student needs as they were teaching concepts or as students were practicing the concepts. This allowed for an immediate response. They also were intentional about what was reviewed or retaught, as well as how they retaught when students did not show mastery of the content.

Teachers found that formative assessments designed to measure student understanding on specific content provided them with valuable information on student understanding when students were not learning in person. Jessie stated, "And then again, a little bit deeper, like, "Okay, they got it, they're good. But these five students, they need a little bit more." So, it's just a lot more structured being able to see the data and see who needs help and how." Jamie shared that specific answer choices were selected so that teachers could easily identify the likely misconception. The teacher felt this was more beneficial than having students fill in a blank because students could write random answers that provide teachers with no insight into student thinking. Jamie said, "We are able to kind of build in these pieces of data so that we can see even if they're making mistakes, it's telling us things about what they're doing." Students were also

asked to self-evaluate, providing the teacher with additional information about student understanding.

Teachers used student responses to identify students who were struggling and provide assistance. Intentional activities also helped teachers to identify content that needed additional review for the entire class and content that could be reviewed with small groups. Jamie reported that having formative assessments targeting specific content and student misconceptions was extremely valuable while students were learning virtually, stating,

I find it incredibly valuable because I think without it, I'm just hoping kids are getting stuff and I think that all kids are learning differently especially in the virtual world, they are learning in the virtual world, but they may be learning differently, and they may have different challenges. I think if I'm not taking the time to look at the work and see what challenges they might have, then I'm not going to be able to meet them where they are. I think especially in the virtual world, that's really not a good place to be because if you're not meeting where they are, they can just click out of the computer pretty easily. If you can read what they have on this, it may just be as simple as dragging and dropping but if I'm able to pull them in and say — so, let's talk about this. (Jamie)

Similarly, when discussing weekly formative assessments, Peyton stated:

I guess it helps me... Because it's weekly, it helps me to immediately find those misconceptions or even if I should just... If a lesson bombs and the majority of the class doesn't get it, it just helps me to know right away and fix it right away. So, that's really important to me because I don't want somebody continuing with having a misconception about something. (Peyton)

Peyton also added:

> So, I guess I just am looking at the data, where are the kids at and then revamping my
> lesson plans to make sure that I'm hitting on things that maybe I thought I hit on, but I
> actually didn't, or I hit on it, but it wasn't received. So, it's an immediate indicator if that
> happens and then I can correct it immediately. (Peyton)

The shift to virtual and hybrid learning produced a need to find new ways to assess student learning. Teachers responded by using formative assessment designed to measure specific student understanding and using the results to meet student needs.

Teachers adapted their actions based on data

Teachers continued to find new ways to meet student needs in the virtual environment, including providing opportunities to meet outside of school time. This included creating smaller groups in the virtual space, supporting students during the non-instructional day each week and during daily office hours/ instructional support time, and supporting students outside of school hours to provide more individualized instruction based on identified needs.

Participants discussed using office hours or a designated additional support time, as well as time outside of the regular school day, to provide support to smaller groups of students identified using formative assessment data. During this time, teachers remediated, retaught content, and worked with students to complete assignments or projects. Jessie required any student who scored below a 60% on assessments to attend office hours for additional instruction on the identified gaps in understanding and then retake the assessment. Students who were not satisfied with their performance were also allowed to attend. To ensure that students attended, the teacher called students who were expected to be in attendance. Using this method, the teacher noted that they have had a "really great response" (Jessie). One teacher also called students or

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sent messages through the district's learning management system to both students and parents inviting them to review or remediation sessions. This teacher also offered assistance outside of school hours. Students were able to text the teacher's Google voice cell phone number and request assistance. Teachers would go online and help students at that time. Another teacher also set up times to meet with and tutor a student on a Friday evening after school hours because that was the best time for the student. In previous years, that would not have been possible.

Breakout rooms in the online platform were used to create smaller groups for students who needed additional support as well as provide enrichment for students who had mastered the content. Reese highlighted the flexibility and ease of working with individuals or small groups. Before moving to virtual learning, classroom groups were generally static during a class block; however, in the virtual environment, the teacher assigned flexible groups of students to breakout rooms to provide more individualized support. This also allowed for students to participate in multiple small groups if needed. Moving from whole group to small group activities if a whole group activity was not effective was easier in the virtual environment due to the types of activities. Reese stated:

> But being that I was virtual, I could say, "All right. Here we go. Here's your first station." And I just made it up as I went along. These first three slides, group one's going to do this, the next few, group two, and so forth. And then we're going to come back and share. And that's what we ended up doing. And it worked out much better than all of us trying to get through 12 slides as a group, as a whole class. So, that, to me, was revolutionary. And only because we were set to be virtual anyway. (Reese)

The flexibility of creating groups during or after class times in the virtual environment afforded teachers a greater ability to meet identified individual student needs.

Theme 2: Teachers continued collaborative data practices

During the follow-up interviews, teachers continued to discuss finding value in collaborating with their peers about assessment data. The collaboration ranged from quick reviews of data entered in a spreadsheet to developing questions based on data and creating a plan to check the inferences. Although some teachers discussed collaborating less often after returning to in-person learning, they remained committed to collaboration and, at times, found creative ways to make that happen. Kris discussed that team members found collaboration around data helpful for different reasons, but was optimistic about the use of data stating, "Hopefully, over time again, it becomes habit, it becomes pattern, becomes the expectation and it's not a fight but people start to realize the deeper opportunity to analyze data and make positive and lasting change to instruction."

Collaboration included deep discussions

When meeting collaboratively, teachers were able to identify specific areas where students needed assistance. In addition to reviewing content that may have been challenging for students, teachers discussed other factors that could impact student performance. This included identifying specific vocabulary or real-world situations that may be unfamiliar to students as well as groups of students who may struggle or assessment conditions that could impact students' ability to show their understanding. For Kerry's team, their collaborative discussions allowed them to realize that poor student performance on some questions was due to context rather than content. Jordan's team began to use the same assessments and discuss data more often in response to teaching virtually. This led to deeper discussions and insights. When they met to

review a common assessment, they noticed similar difficulties for students with disabilities, the

impact of attendance and participation on student understanding, and had concerns about

measuring student learning with only one question. The team developed a plan to check their

inferences based on the data and was able to use follow-up questions to specifically determine

areas where students were struggling. In another situation, Jordan reported having questions

about student performance. Meeting together, the team felt the data was not showing gaps in

teaching and learning but testing fatigue instead. Jordan stated:

> I like that we use the same assessment because now we can look across all of our
>
> teaching styles. We still teach differently, and when we see our scores are similar, that
>
> clicks for us, like, okay, well maybe it's not the method of teaching, because we all teach
>
> differently, we all have different personalities, and maybe we need to look at something
>
> deeper that's going on. (Jordan)

Collaborative discussions included actions based on analysis

When reviewing assessments, teachers continued to meet to determine next steps,

including instructional strategies. Kris noted discussing with colleagues what worked and did not

work during instruction to develop plans for follow-up instruction. Similarly, Reese's team of

teachers used common assessments, reviewing data prior to their meeting. Then, they discussed

their analysis, as well as the instructional strategies that may benefit students. Reese stated:

> But we are seeing this data together for the first time and adding our input and say, "This
>
> is what I've seen. This is what I've noticed with my students." And then, we would
>
> actually even say, "How did you present that question? Or how did you present that
>
> concept? (Reese)

Jamie also reported discussing student performance with content team members to:

> ...kind of check to make sure if it is something that I'm just seeing in my class, what do I need to change about my practice or maybe is there something that I should have hit on differently and how did you guys do it so that you're not seeing that? (Jamie)

Hunter also reported that teachers seek assistance from each other stating, "So, that's something that I asked like, "Hey, how did you teach?" Because I see that two other teachers have higher percentages, like, "What did y'all do?" Because clearly, I'm not doing something right." Kerry found this practice to be valuable, stating, "I think it's beneficial especially when the other teacher gets to share their strategy if they perform well in a certain topic."

Teachers also discussed using data to identify what to reteach or review and then discussing how to do that. At times, concepts did not need to be retaught because the students missed the question due to poor test taking, for example not reading carefully. In other instances, a specific question might need to be reviewed or a skill might need to be taught again. After some students returned to in-person learning, the teachers compared data from virtual students to in-person students to determine the impact that completing the assessment while learning in the virtual setting may have had on student performance. They were then able to refine their inferences and develop a plan to address the problem areas identified. Using the data artifact that was shared, Hunter's team was able to determine two concepts that students were confusing, so they developed a plan to reteach those topics in response. Kerry's team shifted from predominantly focusing on analysis to spending additional time on developing a plan of action. Rather than continuing to discuss analysis once agreement was reached, the team decided to share ideas for instruction.

Many of these practices were not new in the hybrid environment. However, in the initial interviews, teachers discussed a greater need to collaborate and share instructional strategies when teaching virtually. These practices continued to be important to teachers in the hybrid environment and some practices, such as comparing the data of students who were learning in person with those who were learning virtually, were refined with this shift in the learning environment.

Some collaboration changed during hybrid learning

When students and teachers returned to school during the second semester of the 2020 - 2021 school year, teachers were further stretched, decreasing time for collaboration. Although collaboration continued, for most, it was not at the same level. Teachers were standing in the hallway between classes and had administratively assigned duties during planning, so the virtual interactions that previously occurred during this time became more challenging. Kris stated:

> I think again, if this had been our schedule in the fall and through the winter, I don't think
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> you would have seen the level of collaboration because we're just all too tired. We want
>
> to. We have the best of intentions, but it has become a little bit more — get in, get out.
>
> I'll do my part. (Kris)

Although Reese's team had duties during times when they previously met with the return to in-person learning, they decided to meet virtually while on duty. The meetings were not always long meetings, but still allowed them to continue to connect and collaborate consistently.

Teachers discussed continuing to text each other to connect, as well, but not as frequently as they did prior to returning. Since students were in person, there were more things to consider which decreased the time available to send messages during class. Jamie noted that while they were teaching in person, their collaborative partner was teaching virtually. Therefore, they were

able to discuss differences that they saw between the virtual and in-person students. For Kris, the schedule changed so that all meetings were moved to Wednesdays because students did not have classes or come to school on Wednesdays. The teacher noticed that the virtual chat between teachers increased on Tuesday in preparation for the Wednesday meeting and on Thursday in response to the Wednesday meeting.

Virtual collaborative meetings continued after returning to in-person learning

All teachers interviewed stated that team meetings were continuing to occur virtually even after teachers returned to in-person instruction. Most teachers preferred this method of meeting for various reasons, including the efficiency of meetings and the ability to share documents easier. Several teachers planned to continue to meet virtually in subsequent school years, even when they were allowed to meet face-to-face. Some teams had already discussed the idea and preferred to continue to meet virtually. Kris noted, "We hope that next year, even if we're all back and all, we hope that never goes away."

Teachers discussed that it was easier to manage the time in virtual meetings and participants were more attentive. Since there were fewer distractions, teachers were more focused and productive, and the meetings were more efficient. Morgan noted, "We're more on point now that it's virtual." Similarly, Kris stated, "We don't get off-task as much. The chat helps us stay connected from day to day rather than — where is that email, right? It's just in the thread of the chat conversations." The chat feature also made it easier to share links and resources. Teachers discussed the ease of practicing with educational technology and sharing documents or student work to aid in discussion and analysis since everything was readily available.

Including all participants was also an easier process in virtual meetings. Teachers discussed that team members might feel less pressure from superiors and be more willing to

voice their opinions when meeting virtually. These meetings also made taking turns speaking an easier process and the distraction of side conversations was removed. Additionally, if a teacher missed a meeting, they could watch the meeting later to know what was missed. Thus, the move to virtual learning promoted more efficient and productive collaboration.

Theme 3: Teachers expanded data use to include students

Teachers shared data with students and involved students in the data analysis process. In some cases, this was added or increased due to the virtual environment. For other teachers, this was not a new practice, but was particularly beneficial in this learning environment due to the decreased class time or virtual learning.

Several teachers discussed asking students to share their thinking or describe how they arrived at incorrect answers when working with them individually or in small groups. Jordan regularly asked students to explain their thinking, stating, "I look at what possibly they could be thinking, and I have those data conversations with the students, like, "Why did you choose that?" Because then, if I understand the why behind it, I can help them even more." Additionally, when Jordan's team determined that testing fatigue might be a cause of poor student performance, they asked the students questions to evaluate their hypothesis. Jordan stated:

> That's when we started doing more into looking at testing fatigue and having those honest conversations with our kids. You know, the students at River Middle School will say how they feel, and they're telling us they're tired of taking tests, and they're going to keep just clicking through answers. (Jordan)

Reese noted seeking out students to discuss their thinking when they were the only person to select a particular incorrect answer to better understand their misconceptions.

In addition to knowing how they performed, class data is shared in Reese's class. Students know concepts that were challenging for the entire class as well as how they performed on those topics. Reese also noted the ease in sharing feedback with students and parents using online platforms. When students used Google to complete assignments, the feedback could be added to the document making it easier for students to find and use the feedback. The summative assessment contract used by Morgan provided students with immediate feedback on their performance. Then, students were able to use that information to determine whether to retake an assessment or accept their current grade. Morgan stated, "So, this gives them the immediate feedback and it lets them control their grade and practice and learn and see an outcome of it." Additionally, the teacher felt that this assessment helped them to learn while they were completing it since the students had additional practice, stating:

> I feel like this assesses them and helps them while assessing them. So, I kind of know who needs help but hopefully by the end of this, they practice it so much they get it instead of just kind of giving them a test grade and being like, oh, you didn't learn that. (Morgan)

During this process, the teacher monitored student performance and worked with individual students who seemed to be struggling as well.

In Peyton's class, data is regularly shared with students telling them this is "your way of owning the review." Peyton added:

> I have it set so that the most recent is weighted higher than something you may have done earlier in the year, so that the students can see themselves growing. So, they have access to this data too because it's about themselves. And that's why I use this because it's very important to me that the students understand what's going on. (Peyton)

Peyton also felt that the students liked and understood this process because they were spending additional time on concepts that were challenging for them, rather than continuing to complete activities on material they had already mastered. Peyton stated, "So, I think that makes sense to them. And, when it makes sense to them, I think they're more willing to do it rather than just another piece of something that you're sending my way to keep me busy."

Students in Peyton's class have access to their data from assessments, stored in one location, so that they know how they are progressing, including their growth over time. The data is color-coded to make it easier for students to understand. When reviewing data, students create an action plan with assistance from the teacher. Peyton identified students who created strong action plans and asked permission to share their screen with the class so that other students could benefit from their understanding and processes. This teacher also shared student work that was generally strong but could use improvement to aid in that process. Peyton also created videos describing these processes for students who may need a review to work independently. For Peyton's class, this was not a change due to the online environment but made it easier for this teacher to transition to virtual learning.

Theme 4: Data use is important to teachers

Teachers described how they valued using data to support student learning and growth. In the follow-up interviews, teachers continued to discuss the use of more data in the virtual and hybrid learning environments since almost all information was collected physically. Discussions also included the benefits and importance of data use.

Teachers discussed the importance of analyzing and discussing assessment data. This included using the results to provide information about student understanding and teacher performance. Teachers shared that using data helped to remove emotion, resulting in discussions

that were based on numbers rather than rooted in competition. Although collaborative meetings involved viewing and discussing teachers' data collectively, one teacher cautioned against using data to compare teachers, as it could be used as a punishment rather for improvement.

Teachers also discussed the importance of prioritizing data use and ensuring that data use is emphasized. This included needing time between assessments to analyze data and use the results meaningfully. Jordan stated, "So, we actually are losing a lot of our instructional time to testing. It's to the point now where we're testing, and we can't even use the data from the assessments to drive instruction, because we're heading into another test." In addition to ensuring time for data use, establishing an environment conducive to data use was shared. Kris noted, "I think without having the culture of — data is relevant, and data is important and data drives what we do, it wouldn't be done well." Although teachers felt confident in their own ability, and often in their team members' ability, to use data effectively, they also identified the need for additional training and support.

Summary

During the follow-up interviews teachers discussed continuing and, at times, expanding the data use practices begun at the onset of virtual learning. This included increased and different collaboration with colleagues, creating assessments to measure specific concepts and identify student misunderstandings, and measuring student learning in smaller segments of instructional content. Additionally, teachers discussed sharing and discussing data with students to understand their thinking or promote ownership of their learning.

Integrated Findings

Overall, the findings show that teachers adjusted their data use practices in the virtual and hybrid environments including the data sources they used, and the actions taken in response to

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data. Four common themes emerged from the three phases of data collection. They are shown in

Table 17.

Table 17

Integrated Findings Themes

Theme 1: Teachers Valued the Use of Data for Student Improvement
Theme 2: Teachers Collaborate More Often and in Different Environments about Data and Instruction
Theme 3: Teachers Needed Different Sources of Data in the Shifting Environments
Theme 4: Teachers Adjusted their Data Use Actions in the Virtual and Hybrid Environments

Two themes emerged that identified the ways the shifting environments influenced

teachers' data use practices. In the virtual and hybrid environments, teachers valued the use of

data to promote student learning and collaborated more often and differently. Additional themes

emerged that identified the data sources teachers used in the virtual and hybrid environments and

the actions that teachers took in response to data analysis. The four themes are discussed below.

Theme 1: Teachers valued data use for student improvement

Teachers value data use and the impact its effective use can have on student performance,

particularly when teaching students online. The importance of data use to support student

learning was shared consistently and teachers discussed using more data after shifting to virtual

learning. This included intentional planning to produce needed data, collaborative analysis and

action plans, and discussing data with students. Additionally, one teacher expressed concerns

about having limited time to effectively review and use data, due to the frequency of testing that was initiated during virtual learning.

Time was frequently identified as a constraint to data use. Although teachers acknowledged data use was time consuming, they felt it was important enough to take the time needed. Concerns were expressed about the impact of frequent testing on their ability to use data effectively with one teacher discussing that testing was occurring so often that teachers did not have sufficient time to use the data to impact student learning. Teachers also discussed the need for additional support and guidance for data use to decrease the time needed and increase the positive impact of using data.

Theme 2: Teachers collaborated more often and in different environments about data and instruction

Teachers discussed collaborating both more often and differently in the virtual and hybrid learning environments. They shared that they collaborate with colleagues about data from assessments, as well as general instructional practices. Some of their collaboration included analysis of previous assessments and some collaboration included creating classwork activities and formative assessments that would yield specific information about student learning. Teachers also worked with colleagues to develop action plans based on their data analysis, including remediation or reteaching. Effective instructional strategies were also discussed if team members noticed that a teacher's instruction produced better assessment results. Discussions also included identifying and planning in advance to address areas where students may struggle during instruction as well as student weaknesses identified on assessments. Although some of these practices occurred in previous years, the level and depth of collaboration increased with the shift to virtual learning.

When teaching virtually, the teachers discussed collaborating with peers more often and in different ways. This included sending texts or emails during class and using the chat feature during meetings. The quick check-in conversations between teachers that may have occurred in the hallway between classes became quick text messages during class. The virtual team meetings became a positive experience for teachers. Even after teachers and students returned to the buildings for instruction, teachers continued to meet virtually with their content teams. For most, this became the preferred method of meeting. Teachers reported greater focus and efficiency when meeting virtually as opposed to in person. Without side conversations or other distractions, participants stayed more focused on the tasks. This allowed them to accomplish more in a shorter amount of time. It was also discussed that all participants' voices were included more equally and that information, including specific student data, was more easily shared, when meeting virtually. Using the chat feature to share resources, the ease of sharing screens to show student work or resources, and the ability to review the chat or a video of the meeting later were cited as benefits to these meetings.

Theme 3: Teachers needed different sources of data in the shifting environments

Throughout the year, teachers were faced with different challenges including beginning the year teaching virtually, shifting to hybrid learning during the year, and changing schedules. With each change, teachers adapted their data use practices to meet the needs of students. When the school year began with students learning completely online, teachers recognized that they needed new ways to measure student understanding. Teachers shared that when students were learning in person, they often gauged student understanding in class using cues from body language, student responses to questioning, and viewing student work as they circled the room. Since students were learning remotely and most student cameras were off during class time,

these options were not available. Therefore, teachers began using more data to measure student learning. In the initial interview, Kris said, "So, you can't just rely on, 'Do you get it, and it's on your face that you're confused?' You need hard data to kind of know where they are."

Teachers felt that it was important to gauge student understanding while they were teaching so they could adjust instruction in real time as well as during subsequent classes. During the first interviews, several teachers noted using features such as the chatbox, the "yes-no" button, or emojis to receive student input. Many also used Google slides or Google docs, since each student makes a copy of the item and the teacher can see each students' work in real-time, when using the district's learning management system. During the follow-up interviews, most teachers discussed using Google slides or Google docs or other educational technology, often explaining how they were able to adapt the way these platforms were used to measure students' understanding of specific content. At this time in the school year, their class times had decreased, so finding ways to measure student learning while maximizing instructional time was often discussed.

Teachers shared that they used district created and teacher created common assessment data as well as classroom assessment data to make instructional decisions in the virtual and hybrid environments. This included decisions that were made during class, as well as decisions that were made for upcoming lessons. Although many teachers reported using SOL test data on the survey, interview participants noted that SOL test data was not being used this school year, since students did not take the test in the previous year. Participants also reported using all or almost all common activities and assessments, this year, due to the virtual environment.

Teachers used a variety of data sources to identify student needs. Data artifacts that were shared included common warm-ups or exit tickets, teacher-created or required district wide

common assessments, and formative assessments used during instruction. Some of these data sources were created or adapted for the virtual environment, while others were used in previous years, when teaching in person. Several teachers discussed using materials to identify specific areas where students were successful or needed support. This became a greater focus in the virtual and hybrid environments as previous methods of identifying student understanding, including reviewing student work or seeing student reactions, were either not possible or limited.

<u>Teachers were concerned about the quality of assessments and the resulting data</u>

Accurately measuring student learning in the virtual and hybrid environments was a concern for teachers. They discussed concerns about the validity of data they were analyzing, as well as developing assessments to accurately measure student understanding. When creating or selecting assessments, teachers were intentional about using assessments that would provide accurate and meaningful information.

Teachers also expressed concerns about the accuracy of inferences that could be made from assessments when students were completing the assessments online. Since students were not taking assessments in the classroom, participants had concerns about assistance that may have been provided and simple mistakes that students may make when marking answers, as well as the testing environment and whether students were motivated to do their best work. These constraints made most teachers feel it was more difficult to accurately measure student learning in the virtual environment. When discussing these concerns, Jessie stated, "...because they're virtual, either they just don't take the assessment or they just go in, and they click and so they're more of an outlier of - OK. This isn't really representative of what they know. Or it's skewing the data because they're just going in and randomly clicking to get it done with, to say that they did a test. So, I know that kind of skews the data." Concerns were also expressed about interpreting

student understanding when only one question was used to measure a learning objective on district wide required assessments. Jordan stated, "We do have some issues where they'll test a strand with one question. So then... is it that they don't understand? Or was it just this one question that they missed?" To address these concerns, several teachers used formative assessments that identified specific student understandings as well as met with students to review concepts or to discuss their understanding of concepts.

Theme 4: Teachers adjusted their data use actions in the virtual and hybrid environments

Teachers used the information from classroom and common assessments and activities, including informal formative assessments and activities during instruction, to make adjustments in the moment. Teachers discussed creating targeted assessments or activities to focus on small segments of instructional content. Limiting the length of assignments not only encouraged greater participation from students but also created a more manageable amount of data. Additionally, having data on one topic, or individual concepts within learning objectives, was shared as a benefit. Teachers discussed including new or additional instruction for certain classes or creating small groups of students who needed support for a concept or topic based on the information gained from these smaller sources of information. These responses for individual students during class are consistent with teachers' discussions that individual review of data was more focused on specific students, whereas group review of data was generally broader.

Teacher actions with data included sharing data with students or involving them in the use of data in a variety of ways. This allowed students to take greater ownership of their learning. Although some teachers who completed the survey reported sharing data with students, this process seemed to evolve during the school year with additional data sharing occurring later in the year. Some of the data sharing was more informal or driven by feedback, while some

involved specific data sharing including tracking growth over time. Several teachers shared results with students and sought student input when they struggled with content. In addition to helping students, this provided teachers with additional information to identify areas of concern, for example testing fatigue rather than content issues. Other teachers shared class results in addition to individual results with students. One teacher shared all data with students using a tracking tool on the learning management system. This gave both the teacher and the students information about performance on each assessment and about their growth over time. The teacher also worked with the students to develop a plan of action for themselves based on the information in the data. Although for some teachers this was not a new process in the online space, the tools and methods used for virtual and hybrid learning made this process easier and promoted additional sharing of data with students, and at times, parents.

Summary

Overall, teachers showed that data use was important and adjusted their data use in the shifting environments. Some changes were small, while others were more significant. These changes resulted in more and different collaboration with colleagues and greater use of data. Additionally, teachers planned to continue many of these practices after students returned to completely in person learning.

Chapter 5: Discussion and Recommendations

Overview

The purpose of this study was to explore teachers' data use practices in the shifting educational environments created in response to the Coronavirus pandemic that began in March 2020. The learning environments included virtual learning (when students are learning online, synchronously or asynchronously), hybrid learning (when students are learning virtually, and students are learning in-person in the same class at the same time), and in-person learning (when students are physically present in the classroom in a traditional school building). This study was informed by the following research questions:

1. In what ways did the shifting learning environments influence teachers' data use practices?

2. What assessment data sources did teachers use in virtual and hybrid teaching environments?

3. What actions did teachers take in response to data in virtual and hybrid environments?

The purpose of this chapter is to consider the findings within the body of research on teachers' data use practices and make recommendations for applications of the research as well as for future research directions. The strengths and limitations of the study will also be discussed.

Summary of Findings

Several main findings emerged from the study:

- Data use is important to teachers. Teachers discussed using formative and summative data to make decisions, including quiz and test data, and exit ticket, warm-up, and classwork data. The need for data to understand student learning and respond to student

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needs became a greater focus in virtual and hybrid learning than it was when teaching in-person. Although effective data use takes time, teachers felt that it was important and worth the investment.

- Teachers collaborated differently and more frequently about data and instruction in the virtual and hybrid environments than in previous years. In response to the new environment, teachers collaborated informally throughout the day. As they returned to in-person learning, teachers continued to find ways to meet, although this could not occur as often. Additionally, teachers collaborated formally in content area team meetings. This collaboration included discussions with colleagues, leadership, and support personnel, such as coaches about data and instructional practices to improve student learning.

- Teachers used common assessment data and classroom assessment data regularly. During virtual learning, teachers created common assessments and instructional activities to use on a daily basis. Teachers discussed creating all or almost all materials as a team. Although individual classroom assessment data was used, common assessment data was used with more regularity in these environments. This included assessing information in smaller segments or "chunks" of content within learning standards and responding to student needs quickly.

- Teachers adapted their data use practices as the environment shifted. With each shift to the teaching and learning environment, teachers adjusted their data use practices to better meet the needs of their students. These adjustments included using the chat feature in the online learning platform, Google slides, Google docs and other educational technology, as well as providing additional academic support during office hours or in small groups in online breakout rooms.

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- Teachers shared data with students and many teachers involved students in their data use practices. Although much of this was not new in the virtual environment, the technology tools used within this environment made this process easier and allowed for feedback to be shared with students more frequently. Sometimes the level of student involvement was limited, such as discussing performance with students or sharing feedback, and sometimes the involvement was extensive, such as providing students with ongoing data and creating action plans with the students.

Discussion

Research is clear that data use is considered a primary tool for continuous improvement. The teachers in this study used data for the purpose of improving student understanding and made changes to their data use practices in the shifting learning environments during the 2020 – 2021 school year. The modifications teachers made in response to the changing learning environments will be highlighted and represent significant findings that contribute to the current understanding of teachers' data use practices. Although many of the findings can be situated in previous literature, several findings offer new contributions to the research, partially due to the lack of related research on data use in virtual learning environments.

The findings of the present study identify teachers' uses of data and elucidate that teachers were motivated to use data, felt confident in their ability to use data, and were generally the guiding force behind the data use with their teams. Feeling confident and motivated as well as having autonomy for data use are important as confidence with data use and belief in the positive impact of data use promote teachers' use of data (Roderick, 2012) and ability to use data is also needed for improvement in student learning (Datnow et al., 2012). Additionally, teachers regularly discussed data use for improvement rather than accountability. Whether the lack of

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testing in the previous year contributed to this emphasis is unclear. However, teachers described

using data to increase student learning and the ways in which the data artifacts were used was

improvement based, even when the data source was a district wide required assessment.

Teachers understood the need for meaningful information on student progress and described a

great deal of autonomy for determining the data to use and how it was used. Often, this included

sharing data with students. Some of the findings in the present study are consistent with previous

research and reinforce the importance of making data use a priority, providing time for data use

(Coburn & Turner, 2011; Young, 2006), and giving teachers autonomy for data use (Datnow,

2011; Moriarty, 2013). However, teachers in the present study focused on data use for student

improvement rather than accountability, and the nuances of the learning environments that

created a need for and likely promoted this focus represent meaningful contributions to what is

currently known about the data teachers use and how they use it.

Teachers modified their data use practices in the shifting environments

The changes to the learning environment brought changes to instructional and data use

practices. As the environment shifted, teachers adapted their practices to better meet the needs of

students. When developing a support model for teachers, Wang (2021) consulted with

instructional design experts. He stated, "They pointed out that though most of the instructional

design efforts by school teachers started as a reaction to the COVID-19 school closure, many

school teachers soon have learned and adapted themselves to this type of new remote teaching.

They began to move quickly beyond the initial reactive phase and into more active learning

phase of remote teaching" (Wang, 2021, p. 10). The findings of the present study are similar to

Wang's. For example, teachers reflected on their practices and adapted their instructional and

assessment methods to meet the needs of students in the shifting environments. This included the

use of Google forms, sheets, slides, and other Google technologies, educational technology, and the school district's learning management system. Teachers color-coded slides for ease in requesting assistance (for students) and for ease in providing assistance (for teachers). These and other instructional and assessment tools, such as warm-ups, exit tickets, and interactive classwork activities, that could be used to gauge student understanding during the learning process as well as after instruction were utilized and feedback was provided. Online breakout rooms were used for small group instruction and to provide individual and small group remediation or reteaching. Teachers held office hours and allowed students to contact them for support outside of the regular school day. While studies on effective data use in the virtual environment could not be found, Wang's (2021) model for professional development to support teachers in virtual learning provides some context. Instructional and assessment practices identified by participating teachers align with the best practices identified in the professional development model, including using multiple metrics on the learning management system to measure student learning, holding office hours, providing feedback, and having students self-evaluate (Wang, 2021). These uses of data in the virtual and hybrid environments contribute new information to our understanding of data informed practice.

Teachers collaborated and analyzed data deeply

Online learning produced significant changes to the amount and type of collaboration in which teachers engaged and these findings are a meaningful addition to the current research on collaboration. The shift in learning environments promoted additional collaboration and greater depth of analysis. Teachers explained developing materials collaboratively and checking with colleagues more frequently about the effectiveness of instructional practices than in previous years due to the complexity and time required for virtual instruction preparation. Working

collaboratively in this way was viewed as beneficial and teachers continued to find ways to meet regularly even after their planning time was reduced by administratively assigned duties upon returning for in-person learning.

While much of the previous research has shown that teachers do not analyze data regularly (Hoover & Abrams, 2013) or deeply (Datnow & Hubbard, 2015; Hoover & Abrams, 2013), the findings of this study demonstrate the influence of the virtual environment on teachers' data use in ways that counter this narrative. Responding to the virtual teaching and learning environment demanded increased frequency of data use, changes in how teachers collected information about student learning, and real time analytic approaches, responses, and collaboration which deepened their understanding of students' progress. The physical separation from students created new barriers and a greater need for information about student learning. The isolated teaching environment required more trial and error as well as support from colleagues to develop instructional practices and assessments that promoted learning. As such, collaboration increased and was different from collaboration when teaching and learning in person.

The collaboration discussed by teachers differed both between and within participants, but all participants described collaborative practices that included depth of analysis. Individual teachers identified interactions with peers that ranged from cursory reviews of data analysis conducted individually and discussed collectively, to using student data to ask and answer questions. Quick check-ins via text, email, and chat with peers throughout the day at the beginning of virtual instruction seemed to be a way to connect with colleagues and determine whether instruction was effective. From these interactions, teachers determined changes that needed to be made to positively impact student learning. Teachers shared discussing whether the pace of instruction was appropriate, whether materials selected were promoting student

understanding, whether instruction methods were effective, and student misconceptions that may have surfaced during instruction among other instructional topics both informally and in more formal content area team meetings. Additionally, accuracy of data was discussed, and teachers were concerned about inferences that could be made, causing additional reflection about both the assessments and the resulting data. For example, when interpreting assessment information, teachers had to account for assistance that the student may have received when completing assessments outside of the classroom setting, time taken to complete an assessment, and the testing environment as key considerations for determining whether results were an accurate reflection of student understanding.

Since teaching online was a new experience for even the veteran teachers, these connections with colleagues provided a way to evaluate the effectiveness of their instruction on a continuous basis. Even after the decrease in planning time after some students returned to in-person learning, teachers discussed finding ways to connect with colleagues, such as meeting virtually while on administratively assigned duties, such as hall duty, during non-instructional class blocks. According to Schildkamp and Poortman (2015), "having a shared goal is essential" for collaborative data teams (Schildkamp & Poortman, 2015, p. 35). The need for additional support from colleagues with the shift to virtual learning likely created a situation where teacher collaboration had a common purpose which promoted deeper and more frequent analysis. The focus of collaboration on improvement, rather than accountability, may have also had an impact as effective collaboration occurs when the focus is improvement rather than accountability (Datnow et al., 2013).

<u>Virtual collaborative meetings enhanced data use</u>

Virtual collaborative meetings were an unexpected benefit to online teaching and learning and represent significant contributions to the current research. The virtual meetings allowed for ease in sharing data with participants. Since all participants were connected remotely within a single platform, it was easier for teachers to share their screen and display data or student work to discuss with colleagues. Additionally, links to resources could be shared in the chat feature and teachers who were absent were able to watch the video later. These practices promoted greater unity and understanding of the analysis and actions to be taken. These factors likely contributed to the greater depth of analysis within the data discussions, as well as a broader range of actions in response to the analysis.

When meeting virtually, teachers described that participants were more focused and that there was greater participation from team members. Even in collaborative meetings with a large number of participants, individual voices were better represented when the meetings were virtual. Teachers describe being less intimidated to speak up in this environment as well as a greater ability to allow all individuals the opportunity to participate and speak without interruption. Greater involvement will not only create a platform for richer discussions, but also a more equitable environment. When all voices are heard, challenges to assumptions in the data can be made and additional strategies for student success can be shared. The importance of collaboration for effective data use cannot be overstated as collaboration has been identified as a requirement for improvement (Datnow et al., 2012). While teachers gain insights from assessments, interactions with others impact the actions based on that information (Coburn & Turner, 2011). The benefits to virtual collaboration as a means to promote equity and enhance student learning are clear and should encourage school leaders to continue this practice.

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These changes to collaboration, both in form and quantity, as well as the depth of analysis, represent significant and meaningful findings. While some aspects of these findings can be compared to current research, other aspects contrast or provide additions to what is currently known.

Teachers used additional data sources in the virtual and hybrid environments

The virtual environment introduced new challenges to measuring student understanding. Teachers discussed needing additional data in the virtual and hybrid environments since all (virtual environment) or many (hybrid environment) students were not physically present in the learning environment. Data use was important to teachers, and they recognized the impact that effective use can have on student performance. Teachers discussed having some autonomy and decision-making authority for how they used data individually and collectively. Even in schools where data use was a requirement, or specific data meetings were mandated, teachers noted flexibility and choice in determining the type of data at the focus of their practice. As a result, participants described developing assessments and activities, both formative and summative in nature, to produce information about student learning that identified student needs and could be used to compare data points over time. The consistent use of data to measure student understanding coupled with the sense of autonomy discussed by teachers is consistent with previous literature indicating that empowered teachers revised assessments to more aptly gauge student understanding (Farrell and Marsh, 2016b). Additionally, Wayman, Cho, Jimerson, and Spikes (2012) noted that when school leadership established structures and encouraged data use, teachers were more likely to use data effectively and have a positive attitude about using data. Providing teachers with time for data use and choice about the data used may have also contributed to the greater use of data, as well as use of data for improvement.

Teachers used data sources designed to measure student understanding

The assessment data sources that teachers used were designed to measure students' levels of understanding. The need for consistent, real-time data on student understanding in the virtual and hybrid learning environments likely contributed to the use of these sources of data. Most teachers relied heavily on multiple choice questions for summative and formative assessments, including quizzes, tests, and warm-ups or exit tickets, but also used other types of questions. Several discussed questions about inferences that could be made from student responses on multiple choice assessments, particularly in the virtual environment, and one teacher raised concerns about using only one question to measure a learning objective. For example, when analyzing data from a district created "checkpoint," one teacher discussed specific concerns with a single question measuring an objective. The teacher raised questions about other factors that may have impacted student performance on that question, including the reading level of the question or the question type. Thus, participants found ways to use multiple choice assessments to gain more than cursory information to identify and support student understanding. This included creating multiple choice questions that targeted specific skills, selecting answer choices to identify misconceptions, and creating assessments that measured smaller segments of learning objectives which could be addressed more easily. Some teachers used questions that were similar but measured different aspects of a learning objective to compare student understanding of content within a learning objective. Additionally, teachers used other types of questions and developed items that required students to provide written responses or provide specified information to gain a greater understanding of student learning. Research on formative assessment identifies the need to develop specific learning targets and continuously measure students' mastery of smaller segments of content. Teachers can then respond to student needs

quickly, guiding students to mastery of the entire standard (Stiggins and DuFour, 2009). The

teachers in this study regularly discussed using data for these purposes. Additionally, the

consistent use of formative assessment has been connected to increased student learning (Black

& Wiliam, 2010). While the predominant use of multiple-choice questions is related to the

current knowledge of data use practices (Datnow & Hubbard, 2015), these findings provide some

additional contrast to previous research identifying a lack of depth of analysis (Datnow &

Hubbard, 2015; Hoover & Abrams, 2013). Although teachers used multiple choice items, they

were designed to provide substantial information about student understanding, misconceptions

that students may have, and were also used to compare student performance on specific skills

within a learning objective. Additionally, the use of assessments designed to measure and target

specific skills in smaller segments is an important addition to the current body of knowledge.

Common and classroom assessment data were predominantly used

Common assessment data and classroom assessment data were used regularly by

participants; SOL test data was not used this year. Most teachers shared that they historically

used state mandated test data in addition to the common and classroom assessment data.

However, since the state standardized test was not given the previous year, this data was not

used. The use of common assessment and classroom assessment data more often than

standardized test data in the present study was not surprising, as previous literature indicates that

teachers tend to focus data analysis efforts on benchmark tests more than other types of

assessments (Datnow & Hubbard, 2015, Farrell & Marsh, 2016b). The benchmarks or

"checkpoints" teachers used were created by the school district, but teachers also described

developing other classroom and common assessments with their content area teams. Although

teachers used classroom assessments, many teachers responded to the changing environments by

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regularly using teacher created common assessments and activities that targeted smaller "chunks" of learning objectives and allowed for a greater ability to respond to specific identified student needs. The frequent use of data from these common assessments and classroom assessments is significant as research identifies that greater changes to instruction are made when reviewing data from teacher created materials (Kerr et al., 2006; Farrell & Marsh, 2016b) and changes to instruction are needed for data use to positively impact student achievement (Dunn et al., 2013b). Additionally, a lack of standardized test data to review may have contributed not only to focusing on classroom and common assessment data, but also to focusing on using assessment data for improvement rather than accountability.

Teachers adapted their actions with data in the virtual and hybrid environments

Some teacher actions with data were developed or adapted in the virtual and hybrid learning environments. Other actions were not developed due to the shifting learning environments but may have increased due to the greater need for support from colleagues in this environment. These teacher actions in response to analysis differed between participants. While some actions implemented, such as teaching test-taking strategies would be identified as unproductive (Booher-Jennings, 2005; Marsh et al., 2016; Stephens et al., 1995), most of the actions described by teachers are considered productive, including reteaching or remediation with the whole class, individuals, or small groups, changing instruction in the moment or in later classes, and developing action plans independently or collaboratively with colleagues or students (Datnow, 2011; Dunn et al., 2013b; Farrell & Marsh, 2016a). Teachers discussed seeking assistance from colleagues for instructional practices that could be implemented to improve student performance, contrasting an emphasis on "what" was taught rather than "how" it was taught by teachers in Farrell and Marsh's (2016b) research. These findings add to our

understanding of teachers' approaches to data use, as the "help seeking" efforts described by teachers in this study demonstrate a level of confidence and professional practice needed to seek out resources and ideas for appropriate instructional responses based on information about student learning. This finding builds on the current research, as teachers often have confidence with analyzing data, but less confidence with using data to make instructional changes (Datnow et al., 2013).

<u>Teachers involved students in their data use practices</u>

Teacher actions with data included involving students in assessment and data use practices. Teachers shared that they discussed assessment results with students both as a support for student learning and as an insight to student thinking which has been identified as a necessary component for effectively using data to inform instructional practices (Supovitz, 2012). Teachers also shared data or information about students' performance with students in various ways, including using educational technology to provide immediate results and including feedback on assignments. One teacher's use of the mastery feature on the district's learning management system provided an example of student involved data use (SIDU). Abrams (2021) states, "SIDU practices are designed to support students' tracking and analysis of their own assessment information in structured and systematic ways…" (pp. 258 – 259). While this example does not incorporate all of the common features of SIDU identified by Jimerson and Reames (2015), it meets the goal of providing students with greater ownership of their data. Students are engaged with their data throughout the year, can see their growth, and develop plans for improvement or growth in cooperation with the teacher. The specific practices discussed by this teacher and success of this method provide additional information on this emerging topic for which Jimerson

and Reames (2015) note that research is limited, and effective practices have yet to be established.

<u>Time and professional knowledge are needed for effective data actions</u>

Teachers also noted the need for time and professional knowledge to effectively analyze data and develop plans for action. While the need for time to act on the data, in addition to analyzing data, has been established (Datnow et al., 2013;Wayman, Cho, Jimerson, and Spikes, 2012), these findings contribute additional insight to the current understanding. Teachers recognized data use was time consuming but valued the impact it could have enough to take the time. However, reduced time available for effective data use can be an unintended consequence of measuring student learning. For example, one teacher expressed frustration over the amount of required testing, since the schedule did not allow time to effectively use data, after the analysis, before students were taking another required test. Testing without time for analysis and subsequent action will not promote student learning. It was even noted that the ability to use data effectively to identify and respond to student needs did not decrease the time required for this process. Instead, improved professional knowledge and skills with data resulted in actually *using* the data rather than stopping with analysis. Teachers shared that without adequate understanding of effective data use processes, data might be analyzed but would not result in instructional responses and actions. These ideas are consistent with those of Wayman and Jimerson (2014) who found teachers reported feeling that greater competence with data would lead to improved instructional decision making to support student learning. Thus, teachers not only need time for data analysis to inform their instructional processes, but also require professional knowledge and ability to effectively use data to impact student understanding. This provides support for the idea that positive teacher actions with data require an intersection of ability and time which is

important as Farley-Ripple & Buttram (2014) noted that teachers must engage in action-oriented tasks in addition to analysis-oriented tasks for positive changes to student learning.

Teachers' data use was focused on improvement

The shift to virtual learning coupled with the lack of state mandated standardized testing in the previous year likely created a dynamic that promoted an emphasis on data use for improvement rather than accountability. In the virtual and hybrid spaces, a need to accurately measure and respond to student understanding took precedent over accountability pressures. Teachers responded by using more data, developing different assessments and activities, and regularly collaborating with their peers both informally and formally.

Working in isolation in a new learning environment resulted in the need for increased teacher collaboration where instructional practices and data analysis were consistently shared. In addition to meeting more often, teachers shared that discussions focused on improvement. The lack of testing in the previous year may have created a dynamic for data use that encouraged practices more similar to countries where accountability matters but is less emphasized. For example, in the Netherlands, teachers participate in accountability testing. However, the decentralization of accountability creates an environment where data use is focused on using data to improve the school as well as accountability (Schildkamp et al., 2017). Although the lack of testing likely contributed to the focus on improvement, the role of the learning environment cannot be ignored as teachers also expressed a greater need for regular daily data in addition to increased collaboration when teaching virtually.

In a culture of accountability, teachers may use data for compliance rather than student improvement. However, the shift to the virtual and hybrid learning environments created a need for more formal data on student understanding and impacted how the data was used. Rather than

simply fulfilling an obligation, teachers focused on data use to identify and respond to student needs. Common assessments, both required and teacher created, and classroom assessments were used daily to measure student learning. The assessments and activities were designed to produce specific and meaningful data that was used to inform their instructional practices and meet student needs. This provided the consistent data needed to support student learning and also allowed teachers to share the increased workload involved with virtual teaching. Whether the emphasis on improvement rather than accountability was due to the lack of testing in the previous year, the virtual and hybrid teaching environments, some other factor, or a combination of these factors is unclear, but represents a significant finding.

Summary

When teaching and learning moved from in person to online in March 2020, teachers saw an immediate and pressing need to make changes to their instructional and assessment practices. Making these changes effectively required a greater use of data. When teaching in person, teachers regularly relied on cues from students to evaluate their understanding during the instructional process. Since teachers often did not see their students on camera, in addition to the lack of in person contact, they needed additional ways to measure student learning. This prompted a greater emphasis on data use. Although teachers identified both benefits and constraints to data use in the virtual environment, they were driven to use data to understand and impact student learning.

Time has been a consistent constraint for teachers and became a greater issue in the virtual environment. Teachers responded by collaborating with colleagues more frequently and modifying the activities and assessments used or becoming more intentional in their design. Even the virtual collaborative meetings became an unexpected benefit. This finding was reinforced

even after teachers had returned to some in-person instruction where in interviews, teachers discussed preferring the online content area or professional learning community meetings as they were more efficient, allowed for ease of sharing relevant materials (e.g., data displays, student work, assessments, lesson plans, resources), and contributed to greater equity of contributions by team members. Collaborative discussions ranged from quick check-ins via texts to extended formal discussions about instructional methods and ways to identify or address gaps in student learning. Although most teachers discussed administrative requirements to use data in some form, they also shared having autonomy for data use. At times, the collaboration or data use was driven by requirements, but most of the focus on data use was for improvement rather than accountability. Additionally, some teachers shared data with students and one teacher involved students in decision making and developing actions plans using data.

Research on general data use practices is extensive. However, the research on virtual instruction in K12 environments is limited and data use in this environment is even more limited. The disparity between student performance for students learning in virtual and in person environments in Miron and Urschel's (2012) study identifies a need for greater understanding of how to measure student learning. Due to limited research on K12 data use practices in a virtual environment, these findings provide new and significant contributions to the current body of research, including how teachers adapted their data use practices and collaboration with colleagues when teaching online.

Strengths and Limitations

The design is the primary strength of the study. Using a case study design and collecting quantitative data, as well as qualitative data, at two times during one unique school year provide ample evidence to support the findings. The collection of data artifacts from each participant and

subsequent discussion provided specific information about the data sources teachers choose and the ways in which the data are used. These artifacts support and provide evidence for the teachers' statements. The use of a case study design with the discussion and collection of data artifacts was used in previous research by Farrell and Marsh (2016a) providing additional support for the strength of this design.

The low response rate prevents generalization of the survey results and is a limitation. Wayman and colleagues (2016) noted this constraint as a low response rate may produce data that is not representative of the larger population. They stated, "When response rates are low, findings could be biased toward certain types of responders; for example, if only recipients who are interested in data use respond, the results will not reflect the views of teachers who use data less frequently" (Wayman et al., 2016, p. 20). Therefore, the small number of survey respondents could limit the larger application of the recommendations.

As case study research, the goal is not to generalize to the broader population but to describe the particular group within the context studied. In reference to case study research, Maxwell (2013) states, "...the primary concern of the study is not with generalization, but with developing an adequate description, interpretation, and explanation of the case" (p. 79). For this study, the interview participants volunteered to participate in a discussion about their data use. Teachers who felt more confident in their ability to effectively use data or held positive attitudes toward data may have been more likely to volunteer for participation. Thus, the data use practices described may be more reflective of best practices rather than general data use practices or even the practices of all teachers in their schools. However, much of the information shared by teachers addressed collaboration and shared practices so their use of data may be very similar. Additionally, two-thirds of the teachers are leaders in their school and several teachers discussed

sharing their data use practices with colleagues. Therefore, positive data use practices may be promoted both with their team members and other members of the school community. Although the self-selection and limited number of participants is a limitation that must be considered, the descriptions of the context and participants allow for transferability of the findings to similar contexts.

Recommendations for Practice

The findings show that teachers adapted their instruction and assessments to better meet the needs of students when teaching virtually. These adjustments included changes to both teaching and measuring student learning, including working collaboratively with peers to develop meaningful assessments and using data analysis to determine needed adjustments to instruction both immediately and in future classes. Many of the shifts to instructional and assessment practice can be beneficial to teachers and students when returning to in-person learning. Without seeing students in person, teachers discussed needing more data to gauge student learning. In response, teachers adjusted the data they collected. These data collection methods would be beneficial for in-person learning as well. Teachers can be encouraged to continue to collaborate with colleagues and use targeted common and classroom assessment data to identify and respond to student needs with the return to traditional instruction.

Teachers value data use and recognize the positive impact effective use can have on student learning. While teachers desire to use data, constraints to data use can hinder their ability. To support effective use, it is important to provide teachers with support (Jacobs et al., 2009; Kerr, et al., 2006; Militello et al., 2013; Roderick, 2012; Wayman, Cho, Jimerson, & Spikes, 2012; Young, 2006), including training (Lange et al., 2012; Militello et al., 2013; Schildkamp et al., 2017; Young, 2006), structures for collecting and analyzing data, and time to collaborate

with colleagues and develop meaningful action plans (Datnow et al, 2013; Lange et al., 2012; Militello et al., 2013; Wayman, Cho, Jimerson, & Spikes, 2012; Young, 2006). Although the participants expressed confidence in their ability to use data, one participant discussed the need for more training for data use. The teacher shared the positive impact that data use can have. However, if teachers lack knowledge about how to use data effectively, they may just go through the motions which will not positively impact student learning. Additionally, teachers must have sufficient time to both analyze and act on the analysis (Datnow et al., 2013). Time for effective data use includes providing enough space between required assessments for teachers to analyze and respond to results before assessing students again. Additionally, leaders can support the continued use of data for improvement rather than accountability. This could include a focus on common and classroom assessments, particularly when they are used as a formative assessment which has been connected to improved student performance (Black & Wiliam, 2010).

Since time is a consistent constraint to data review and use, the greater efficiency of virtual meetings can have broader implications. With the increase in focus and efficiency in a virtual meeting environment, teachers are able to maximize the time spent reviewing data, possibly leading to greater use. This environment also creates greater opportunities for other participants such as central office personnel, researchers, data coaches, experts, or other stakeholders to be included. Teachers who miss meetings can watch the video recording of the meeting later, ensuring greater connection with the team and understanding of the analysis and decisions that were made. Additionally, this provides a platform for collaboration across schools or school districts. This is particularly beneficial when a teacher is the only teacher in the school, or possibly the district, teaching a particular course. Virtual meetings allow teachers to develop common assessments and then meet collaboratively to review the data and determine next steps.

While this option has always been available, the forced movement to this form of collaboration has shown not only that it works but also that it can be beneficial.

Recommendations for Future Research

Many of the findings in this study about teachers' data use are consistent with the established research, however this study breaks new ground by exploring data use practices within a virtual teaching and learning environment and over time as this environment changed to include in-person instruction. The nature of the learning environments, both virtual and hybrid, influenced the data teachers used and the ways in which they were used. The extent to which the environment influenced these practices warrants further study. Other factors, including leadership, training in assessment and data required for licensure, as well as teacher's self-efficacy with using data, also likely contributed. Additionally, as teachers adjusted their practices in the virtual environment, they recognized a tangible and immediate benefit of these new practices that were continued even after the return to in-person instruction. Investigating the long-term effects of shifting practices in response to the changing instructional environments would provide significant information related to efforts to instill lasting and meaningful changes to data use practices. Research topics could include: an investigation into whether the focus on data for improvement that occurred in the virtual environment was continued once students returned to in-person learning, studies on whether changes to the collaborative methods and frequency employed by teachers became common practice or discontinued with the return to the traditional classroom, and research into whether teachers continued to focus data use efforts on teacher created common assessments.

Additional research on teachers' professional development needs for effective data use practices is also warranted. Teachers made adjustments to instructional and assessment practices

as the environments changed. As noted in Wang's (2021) instructional model, teachers quickly

modified their teaching. However, they may still need assistance with pedagogy (Wang, 2021).

Therefore, after potentially a year or more of teaching virtually, it would be prudent to

investigate the professional development that teachers need to build upon the lessons learned in

virtual instruction.

Limited teacher actions for equity were discussed; however, these actions differed from

much of the current research. Studies have shown that concerns about equity can result in

negative stereotyping (Horn, 2018), unproductive use of data that actually increases inequity

(Garner et al., 2017), and inequitable practices (Horn, 2018). When discussing equity, some

teachers discussed reviewing data for subgroups of students including special education students,

English language learners, and African American students. However, the emphasis was on

ensuring that all students were achieving rather than on limiting the curriculum or labeling

students negatively. One teacher also discussed using data to recognize that minority students

were underrepresented in advanced classes and using additional data to rectify the problem.

Although the nature of this study did not allow for in depth discussion on the use of data to

promote equity, this topic deserves additional consideration in future studies.

Conclusion

This study has met the goal of identifying ways that teachers used data differently when

teaching in virtual and hybrid environments. In many ways, teachers' data use practices parallel

previous literature on data sources that teachers use and how they use data. However, additional

data use practices emerged from the research, including greater use of data in the virtual

environment, additional focus on changes to instructional practice in response to data, intentional

design of assessments, a focus on data use for student improvement, and differences in

collaboration. While the influence of the shifting environments on some changes to data use practices cannot be emphatically stated, teachers directly linked the greater use of data and differences in collaboration to the virtual environment. Although developed in response to teaching online, teachers discussed planning to continue using these methods with a return to in-person learning. This would benefit both teachers and students, and future studies to determine the long-term effects of virtual teaching are needed.

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Appendix A

Teacher Survey

Teacher Survey

Definitions included with the survey:

1. SOL test data: Information about group or individual student performance on the SOL test.

2. Common assessment data: Common assessment data includes data (information) from formative and summative assessments that are given, and reviewed and/or analyzed collaboratively by teams of teachers. This includes benchmark tests and other assessments given by teachers in a content team. These assessments can be created by teachers, specialists, or others.

3. Classroom assessment data: Classroom assessment data includes data (information) from formative and summative assessments that are used by individual teachers. This includes warm-ups, exit tickets, quizzes, tests, etc. that are chosen or created, and administered by individual teachers.

Items 4 - 20 are from the Teacher Data Use Survey developed by Wayman, Wilkerson, Cho, Mandinach, and Supovitz, 2016.

1. What content do you teach? _____

2. Do your students take an SOL test at the end of the year? _____

3. Is your school fully accredited? Yes or No.

4. Are the following forms of data available to you?

Forms of data	Yes	No
SOL Test Data		
Common Assessment Data		
Classroom Assessment Data		
Other		

If you indicated "no" to all options in question 4, skip to question 12. If you responded "yes" to

any option, please proceed to question 5.

5. Teachers use all kinds of information (i.e., data) to help plan for instruction that meets

    student learning needs. How <u>frequently</u> do you use the following forms of data?

Forms of Data	Do not use	Less than once a month	Once or twice a month	Weekly or almost weekly	A few times a week
SOL Test Data					
Common Assessment Data					
Classroom Assessment Data					
Other					

6. If you marked the "other" option above, please specify the form of data here:

_____

If you indicated that SOL test data is "not available to me" in question 4, OR if you indicated

that you "do not use" SOL test data in question 5, please go to question 10.

7. The questions ask about SOL test data. In a typical <u>school year</u>, how often do you do the

following?

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

If you indicated that Common Assessment data is "not available to me" in question 4, OR if you indicated that you "do not use" Common Assessment data in question 5, please go to question 11.

8. These questions ask about Common Assessment data used in your school or district. In a typical <u>month</u>, 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 Common Assessment data to identify instructional content to use in class.				
b. Use Common Assessment data to tailor instruction to individual students' needs.				
c. Use Common Assessment data to develop recommendations for additional instructional support.				
d. Use Common Assessment data to form small groups for targeted instruction.				
e. Discuss Common Assessment data with a parent or guardian.				
f. Discuss Common Assessment data with a student.				
g. Meet with a specialist (e.g., instructional coach or content coach) about Common Assessment data.				
h. Meet with another teacher about Common Assessment data.				

If you indicated that Classroom Assessment data is "not available to me" in question 4, OR if you indicated that you "do not use" Classroom Assessment data in question 5, please go to question 12.

9. These questions ask about Classroom Assessment data used in your school or district. In a typical <u>month</u>, 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 Classroom Assessment data to identify instructional content to use in class.				
b. Use Classroom Assessment data to tailor instruction to individual students' needs.				
c. Use Classroom Assessment data to develop recommendations for additional instructional support.				
e. Use Classroom Assessment data to form small groups for targeted instruction.				
e. Discuss Classroom Assessment data with a parent or guardian.				
f. Discuss Classroom Assessment data with a student.				
g. Meet with a specialist (e.g., instructional coach or content coach) about Classroom Assessment data.				
h. Meet with another teacher about Classroom Assessment data.				

10. These questions ask about your attitudes toward <u>your own</u> use of data. Please indicate

how much you agree or disagree with the following statements:

Action	Strongly disagree	Disagree	Agree	Strongly agree
a. I am good at using data to diagnose student learning needs.				
b. I am good at adjusting instruction based on data.				
c. I am good at using data to plan lessons.				
d. I am good at using data to set student learning goals.				

11. 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.				
b. We discuss our preconceived beliefs about an issue.				
c. We identify questions that we will seek to answer using data.				
d. We explore data by looking for patterns and trends.				
e. We draw conclusions based on data.				
f. We identify additional data to offer a clearer picture of the issue.				
g. We use data to make links between instruction and student outcomes				
h. When we consider changes in practice, we predict possible student outcomes.				
i. We revisit predictions made in previous meetings.				
j. We identify actionable solutions based on our conclusions.				

12. What else would you like to share with me about data use?

13. Are you willing to be interviewed about your data use practices? YES or   NO

14. If yes, please include your email address: _____

Initial and Reminder Emails

Initial Recruitment Email

Hello,

I am a doctoral student at Virginia Commonwealth University, and I am looking to understand how teachers use data to inform practice. As part of this research study, I invite you to complete a survey of how teachers use student data. I will use the results of this survey to learn about how data are used throughout the school district, and ultimately, to make it easier for teachers to use data.

I want to stress that your responses will be completely confidential and will not be tracked or attributed to you. Results from this survey will be reported in aggregate, not individually. If you choose to include your email address at the end, contact information will be stored separately from the survey results.

This survey will give a full picture of how teachers use data and will inform our work toward supporting teachers' use of data. All mathematics, English, science, and social studies teachers are being asked to complete this survey. This survey will be open until _____.

Although your participation is completely voluntary, your participation will help to provide a more accurate and complete picture of data use. Therefore, I ask you to please take a moment to click the link below to take the survey. The survey takes about 15 minutes to complete.

Survey link:

Thank you for your time and participation in this survey.

Reminder Email

Hello,

Recently, I sent you an email inviting you to participate in a survey that is part of a research study about how teachers use student data. If you have already completed the survey, please ignore this email. If you have not completed the survey, could you please take a moment right now to complete it?

I am looking to understand how teachers use student data to inform their practice. I will use the results of this survey to learn more about how data are used throughout the district and, ultimately, to make it easier for teachers to use data.

I want to stress that your responses will be kept completely confidential and will not be tracked or attributed to you. Results from this survey will be reported in aggregate, not individually. If you choose to include your email address at the end, contact information will be stored separately from the survey results.

This survey will give a full picture of how teachers use data and will inform our work toward supporting teachers' use of data. All mathematics, English, science, and social studies teachers are being asked to complete this survey. This survey will be open until _____.

Although your participation is completely voluntary, your participation will help to provide a more accurate and complete picture of data use. Therefore, I ask you to please take a moment to click the link below to take the survey. The survey takes about 15 minutes to complete.

Survey link:

Thank you for your time and participation in this survey.

Appendix C

Initial Interview Protocol

Introduction

Thank you for taking the time to participate in this interview. My name is Stephanie Moore, and I am a doctoral student in the School of Education at VCU where I am working on my dissertation investigating how teachers use assessment data for analysis and decision-making. What I learn from the survey and the interviews will be used to provide the school district with information that can be used to enhance and guide specific professional development to support teachers' use of data to improve student achievement.

This project is designed to identify the assessment data that teachers have available and use as well as the ways in which these data are used. Based on the current data use literature, data use will be separated into two categories: how data are analyzed, and the actions taken based on data. The purpose of this interview is to find out you use assessment data, both individually and collaboratively. Our session will last approximately 30 minutes.

I will be audio recording the session so that I can accurately capture all of your comments. If you would like to review the transcript of the session, please let me know.

Part I: Data Sources

1) What data do you use?

   Follow-up:

   - If not listed, ask about standardized test data, common assessment data, and classroom assessment data.

2) How do you decide what data to review?

Part II: Data Use and Supports

3) What impacts the frequency of your data review and use?

   Follow-up:

   - How often do you use or review that data?

   - Do you spend more time reviewing data individually or collaboratively?

4) How do you review your data?

   Follow-up:

   - Do you review the data individually or with others?

   - Are there differences in how you review the data individually and

     collaboratively?

   - Is collaborative data review required or optional?

   - (If required) What is the requirement for data use? (Potential prompts: How much

     time is required? How much data is reviewed? Who decides what data to review?)

   - (If data are reviewed collaboratively) Who is part of the data review?

   (If data are reviewed collaboratively) Who leads or guides the collaborative data use?

   - (If data are reviewed collaboratively) Do you follow a data use protocol?

5) (If data are reviewed individually and collaboratively) What are the benefits and

   constraints to individual and collaborative data review?

6) Are there ways that data use has been different this year? If so, how?

Part III: Data Analysis and Actions

7) How do you analyze the data?

8) What do you do with the analysis?

9) (If data are reviewed collaboratively) Are the data analysis and actions taken based on the analysis discussed or written?

Part IV: Conclusion

10) Would you like to share any other thoughts related to using data that I did not cover during this interview?

11) Would you be willing to discuss your data use again later in the year? If so, would you bring an example of data you have used that we could discuss?

Thank you for your time and participation.

Appendix D

Follow-Up Interview Protocol

Introduction

Thank you for taking the time to participate in this follow-up interview. The purpose of this interview is to discuss your selected data artifact and learn more about some of your responses in our original interview. Our session will last approximately 45 minutes.

I will be audio recording the session so that I can accurately capture all of your comments. If you would like to review the transcript of the session, please let me know, I am happy to share it with you.

Part I: Data Artifact

1) Please describe the artifact you selected.

2) What made you select this artifact?

3) What kinds of data are evident in this artifact?

4) What did you learn about your students' knowledge/skills from your review and analysis of this artifact?

5) Based on what you see in this data, what would be your next steps for teaching? (Follow Up: What kind of decisions have you made based on this data? How has this guided your instruction? What other data might you collect? What questions might you have about student learning?)

6) How often do you review this type of data?

7) How valuable do you find this data? Why?

Part II: General Follow-Up

(These questions will be prefaced with the information shared during the initial interview.)

8) Are there any differences in how you use data now that students are back in school after almost a year of remote learning and teaching? If so, what are those differences?

   Potential Follow-Up:

   a. Are there any differences in the data you are using now than the data you were using when your classes were completely virtual? If so, what are those differences?

   b. What made you decide to continue to use those data? OR What made you decide to change the type data you were using?

9) Are there differences in how you are using the data now that some classes are in-person?

10) When we met earlier, you noted that you were collaborating (texts, chats, etc.) with your content team members to make adjustments to instruction based on student performance. Now that you are in-person, are you still collaborating as much as you were when you were teaching virtually?

   a. Are your collaborative meetings in-person?

   b. Are they similar or are there changes to your collaborative meetings?

11) How are you using data to make decisions?

12) When reviewing data, what are your main goals?

13) In what ways has your use of data increased your awareness of differences in student learning and differences in opportunities to learn? How do you use data to try to address gaps and differences in student learning? In what ways can using data help teachers to promote culturally responsive and inclusive classrooms?

Potential Follow-Up: Ask questions about which students may benefit from these efforts (i.e., Students with IEP's, LEP students, Lower SES students, minorities, etc.)

13) Are there any data use requirements that seek to promote equity? If so, what are they and how are they used?

Part III: Individual Follow-Up Questions

See Below

Part IV: Conclusion

14) How many years of teaching experience do you have? How many years have you been at your school?

15) Would you like to share any additional thoughts related to using data that we haven't addressed?

Thank you for your time and participation.

Original Codebook

Code	Brief Description
Use_Attitudes	Attitudes and opinions about data use
Use_Procedures	Procedures for data use, including agendas or protocols
Use_Decisions	Decisions about data use, including what data to review and how to review it
Use_Virtual	Assessment and data use that has been specifically implemented or is different due to the virtual environment
Use_DataUsed	Types of data that are used
Use_Frequency	Frequency of data use
Use_Constraints	Constraints to using or reviewing data
Use_Time	Time spent on data review
Use_Benefits	Benefits to using or reviewing data
Analysis_Documentation	Documentation of data analysis
Analysis_Individual	Analysis of data that is done individually
Analysis_Collaborative	Analysis of data that is done collaboratively
Analysis_Constraints	Constraints to analysis of the data (e.g., concerns about reliability, validity, outliers, etc.)
Analysis_Literacy	Examples of teacher data literacy in analysis
Analysis_Differences	Ways that analysis has been different this year
Access_Availability	Data that are available and easy for teachers to access
Access_Educational Technology Data	
Actions_Individual	Actions that teachers take individually based on data analysis
Actions_Collaborative	Actions that teachers take collaboratively based on data analysis
Actions_Differences	Ways that actions based on data have been different this year
Requirements_General	General requirements or expectations for assessment and data use
Requirements_Meetings	Meetings that are required for collaboration, planning, and data analysis
Virtual_Constraints	Constraints to the virtual environment

Virtual_Benefits	Benefits to the virtual environment
Virtual_Collaboration	Collaboration that is unique or specific to the virtual environment or came about due to the virtual environment
Leadership	Leadership involvement in data use
Collaboration_General	General statements about collaboration
Collaboration_Equity	Collaboration to support equity
Collaboration_Benefits	Benefits to collaborative data use
Collaboration_Data Meetings	Meetings that are designated to review data
Collaboration_Constraints	Constraints to collaborative data use

Appendix F

Final Codebook

Code	Brief Description
Access_Availability	Standardized test data that are available and easy for teachers to access
Access_Educational Technology Data	Data that teachers have from educational technology, such as Kahoot!, Quizizz, Socrative, and the learning management system.
Actions_Collaborative	Actions (such as reteaching, remediation, changes to planning and/or instruction) that teachers take collaboratively based on data analysis
Actions_Differences	Ways that actions based on data have been different this year due to the virtual or hybrid teaching environments.
Actions_Individual	Actions(such as reteaching, remediation, changes to planning and/or instruction) that teachers take individually based on data analysis
Analysis_Collaborative	Analysis of data that is done collaboratively
Analysis_Constraints	Constraints to analysis of the data (e.g., concerns about reliability, validity, outliers, etc.)
Analysis_Differences	Ways that analysis has been different this year due to the virtual or hybrid teaching environments
Analysis_Documentation	Documentation of data analysis
Analysis_Individual	Analysis of data that is done individually
Analysis_Literacy	Examples of teacher data literacy in analysis
Analysis_Questions	Questions that teachers had based on the data analysis
Collaboration_Benefits	Benefits to collaborative data use
Collaboration_Constraints	Constraints to collaborative data use
Collaboration_Data Meetings	Meetings that are designated to review data
Collaboration_Equity	Collaboration to support equity
Collaboration_General	General statements about collaboration
Hybrid_Insights	Insights about data that are unique to the hybrid environment

Leadership	Leadership, including school or central office level involvement in data use. This could include administrators, specialists, or coaches among other school leadership.
Requirements_General	General requirements or expectations for assessment and data use
Requirements_Meetings	Meetings that are required for collaboration, planning, and data analysis
Use_Attitudes	Attitudes and opinions about data use
Use_Benefits	Benefits to using or reviewing data
Use_Constraints	Constraints to using or reviewing data
Use_DataUsed	Types of data that are used by teachers
Use_Decisions	Decisions about data use, including what data to collect, what data to review, and how to review it, that teachers make prior to data analysis.
Use_Frequency	Frequency of data use
Use-Goals	Goals that teachers have for data use
Use-Hybrid	Use of data that is related to hybrid teaching
Use_Procedures	Procedures for data use, including agendas or protocols
Use_Students	Data that are shared with students and how individual data is shared with students for them to use
Use_Time	Time spent on data review and analysis
Use_Virtual	Assessment and data use that has been specifically implemented or is different due to the virtual environment
Virtual_Benefits	Benefits to the virtual environment
Virtual_Changes	Changes that have been or will be made or will not be made to data use when students were or are no longer learning virtually.
Virtual_Collaboration	Collaboration that is unique or specific to the virtual environment or came about due to the virtual environment
Virtual_Constraints	Constraints to the virtual environment
Virtual_Insights	Insights about data that are unique to the virtual environment

STEPHANIE MILLS MOORE
Curriculum Vitae
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EDUCATION:

Ph.D.   Education - Research, Assessment, and Evaluation Track
Expected Graduation, December 2021
GPA: 4.0
Dissertation proposal title:
The Influence of Shifting Learning Environments on Teachers' Data Use Practices

M.T.   Elementary Education, University of Virginia, May 1992

B.A.   English, University of Virginia, May 1992
Concentration: Mathematics

Additional Coursework in Mathematics, Science, and Education, Virginia Commonwealth University and J. Sargeant Reynolds Community College

VIRGINIA TEACHING LICENSES:

Early Education NK – 4	Gifted Education
Middle Education Grades 4 – 8	Mathematics – Algebra I
Mathematics	

PROFESSIONAL EXPERIENCE:

Assistant Director, EducateVA, Virginia Community College System (2019 – present)
- Develop and revise curriculum
- Review alignment of curriculum to state standards
- Recruit candidates for the program
- Review prospective student applications
- Maintain and oversee the learning management platform
- Support, observe, and mentor new teachers
- Faculty recruitment and training
- Assist in the preparation of yearly reports for VDOE
- Assist in the preparation of documents for VDOE approval

Adjunct Instructor, Virginia Commonwealth University, Richmond, VA (2019 – present)
- EDUS 660 – Summer 2019
- EDUS 651 – Spring 2020
- EDUS 401/SEDP 401 – Summer 2020, Fall 2020, Summer 2021, Fall 2021

Instructional Coach, School Improvement (2018 – 2019)
- Support new and probationary teachers
- Observe and provide feedback to teachers
- Assist teachers with data analysis, planning, classroom management, student engagement, alignment, differentiation, and providing feedback
- Provide teachers with research-based strategies to improve student achievement
- Lead professional development for departments or the school
- Attend content planning team meets to assist with data analysis, alignment, content, pedagogy, planning, and materials
- Participate on the VCSIP team

Coordinator of Assessment and Remediation (2017 - 2018)
- Supported the school in data analysis and remediation efforts leading to improvements in test scores in Reading, Writing, Science, and History
- Provided targeted data analysis and instructional support for one collaborative Mathematics class leading to an increase in the SOL pass rate from 47% to 81%
- Organize schoolwide assessments
- Analyze and present schoolwide testing and assessment data
- Attend content planning team meetings to assist with data analysis, content, pedagogy, planning and materials
- Establish and monitor RTI interventions and review data from RTI intervention
- Serve on the school leadership team
- Chair Intervention Team, including creating the Intervention Team website and planning the Intervention Team schedule
- Analyze and present PBIS data to school leadership
- Review assessments and provide feedback, including creating test blueprints

Mathematics Coach/Teacher (2012 - 2017)
- Lead the Mathematics Department to a 15-point (28%) improvement in the mathematics pass rate on Standards of Learning Tests
- Teach Geometry and Collaborative Math 8
- Plan and lead Professional Development at PLC meetings, department meetings, District mathematics meetings, and for the Greater Richmond Council of Teachers of Mathematics and the Virginia Council of Teachers of Mathematics
- Create materials and lesson plans for Math 6, Math 7, Math 8, Algebra I and Geometry
- Create materials, lessons, and assessments for use by teachers throughout the district
- Meet with teachers weekly to provide support for individual and team planning, including instructional materials and strategies and analysis of data to determine student needs
- Model and co-teach lessons in all math classes, including Math 6, Math 7, Math 8, and Algebra I
- Analyze data on formative and summative assessments data
- Observe mathematics teachers in order to provide feedback and assistance
- Meet with PLC groups weekly to assist with content, pedagogy, planning and materials
- Meet with the Coordinator of Assessment and Remediation to plan tutoring programs
- Review data from RTI interventions and meet with school leadership
- Serve on the intervention and leaderships team
- Meet with science teachers to support cross-curricular activities in math and science classes

Mathematics Teacher (2006 – 2012)
- Teach Math 7, Math 8, Algebra I and Geometry ACE
- Plan and teach Professional Development at grade level content planning meetings
- Create materials, lesson plans, and assessments for Math 7, Math 8, Algebra I and Geometry
- Analyze data on formative and summative assessments, including warm-ups, quizzes and tests, and district assessments
- Meet with grade level content team weekly to discuss content, pedagogy, planning and materials
- Plan and teach mathematics remediation
- Serve as 7th grade and 8th grade team leader

Master Teacher, Atlee Christian Academy (2004 – 2006)
- Teach Kindergarten, 2nd Grade, and 3rd Grade
- Create school report card
- Worked with school director to choose curriculum for the school
- Worked with school director to create the calendar for the school year
- Observe and Supervise teachers
- Interview prospective teachers
- Mentor new teachers

EXTERNSHIP EXPERIENCE:
EducateVA (January 2019 – May 2019)
- Developed curriculum materials and an assignment on feedback for the EducateVA students
- Presented information on feedback to students
- Developed a protocol for analyzing classroom assessment data
- Created instructional materials and led an EducateVA class session on analyzing classroom assessment data and using the data to inform and drive classroom instruction
- Attended EducateVA class sessions and assisted as needed

PUBLICATIONS
- James H. McMillan & Stephanie Moore (2020) Better Being Wrong (Sometimes): Classroom Assessment that Enhances Student Learning and Motivation, The Clearing House: A Journal of Educational Strategies, Issues and Ideas, 93:2, 85-92, DOI: 10.1080/00098655.2020.1721414

PRESENTATIONS
- MERC (Metropolitan Educational Research Consortium) Fall Conference 2016, Flipped Classrooms
- AERA (American Educational Research Association) Conference, April 11, 2021, Poster Presentation, *Development and Validation of the Perceptions of Science Classroom Assessment Student Self-Report Survey*

K-12 PROFESSIONAL DEVELOPMENT PRESENTATIONS

- Algebra I – Content, curriculum, instructional methods, and pedagogy
- Math 8 – Content, curriculum, instructional methods, and pedagogy
- Geometry – Content, curriculum, instructional methods, and pedagogy
- Using Data to Drive Instruction
- Student Engagement
- Flipped/Blended Classroom
- Think Through Math
- Interactive Achievement
- Feedback
- Backwards Design
- Formative Assessments: Creating, Implementing, and Analyzing Formative Assessments
- Classroom Management
- Effective Use of Technology in the Mathematics Classroom
- Integrating Math into the Science Curriculum
- Using Engineering to Teach Mathematics Concepts
- Quality Questioning
- Assessing Student Learning
- Grading
- Mindset

RELATED EXPERIENCE AND QUALIFICATIONS:

2017 – 2018	Participant and Curriculum Writer, Middle School Transformation/Deeper Learning Leaders
2016	Virginia School University Partnership Question Writing Committee
2015	Participant, Standards of Learning Review Committee, VDOE
2012 -	Staff Development Leader/Facilitator, School and County Level Staff Development, School District in Virginia, the Greater Richmond Council of Teachers of Mathematics (GRCTM), the Virginia Council of Teachers of Mathematics (VCTM)
2010 -	Clinical Faculty, Virginia Commonwealth University
2010 – 2011	Leadership Academy, Hanover County Public Schools, Hanover County, Virginia
2009	Consultant, University of Richmond
2007 - 2008	Fellow, 21st Century Engineering, MathScience Innovation Center, Richmond, Virginia

PROFESSIONAL MEMBERSHIPS

- American Educational Research Association (AERA)
- Phi Kappa Phi National Honor Society
- Virginia Association for Supervision and Curriculum Development (VASCD)
- Virginia Council for Mathematics Supervision (VCMS)

STUDENT MEMBERSHIPS
- Association for Aspiring Leaders in Education (AALE)
- LaunchPad

ACTIVITIES:

2017 -	Student Research Team, Virginia Commonwealth University
2011 – 2020	Volunteer, Walk-In Homeless Feeding Ministry, Centenary United Methodist Church, Richmond, Virginia
2011 – 2012	Volunteer, Fairmount Christian Church Youth Ministry, Hanover, Virginia
2008 – 2010	Volunteer, Fairmount Christian Church Children's Ministry, Hanover, Virginia
2006 – 2007	Director, CARITAS, Shady Grove United Methodist Church, Hanover, Virginia
1997 - 2005	Volunteer, CARITAS, Shady Grove United Methodist Church, Hanover, Virginia
2009 – 2010	Jr. Beta Sponsor, Oak Knoll Middle School, Hanover, Virginia
1998 – 2003	Member and Scorer, Jefferson Scholars Committee, UVA Alumni Association, Richmond, Virginia