2019

How Teachers Use Data in Instruction

Laura Ann Drake
Walden University

Walden University

College of Education

This is to certify that the doctoral study by

Laura Ann Drake

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

Review Committee
Dr. Candace B. Adams, Committee Chairperson, Education Faculty
Dr. Michael V. Brunn, Committee Member, Education Faculty
Dr. Chris S. Cale, University Reviewer, Education Faculty

Chief Academic Officer
Eric Riedel, Ph.D.

Walden University
2019

Abstract

How Teachers Use Data in Instruction

by

Laura Ann Drake

MA, Walden University, 2011

BS, University of Wyoming, 1989

Doctoral Study Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Education

Walden University

May 2019

Abstract

A portion of teachers in the United States educational system don't use data to inform and improve their instruction resulting in actionable change. A gap exists between teachers having and interpreting data and making meaning in such a way that leads to actionable change in instruction. The purpose of this case study was to investigate how teachers used data to alter instruction and identify factors that inhibited or supported teachers in using data to drive instructional practice. This study was guided by Ackoff's theory of action cycle, which included interaction, dialogue, data discoveries, and team response to data. The research questions asked how teams used data and what factors inhibited and supported the use of data. Three teams were observed. Eleven classroom teachers, the building principal and the district professional development director were interviewed. The teacher team criteria included that teachers met weekly and used, at a minimum, common formative assessments. The school and district mission, vision and value statements were collected as artifacts to see how these documents supported the use of data. Open and axial coding exposed themes and patterns. Results indicated that teachers commonly omitted one or more phases in a data cycle; however, when teachers worked through all phases of a data cycle, actionable change in instruction resulted, and factors that both inhibited and supported teacher use of data to guide instruction were evident throughout all aspects of the study. The project, a white paper, summarized the study and provided research-based recommendations based on the study. These recommendations focus on building teacher capacity and relationships. This study may generate social change through educational equity. Equity is achieved when teachers use data to inform instruction so that learners of all abilities may have access to learning.

How Teachers Use Data in Instruction

by

Laura Ann Drake

MA, Walden University, 2007

BS, University of Wyoming, 1989

Doctoral Study Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Education

Walden University

May 2019

Dedication

I would like to dedicate this page to my husband, Kent. First, he gave me the confidence to believe I could do this. Then he gave me support for five long years to keep me going. It may have been helping with the laundry, giving a shoulder to cry on, or taking me out for a much-needed break. This journey would not have had a beginning and ending without this incredible man.

Acknowledgments

I would like to begin by thanking my chair, Dr. Candace Adams and my second chair, Dr. Michael Brunn. Dr. Adams gave me new confidence in myself and moved this process forward. Dr. Brunn offered support beyond what any second chair should have to give. I would also like to thank my family and friends who tried to remain patient with me when I told them I was unavailable because my doctoral work was calling. To my colleagues at work, thank you for keeping me afloat at school when the doctoral work took precedence. Finally, a special thank you to Dr. Deborah Duncan. You made me see the value in continuing to always learn and helped me think at a level I did not know I was capable of. Your support helped me think and respond like a scholar.

Table of Contents

List of Figures v

Section 1: The Problem 1

The Problem 1

Local Problem 2

Rationale 6

Definition of Terms 7

Significance of the Study 9

Research Questions 10

Review of the Literature 11

Conceptual Framework 11

Review of the Broader Problem 13

Critical Review 15

The Role of Professional Learning Communities 19

Professional Learning Communities and Data Use 19

Leadership 21

Supports 27

Specific Skills for Data Use 32

Conclusion 36

Implications 36

Summary 37

Section 2: The Methodology 38

Qualitative Research Design and Approach 38

Participants....40
Data Collection....42
Observations....43
Interviews....44
School Documentation....46
Triangulation....46
Data Analysis Process....49
Data Analysis Results....50
Findings from the Data and Research Questions....51
Types of Data....51
Value Given to Data....54
Altering Instruction....56
Decisions based on Numeric Data....57
Decisions Based on Observational Data....64
Factors That May Inhibit the Use of Data to Alter Instruction....66
Data Literacy....67
Data Beliefs and Buy-In....70
Data-Access/Data Alignment....72
Time....73
Trust and Relationships....74
Sustainability/Change....74
Systemic Support....75
Resources....77

Compliance 78
Conclusion 79
Support to Build Teacher Capacity to Use Data to Guide Instructional Practice 79
Relationships/Trust 80
Training/Support 83
Leadership 87
Systemic Support 88
School-Based Resources 91
Expectations 91
Beliefs 92
Patterns, Relationships, and Themes 94
Patterns 94
Relationships 95
Themes 96
Theme 1: Beliefs Shape Data Use 96
Theme 2: Relationships 98
Theme 3: Leadership 102
Theme 4: Data Literacy 103
Theme 5: Contextual Learning 104
Salient Data and Discrepant Cases 105
Evidence of Quality 106
Summary 106
Section 3: The Project 109

Introduction 109
Rationale 109
Review of the Literature 109
Focus on Relationships 110
Build Data and Assessment Literacy 115
Contextual Learning 118
Project Description 122
Project Evaluation Plan 123
Project Implications 124
Section 4: Reflections and Conclusions 126
Project Strengths and Limitations 126
Recommendations for Alternative Approaches 127
Scholarship, Project Development and Evaluation, and Leadership and Change 128
Reflection on Importance of the Work 128
Implications, Applications, and Directions for Future Research 129
Conclusion 129
References 131
Appendix A: The Project 142
Appendix B: Professional Learning Communities Observation Protocol 196
Appendix C: Teacher Interview Questions 197
Appendix D : Principal Interview Questions 199
Appendix E: Professional Development Director Interview Questions 201

List of Figures

Figure 1. Professional learning community survey question 1.....5

Figure 2. Professional learning community survey question 2.....6

Section 1: The Problem

Despite having access to many forms of data, teachers worldwide are not always able use the data to respond in a way that changes practice and improves student learning (Sompong, Erawan, & Dharm-tad-sa-na-non, 2015). The practice of collecting, analyzing and making decisions about data typically occurs in professional learning communities (PLC) or data teams. Cantalini-Williams et al. (2015) decribed the PLC process as a means to share instructional practice, build teacher confidence through affirmation, increase teacher reflection, and result in improved student learning. A study by Schildkamp and Portman (2015) asserted that several variables influence instructional data making decisions including how teams function in their use of data, how teachers are trained, and the characteristics of the group, such as the level of data literacy and the pedagogical content knowledge of the team.

The Problem

The problem addressed in this study was that some teachers in the United States educational system are not using data to inform and improve their instruction resulting in actionable change. Marsh, Bertrand, & Huguet (2015) described this phenomenon as the "data-practice divide" (p. 2). A gap exists between having and interpreting data and making meaning in such a way that there is an actionable change in instruction. Teachers often do not respond to data or use data in simplistic ways that do not improve their instruction (Marsh et al., 2015; Marsh & Farrell, 2015; Schildkamp & Poortman, 2015;). There is a lack of skills and understanding with teachers about what questions to ask about data, how to understand what the results show, and how to respond instructionally

(Huguet, Marsh, & Farrell, 2014). The knowledge and understanding of how to build school capacity for data use and how this information can alter instruction are limited (Farley-Ripple & Buttram, 2015). Datnow, Park, and Kennedy-Lewis (2013) suggested the need to look more closely at how teachers are interacting and responding to student learning data to understand why some teacher teams see positive results, while others do not. These findings provide relevance for this study on the PLC process. This study took a closer look at PLC teams and revealed how teachers are interacting and responding to data as well as what supports have been provided to teachers and PLCs to build their knowledge and understanding of the student learning data to create actionable change. While research shows this is a national problem, it exists at the local level as well.

Local Problem

At the local district level, professional learning communities are the tools used for creating data discussions that should result in data-driven decisions and delineating expectations for how teachers interact when discussing student data. The problem is that the 2015 accreditation study (AdvancEd, 2015) conducted at the XYZ School District (pseudonym) and each school level revealed that work still needs to be done to improve the PLC process in regard to data use and decision-making. Teachers are not using data as leverage for instructional change in their classrooms.

The XYZ District, which served as the study site, is set in an urban community in the Western United States. There are 28 elementary schools, one fifth-sixth grade school, one charter elementary school, three junior high schools, three high schools, and one alternative high school. The focus of this study was on the district elementary school

level, as this sample is where my interest lies. The entire district has one curriculum director who also serves as the professional development (PD) director. Dr. James (pseudonym) oversees all PD that occurs within the district and directly influences the accessibility of PD focused on PLCs and data use. This distinction is noted because the perceptions of the PD director were a part of this study.

The XYZ accreditation process began with a collection of student performance data. The process included every school, which made this study unique (local principal, personal communication, May 17, 2017); each school conducted a self-assessment that involved analyzing data and collecting artifacts that allowed the schools to rate themselves against the AdvancEd accreditation rubric. AdvancEd accreditation is an outside entity, which through program analysis and an external review helps schools and districts improve. Stakeholders, which included staff, parents, and students, participated in interviews and site visits and school observations occurred. At the end of this process, an executive summary that compiled perspectives of multiple stakeholders reported both successes and areas in need of improvement. This executive summary pointed to a gap in practice between research asserting the efficacy of PLCs exploring and effectively using student learning data to create positive, actionable change, and a lack of understanding about how PLCs at the local level are using data to alter instruction and what support PLC members receive from their schools or the district to build their capacity to use data to guide instructional practice (AdvancEd, 2015).

The recommendation to the district by the AdvancEd accreditation team was to increase the practical use of the PLC process at a district level to improve professional

practice, which increases the process of improving student achievement through the more effective use of data (AdvancEd, 2015). Thus, in the 2015-2016 school year, the curriculum director advised each school to use the same data discussion questions in their PLC team meetings. Furthermore, opportunities existed to attend an outside summit on PLCs to train new staff and retrain veteran staff on active PLCs. In the 2016-2017 school year, the district offered training to K-6 staff on how to create common formative assessments that could also serve as a data point for PLC discussions. Finally, in the spring of 2017, the district offered an Action-Based Collaborative Teams class. These district-wide PD efforts were intended to increase the effectiveness of the PLC.

Further data in this research included a survey regarding essential perspectives on many of the practices within the district. One question on the survey asked principals to reflect on how teachers used data for learning. Local principals indicated data to use for learning or using data to make changes in teaching, as an area of weakness, scoring it an average 2.1 out of 4 points (curriculum director, personal communication, November 10, 2016).

Final data were gathered in the spring of 2017 from a PLC survey given in the district's Action-Based Collaborative Team's class (Action-Based Collaborative Teams instructor, personal communication, May 16, 2017). Seventeen individuals representing elementary, junior, and high school teachers from multiple disciplines, such as Spanish, English as a Second Language, and Special Education made up this course. Two questions on this survey related directly to the content of this study. The first question

asked, “As a learning team, we regularly collaborate to decide what instructional strategies we will teach in each of our classrooms.”

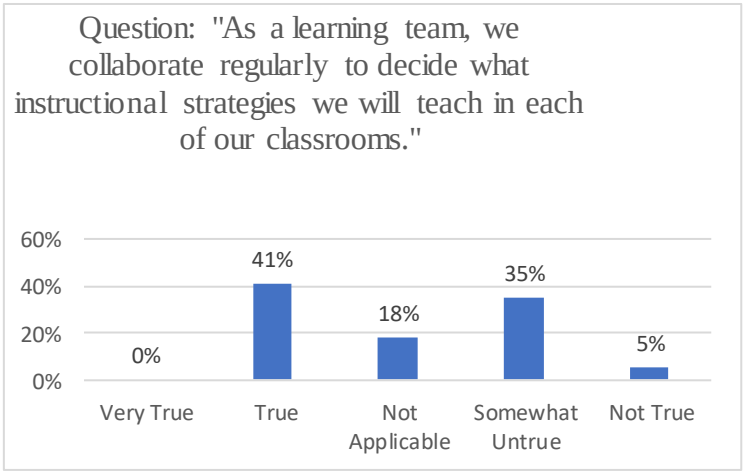

Figure 1. Professional learning community survey question 1.

This graph indicates that of the 17 teachers (40%) do not collaborate to decide on instructional strategies. In data-driven PLC teams, this would be a part of the data cycle based on the data reviewed.

Directly related to research question one was a second question on the survey, which asked, “As a learning team, we make decisions to adjust instructional practices based on analysis of student achievement data.”

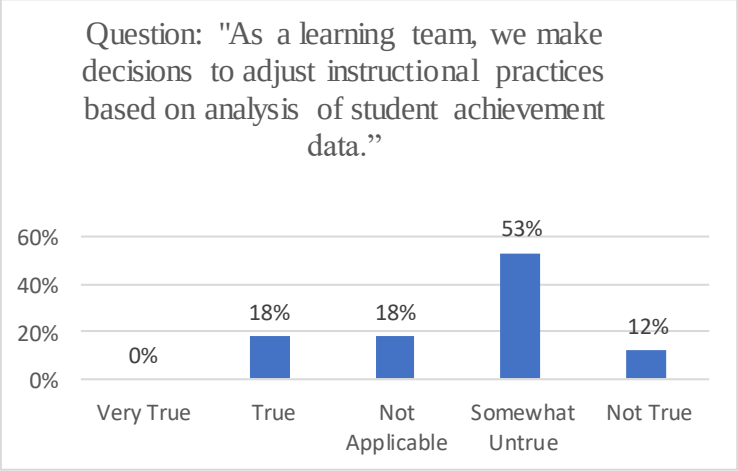

Figure 2. Professional learning community survey question 2.

The results of this graph show that 65% of the teachers conduct limited practice in using data to adjust instructional practice. Thus, even within a small but varied and random group in this district, there is not a reliable indicator that teachers have fully closed the data/practice divide.

Building principals manage the work of PLCs at a building level with little influence from the district. The practices of PLC teams vary greatly, from teams who have presented at a national level to those who struggle to identify blocks of times to meet and what actions to take during the meeting (curriculum director, personal communication, March 14, 2016). Also, while the local district supports educators to attend national PD on PLCs, it has not offered district classes that support PLC work or the use of data with the PLC process (assistant human resources director, personal communication, January 5, 2017).

Rationale

Dufour and Eaker (as cited by Chen, Lee, Lin and Zhang, 2016) noted that using a data cycle in a PLC is considered one of the most powerful tools to affect student learning. However, the accreditation report evaluators (AdvancEd, 2015) revealed a need for improvement in the use of data at the local level, and local principals acknowledged

that the use of data for learning was an area of weakness (curriculum director, personal communication, November 10, 2016). The report indicated that there was a gap in the practices of the teachers insofar as their use of data to inform and improve their instruction. If the full data cycle is not occurring, the power of using data to inform practice and affect student learning is diminished. Studying how PLC teams were engaging in the data cycle to alter instruction, which was accomplished via interviews of the PLC teachers, the school principal, and the district PD coordinator, was vital as it created a new understanding of the phenomenon that may inform future PD. By unveiling the practices of teachers and explicitly learning what supported the capacity of participating teachers to use data, the results of this study provide new understandings to inform future actions of the district to support teachers in data use. The purpose of this study was to explore how PLCs at the local level were using data to alter instruction and what support PLC members received from their schools or the district to build their capacity to use data to guide instructional practice.

Definition of Terms

Altered instruction: Adjusted instruction for the whole class, by the group, or for an individual by changing curriculum content, pacing, or pedagogy as a result of researching and implementing new practice (Marsh et al., 2015).

Collaborative inquiry: When a group of teachers work together to investigate a problem of practice related to teaching and learning (Nelson & Slavit, 2008, as cited in Bocala & Boudett, 2015).

Data culture: "One in which teachers and administrators use data to focus on results and to guide systemic reflection and planning." Teachers say, "The way we do things around here" (Gerzon, 2015, p. 4).

Data inquiry: Using student data to analyze their progress and make decisions about curriculum and instruction. These decisions receive a follow up to determine the effectiveness of decisions made (Kekahio & Baker, 2013; National Forum on Education Statistics, 2012, as cited by Bocala & Boudett, 2015).

Data literacy: "The ability to transform information into actionable instructional knowledge and practices by collecting, analyzing, and interpreting all types of data" (Gummer & Mandinach, 2015, p. 2)

Data use: "Systematically analyzing existing data sources within the school, applying outcomes of analyses to innovate teaching, curricula, and school performance and implementing and evaluating these innovations" (Schildkamp and Kuiper, 2010 as cited in Jimerson and McGhee, 2013, p.8).

Deep change: "When teachers use data to change their instruction, such as how it is delivered and what is taught, adjust pedagogy and understand the supports and conditions facilitating these actions" (Marsh et al., 2015, p. 3).

Effective data use: "Data practices that benefit educators in their own practice" (Jimmerson & Wayman, 2015, p. 3).

Mental models: "Deeply ingrained assumptions, generalizations, or even pictures or images that influence how we understand the world and how we take action" (Senge, 2006, p.8).

Surface level change: When the response to data is to make procedural changes, such as reteaching the same content, identifying students for additional support, or regrouping students. Surface changes do not question what is taught or how it is taught, nor consider new ways of thinking (Marsh et al., 2015).

Significance of the Study

Advantages exist for studying the context and implementation of PLCs, as well as whether support from the system exists or does not exist to assist PLC use of data to alter instruction. The collaborative inquiry that occurs in a PLC affirms teacher practice, allows for sharing of new instructional approaches, increases teacher confidence and self-reflection, and improves student understanding of concepts learned (Cantalini-Williams et al., 2015). In the XYZ District, every PLC meets weekly with time set aside to do so. The administration is committed to giving teachers time to meet in PLCs, thus making PLC teams more effective at using data to inform instruction that will increase teacher effectiveness with their learners in the present time allotted. The contribution this study makes at the local site is increasing understanding of what data seems to support instructional change, what instructional changes teachers are making, and the resources given to teachers to support the practice of using data to guide instructional practice. While PLC work is not new to the district, this research provides an original contribution by providing a close analysis of the PLC process and carefully analyzing the process of several teams. This study provides teacher and leader perspectives, unveils their insights, and provides the opportunity to see the specific practice of teams, within the bounds of this case study, at a district level. The results could add to the local understanding of what

factors are inhibiting the capacity of teachers to analyze and act on data to alter instruction. (see Farley-Ripple & Buttram, 2014; see Thornton & Cherrington, 2014). This study informs leaders of what different factors are contributing to PLC work in both in a supportive and inhibitive manner and provides leaders with a new perspective to make future decisions in the system. Increased understanding of effective data use can prevent overgeneralizations due to poor understanding (Datnow et al., 2013). This research identifies critical constructs and relationships at the site that support data use and teacher learning in the process of the PLC. Results of this study serve to inform district PD leaders, principals, and classroom and support personnel who use data to make decisions about students. The findings of this study have the potential to promote positive social change by providing an implicit view of how one school utilizes PLC work to alter instruction. When teachers learn to use data to alter instructional practices, they seek to give value to all learners and can use life experiences and cultural knowledge to make informed decisions that result in effective pedagogy for all, both locally and across the nation.

Research Questions

The guiding research questions were aimed to address the data/practice divide, that is, the gap between collecting data and using data to change instructional practice. In this study I took a close look at the PLC process and sought to understand what happens during this process. The underlying inquiry formulated in the interview protocol explored what dialogue and actions occurred to guide the PLC process, what these teachers

perceived the supports were, and what supports the leaders from both the school and the district saw as their contributions and support to PLC teams.

This study addressed the following research questions and sub question:

RQ1: How are PLC teams using data to alter instruction?

SQ: What factors may inhibit the use of data to alter instruction?

RQ2: What support have existing PLC teams received from their schools or the district to build their capacity to use data to guide instructional practice?

Review of the Literature

In the literature review I laid the foundation for the study. I began by establishing a framework that served as the lens for observation and interviewing in this study. The framework described is that of a data cycle model that establishes what steps should occur in a team that is using data to alter instruction.

Conceptual Framework

The conceptual framework that grounds this study was the theory of action cycle (Ackoff, 1989). Marsh et al. (2015) indicated that the steps of using data to alter instructional practice are often missing in the discussions on student learning. It is this final piece that has the most impact on student learning and was found to be missing. While teachers have access to data and often spend time discussing it, turning data into usable information that can affect instructional change is less frequent (Marsh et al., 2015). The next section describes the importance of turning data into usable information and how this process is accomplished.

, Ackoff (1989) explained that the data cycle model is essential. A data cycle model, adapted from the theory of action, includes four steps: (a) accessing data; (b) analyzing the data to turn it into information; (c) combining the data with understanding and expertise, which can form actionable knowledge; and (d) then using that knowledge to act (Ackoff, 1989; Marsh et al., 2006 as cited in Marsh & Farrell, 2014). Ackoff (1989) addressed the use of a learning cycle to generate wisdom. Ackoff noted that data alone is just that, data. It does not inform, suggest action, or make decisions. Furthermore, Ackoff purported that if there is too much data, much of the data is irrelevant. Ackoff deduced that unless educators filter and organize data into meaningful information based on the need of the user, data is useless. Thus, using data to make instructional decisions is a critical piece of the data cycle, and this phase is considered the final step.

If the final phase is crucial, then understanding how teachers are participating in the phase and understanding why or why not can guide and direct future decisions regarding what teachers need to be active users of data for instructional purposes and the supports that are necessary. While my study focused on the Ackoff theory of action cycle, Senge (1990) created an umbrella for thinking about how support from many areas has built simple cognitive structures, or mental models, that allow teacher engagement in all four phases of Ackoff's cycle. Also, teachers in a PLC may use the data to discuss and share practices that are achieving the best results. This in turn leads to teachers adjusting their lessons and pedagogy. In that same sense, Senge's (1990) use of mental models showed how the creation of common cognitive structures among teachers about data use

can increase the level of data use. Thus, the second piece of this study was to learn how leaders support teachers in a PLC through time, information, and guidance to use data to affect instructional change. An understanding of this support derives from RQ2, what support have existing PLC teams been given from their schools or the district to build their capacity to use data to guide instructional practice?

Little research has shown how PLC teams mediate the use of data (Marsh et al., 2015). This final phase of Ackoff's (1989) theory of action was the focus of my study. The four-phase cycle served as a lens for observing and collecting data from the PLC team process. To answer RQ1—How are PLC teams using data to alter instruction? –it was important to note which types of data teachers were using and understand why that data was relevant. Furthermore, observations of the relationship between the type of data and the actions it perpetuates also informed this study. This study evolved from my understanding that teams must be able to complete a full data cycle to create instructional change. Thus, an understanding of how teachers mediate data use, what type of decisions teachers make, and what inhibits or contributes to the capacity of teachers to engage in this final phase was the focus of my study.

Review of the Broader Problem

The literature review for this study started with an investigation into professional learning communities and why some PLCs are capable of producing actionable change, and others are not. As the review grew, the focus began to narrow the study of how PLCs used data to alter instruction. Not only was there a gap in practice at the local level, as described in the problem statement, but the research writ large showed a gap between

having data and using data across various educational settings. While much of the original literature contributed to the understanding of why some PLCs succeeded and some failed, narrowing the focus to literature using data to alter instruction provided information that was more specific.

The reviewed literature contained peer-reviewed research articles written within the last 5 years. Theorists and conceptual frameworks described in these articles led to further research on which framework would serve as a guidepost for my study. I read a variety of studies, such as case studies, action research, and quantitative research. Also, I made an attempt to include research done both in the United States and abroad and at numerous education levels that utilize PLCs as a collaborative tool.

The research in this review derived mostly from the Walden University library. A wide variety of search terms and multiple data sources guided how I found research through Walden. I used the words *effective, PLC,* and *data* as original search terms. As themes and patterns emerged related to data use and altered instruction, those words were included in the search as well. Some such words included *shared mental models, discourse, critical reflection, leadership, professional development, system support,* and *inquiry* or *data cycles*. The reference lists in articles served as another source for current works and related keywords. Themes emerged from each successive article and began to create a synopsis of what factors influenced the type of and ways in which teachers use data to alter instruction. This repetition indicated a level of saturation.

Critical Review

The broader problem associated with the use of data to alter instruction is a complex one. Many roadblocks occur to prevent the use of data to change instruction. In this section I describe what I found in the research to be inhibiting factors for effective data use that leads to deep-level changes in teaching. These factors included leadership skills, teachers' collective efficacy, characteristics of decisions made around data, the ability to sustain change, a focus on accountability, and lack of resources.

Leadership skills are a vital construct in data use. Gray, Mitchell, and Tarter (2014, p.85) included leadership opportunities such as shared decision-making and leaders who "tend to encourage problem-solving, enable cooperation, protect participants, and promote collaboration, flexibility, and innovation" as critical structures that must be in place. The research found that teachers often do not have the opportunities to build collaboration skills, and there is an assumption that collaboration is a preexisting skill. Hoaglund, Birkenfeld, and Box (2014) concluded that the building of collaborative expertise should be intentional and designed in such a way as to build on previous learning. The characteristics of the leader have the potential to support the building of this expertise.

A leader must have the ability to build trust among colleagues for PLC teams to reach their fullest potential (Gray & Summers, 2015). Gray and Summers (2015) found that supportive conditions must exist. One such support was building the capacity to grow relationships and trust among teachers (Hord, 2007 as cited in Gray & Summers, 2015). Trust and relations were often missing in schools. Teachers did not believe they were

listened to or valued, that they could trust their colleagues, or that they could share data without evaluation (Thornton &Cherrington, 2014). Expectations for data use and its purposes often were not established, and a clear vision was not articulated (Schildkamp, Karbautski, & Vanhoof, 2013). Thus, trust is a factor considered when studying a PLC team. Knowing what constitutes trust as described in the literature review and finding out how teachers perceive the level of trust within their team can be instructive of whether the trust is a factor supporting or inhibiting the work of the team. In addition to trust, collective efficacy is another crucial concept for study in a PLC.

Collective efficacy was described by Gray et al. (2014) as a group's belief in themselves that they can work together to find courses of action that result in the desired improvement. Teachers often did not believe their influence extended to all students and that by working horizontally and vertically they could support each other's thinking and knowledge to increase learning for all. Such teachers continued to work in isolation and did not benefit from the shared experience of others. It is a sense of shared responsibility that necessitates the need to use data to make decisions (Gray et al., 2014).

The characteristics of and decisions made with data are potential roadblocks to data use as well. Often, there is just too much data, or teachers do not have time to compile it, or do not have access to data (Hubbard, Datnow & Pruyn, 2013; Schildkamp et al., 2013). Slavit, Nelson, and Deuel (2013) noted that often teachers lacked an understanding of what kind of data might provide the information they needed to gain access to student thinking. In turn, teachers did not have the information they needed to inform instruction. Another hindrance to data use consisted of not knowing what

questions to ask and what collaborative dialogue to engage in to make data meaningful (Schildkamp et al., 2013; Hubbard et al. 2013). This interchange assists in transforming data into usable information. Kallemeyn (2013) found that two routines facilitated data use: collaborative teams and the process of inquiry. When combined, these routines had the power to influence instructional change. The inquiry process moved teams through a cycle of learning in which they collected, analyzed, and created knowledge and turned the knowledge into instructional action.

When efforts of change happen, such as learning to use data to alter instruction, some of the following key factors of change sustainability may be missing (Jimerson & McGhee, 2013; Jimerson & Wayman, 2015). Modeling and sharing new knowledge are two ways to sustain change. Jimerson and McGhee (2013) showed that the language used and the modeling presented by school leaders influenced data use to impact instruction. When there is a failure to mentor and model, change is not likely sustainable. Wayman and Jimerson (2015) addressed sustainability through the sharing and transfer of knowledge. Senge (2006) posited that knowledge must be preserved and shared to build organizational learning over time. The knowledge gained from studying data, if shared with others, is less likely to be lost.

Schildkamp et al. (2013) found that a focus on accountability rather than improvement can stifle data use for instructional purposes. There may be a focus on accountability data because that is what other stakeholders such as the public and school boards focus on, and the data is only used as a means for monitoring and planning, not for improvement. A focus on compliance and accountability data can restrict data use for

instructional improvement (Jimerson, 2013). This stance of using data to prove to learn, rather than improve learning, derives from the data-driven decision-making model but does not lend itself to classroom-level data that informs teachers about student thinking (Jimerson and McGhee, 2013). A historical focus on data for accountability has created a mental model for many in education that summative assessments or large-scale assessments are the data to be considered in data use (Jimerson and McGhee, 2013), thus pulling the focus away from powerful data such as assignments, common formative assessments, student work, and formative measures. While the data-driven decision-making model has a role to play in understanding the progress of schools and students, there is not always clarity of how multiple forms of school-based data are essential for exploring the thinking and learning of students at a school-based level (Jimerson, 2013; Jimerson and McGhee, 2013). Thus, a constraint found for data use is that teachers have many different mental models of what comprises data use for altering instruction.

Failure to change instruction can be a result of a lack of resources on how to do so (Hubbard et al., 2013). Marsh et al. (2015) found in their study that only 19% of teachers' instructional responses to data resulted in a change in delivery. Rather, teachers' practice remained much the same. In a study of five countries, Schildkamp et al. (2013) found only two schools where concrete examples of instructional changes occurred because of data use. PD on data use and collaborative inquiry are often non-existent. Leaders often did not intentionally plan PD that builds the capacity of teachers to use data (Jimerson and Wayman, 2015). A further hindrance is that PD can occur at times that teachers cannot immediately apply new learning in the current environment of practice

(Schildkamp et al., 2013). Jimerson (2013) found that teachers often seek help informally, such as with colleagues, to develop an understanding of data. While this can be helpful, it can also lead to misconceptions if teachers hold varying mental models, focus on accountability data and have little training on data use.

Many roadblocks can occur to prevent the use of data as a tool to improve instruction. However, the literature revealed many practices that, when made intentional, offered the support and skill needed to use data for increased student learning. The following critical analysis of the body of literature sifts out these practices.

The Role of Professional Learning Communities

In the past, data-driven decision-making (DDDM) used broad scale data (Jimerson &McGhee, 2013) to determine if schools were being successful. However, summative data alone cannot serve to change and improve instructional practice. To learn about student thinking, uncover what students know and can do, and determine how students are interpreting learning and thinking, teachers must use a wide variety of school-based data used. The PLC is a tool for leveraging this type of data use. It is the school-based data and actions of teachers, leaders, and administrators that will be the focus of this study. The following discussion of the role the PLC played in research to support data use will continue the literature review.

Professional Learning Communities and Data Use

PLCs are the tool used to make data meaningful and to generate a culture of data use. “Evidence exists that schools in which teachers act in collaborative settings to deeply examine teaching and learning, and then discuss effective instructional practices, show

academic results for students more quickly than schools that do not" (Hord, 2004, as cited in Wells & Feun, 2013, p. 236). Sompong et al. (2015) described the PLC as the place for teachers to share and learn how to practice. Data analyzed and used in the PLC affected both school improvement efforts as well as instructional pedagogy and day-to-day practice (Farley-Ripple & Buttram, 2015). Feldman and Fataar (2014) noted the difficulty teachers have with shifting pedagogical processes. Using the PLC as a venue can create the shared cognition to use data to change instructional practices as driven by student needs.

The PLC process, when paired with an inquiry process, can be even more impactful (Kallemeyn, 2013). This process occurs through a data cycle that is iterative and includes inquiry, analysis, examination of student work, and the observation during instruction to assess and reflect on instructional practice (Thessin, 2015). The schools in Thessin's (2015) study implemented this cycle as part of their improvement plan. "Teams must first engage in and learn to implement specific PLC process steps as a precursor to engaging in the continual, ongoing process of improvement" (Thessin, 2015, p. 19). When PLCs and inquiry are part of a routine, data use practices are more likely to become culturally embedded (Kallemeyn, 2013). Thus, the PLC is the venue for data use observed in this study, in which I sought to understand what factors support PLCs to use data as information that is usable for guiding and making decisions about instruction. I the following sections I describe what research found to be factors that facilitate the use of data in the PLC process. These factors include leaders and leadership expectations, support, and data use skills.

Leadership

Principals and district leaders that demonstrate strong leadership build teacher capacity to use data to guide instructional practice. The research showed that leadership provided support in many ways. These ways included modeling, holding high expectations, building a common language (common mental models), and providing PD. The leadership style of the school principal also influenced the kind of support necessary for data use. Finally, the building of trust occurred, and teachers felt there was autonomy to be creative and make decisions as a team.

Modeling by leaders was an effective strategy for developing data discussions in a PLC (Jimerson, 2014; Schildkamp and Poortman, 2015). This modeling included peer teaching, videotape analysis or lesson study. As related to this study, the findings suggested that modeling might be a type of support necessary to build capacity in new teachers and teachers not familiar with the PLC /data process. This modeling often followed a gradual release model. At first, the leader modeled very precisely how to think about, interpret, and act on data (Schildkamp and Poortman, 2015). Over time, the leader removed this support. This support also came from other experts as well, such as instructional coaches.

Another component of modeling found in the literature was the need for the leader to model the right attitude about data. If the leader focused only on accountability data, teachers were likely to do so as well. Slavit et al. (2013) called a focus on accountability data a proving stance. A proving stance is using data for the sole purpose of proving that students are showing growth. While a focus that sought to uncover

student thinking, to change practice, was an improving stance. A leader who uses words and actions that show the importance of using data to learn and improve is likely to have teachers who do the same (Jimerson & McGhee, 2013; Jimerson, 2013). Slavit et al. (2013) found that the influence on data use comes from the district level. If the district focuses on accountability data, then the school leader must find a way to mediate district expectations with improvement concentrate on school goals

High expectations were another characteristic found in leaders who support and foster data use. High hopes for data use must start at the central office, through building administrators, down to the teacher. High expectations at the district level and a shared vision and purpose increased the likelihood of teachers using data to assess their instructional effectiveness and make a change (Wells & Feun, 2013). One expectation of the district in Wells and Feun's (2013) study was that all teachers would work with failing students. However, the expectation alone was not enough. The district also offered support to teachers and gave the teachers ideas on how to work with failing students. The district set clear expectations for how teachers were to use PLC time. Hardy (2016) shared the need for the administration to endorse the efforts of those supporting the work in the process. Funding, providing data management systems, allowing time and providing a safe environment for reflection on data and instructional practices (Marsh et al., 2015) offered additional support.

The principal's expectations about data use can also contribute to the success of using data to alter instruction. There was a need for leaders to communicate expectations about data use (Thessin, 2015; Lippy & Zamora, 2012), such as supporting and expecting

an instructional goal, if data use was to occur (Sompong et al., 2015; Schildkamp and Poortman, 2015). In addition, it was found the leader must create the expectation of a focus on academics or student learning (Gray, Kruse, & Tarter, 2015; Sompong et al., 2015) and sharing and jointly creating mission, vision and values for the work (Lippy, & Zamora, 2012; Marsh et al., 2015; Farley-Ripple & Buttram, 2014). When the district and the principal created clear visions and expectations, PLC implementation was considerably stronger (Farley-Ripple & Buttram, 2014). School leaders must also promote a school culture of collaboration (Thessin, 2015). This support not only focuses on data but also time to discuss content, share practice and pedagogy, and research what is working well. Sims and Penny (2014) added that the cycle of the PLC should include not only looking at data but on collaborating around teaching practices to improve student learning.

High expectations must coexist with support. “School leaders must attend to the development of the formal organization to attend their end goals of student learning” such as time dedicated in the schedule of the day (Sims & Penny, 2014, p. 5). Gray, Kruse, and Tarter (2015) found that formal structures were the antecedent to community building. It is these formal structures that allow for the time to be consistently set aside for the work of the PLC team, and this consistency sets the foundation for change to happen (Gray et al., 2015).

Leadership style contributed to efforts to build teacher autonomy and trust. Wells and Feun (2013) stated the need for teacher ownership. Teachers share collective creativity to design lessons and analyze achievement. Through the learning cycle,

teachers have ownership over what is learned (Hardy, 2016; Schildkamp and Poortman, 2015). Teachers do not want their autonomy restricted, but instead, want to be creative in teaching and planning (Sims & Penny, 2014). A final piece of teacher autonomy is the ability to come to a consensus (Schildkamp and Poortman, 2015). Teachers must learn how to blend their ideas and to think to make instructional decisions together.

Leaders must model and show that the sharing of data is okay and safe. Teachers must cultivate a non-threatening environment (Chen, Lee, Lin & Zhang, 2016). Wells and Feun (2013) added that the leaders in their study were intentional about not evaluating results, so teachers felt safe and open to sharing. Louie (2016) found in his research that teachers needed to take each other's problems of practice seriously and share ideas and practices without making colleagues feel lacking. Thornton and Cherrington (2014) clarified trust more explicitly. Interpersonal respect is when others are listened to and valued. Personal regard constitutes being caring and supportive. Competence in your role means that you show integrity and trustworthiness. The definition of integrity is matching what you say with what you do. If teachers do not trust each other, they are unwilling to expose ineffective practice or weakness.

In turn, the willingness to get into a robust debate, which can stimulate improved practice, declines (Thornton & Cherrington, 2014). These authors stated that the sharing of instructional practices is indicative of the level of trust in a team. Thornton & Cherrington's research took two approaches to leadership. The question these researchers asked was "Which type of leadership promotes effective PLC work, top-down or bottom-up?". Sheehy, Bohler, Richardson, and Gallo (2015) studied communities of practice and

found that a combination of top-down and bottom-up approaches offered the necessary support. Within the community of practice, teachers needed the autonomy to make decisions and generate new thinking and ideas. However, the support of leaders and administration was necessary as well. Leaders may support teachers through providing the structures of time and resources, setting a framework for expectations of PLC work (Wells & Feun, 2013), or helping to support understanding of the concept of a PLC and providing access to expert help (Gray & Summers, 2015).

In addition to Thornton & Cherrington's question, Peppers (2015) and Vanblaere and Devos (2016) addressed what type of leadership was helpful for data use. Three critical styles mentioned by researchers included: distributive, transformational and instructional (Peppers, 2015; Vanblaere & Devos, 2016). Peppers (2015) found that transformational leadership empowers teachers to make many decisions. This leadership cycle provides a sense of ownership where teachers feel empowered to collaborate, share new learning, and make decisions about instructional practice. Therefore, teachers felt like they were empowered. Another outcome of this shared decision-making was sustainability. Lalor and Abawi (2014) found that teacher empowerment and leadership helped stabilize the change of new staff. When many teachers served as teacher leaders, there was less gap when new teachers or leaders arrived. A study by Vanblaere and Devos (2016) delved into the discord associated with which type of leadership is essential to help PLCs achieve their fullest potential. The two styles studied were instructional and transformational.

An instructional leader focuses on instruction. This instruction includes curriculum, pedagogy, assessment, and climate. These leaders have in-depth knowledge of these areas (Vanblaere and Devos, 2016). Teachers' perceptions of leadership demonstrated which style best supported the collective responsibility, reflective dialogue and teacher's ability to deprivatize their practice. The results of Vanblaere and Devos' study showed that both types of leadership play an influential role in PLC work. While the perception of transformational leadership was that it built an increased sense of collective responsibility, teachers perceived instructional leadership to increase deprivatized practice. An instructional leader can observe and interact with a teacher about their instructional practice. Vanblaere and Devos (2016), suggest that when the conversation is opened up by the leader, teachers are more willing to sharing with their colleagues. The school leader needs to participate in the pedagogy of teachers actively. Both styles were perceived to increase thoughtful dialogue. Leadership must be considered essential to PLC effectiveness (Peppers, 2015).

Finally, the leader must understand the essence and impact of mental models and find ways to help teachers share and co-create mental models. Senge defined mental models as "the cognitive structures that are the results of an individual's experiences" (1990, p. 174). Senge discussed the need to identify one's mental models to bring an awareness of what they are. It is the awareness of these mental models that allow the person to change their mental models. Senge continues by asserting that it is when mental models begin to change that there is an improved opportunity for new understanding at both an individual and an organizational level. Thus, when discussing data, it needs to be

clear what teachers' beliefs and values are as they relate to data and data use. The beliefs teachers hold are often very different and can influence decisions made about how to use data. Wayman and Jimerson (2013) found that teachers must have a shared understanding of the purpose of data use and must establish common goals and objectives. Jimerson and McGhee (2013) called the leader the "linchpin" for developing these common mental models (p. 5). These researchers further suggested that if leaders and teachers do not examine their mental models, they limit their understanding of one another and may unknowingly be talking about two things, when they believe they are only talking about one. However, Jimerson (2013) found that a leader can intentionally build these mental models by providing training, modeling, encouraging interaction between colleagues, and giving teachers experience and time.

An analysis of the research on leadership efforts that build teacher capacity to use data within a PLC provides evidence that teachers benefit from the support of those who are leaders. An understanding of this problem guided my research study and directly correlated with the questions of the study that were part of the interviews.

Supports

PD, as it related to my study, is crucial support for the practical use of data to alter instruction (Jimerson, 2013). Accordingly, a study of what researchers have found to be the most effective PD served as a backdrop for viewing the PD opportunities provided by the local district. Sheehy, Bohler, Richardson, and Gallo (2015) referred to teacher expertise as "professional capital" (p. 12), which includes three areas: human, social, and decisional. These researchers described professional capital respectfully as teaching

skills, collaborative ability, and expertise in making wise decisions. Decisional capital empowers teachers to make choices about instruction, pedagogy and student needs (Yi & Mitchell, 2015). One way to improve teacher capital is to improve the PLC process through training.

Wells and Feun (2013) found the teams that implemented PLC practices, defined by DuFour and Eaker (DuFour & Eaker, as cited in Wells & Fuen, 2013), have had the training to analyze data. Schildkamp et al. (2013) found that the schools which were most successful at making changes in instruction had teachers who were competent in data use. Teachers need to be able to merge data into relevant chunks of meaning. Through training and practice, leaders can build the capacity of teachers to use active dialogue and know how to ask the right questions of data (Wells and Feun, 2013). Sjoer and Meirink (2016) noted that teachers also need an opportunity to develop shared knowledge, which may come from outside PD. Teachers do not always have a chance to observe each other, so they must know how to be explicit about their practice, making sure dialogue includes asking questions, not just listening, so that it is clear to others what methods have occurred (Tan and Caleon, 2016; Vanblaere & Devos, 2016). It is through an explicit description that teachers can gather their experiences and gain wisdom from other's practices. This clear and distinct sharing also brings teacher assumptions about good practice to the forefront. After teachers examine the likenesses and differences of their assumptions, they can begin to challenge some of their premises, which can result in changed practice. Stewart (2014) added that PD on collaboration is also necessary. Leaders cannot assume that teachers know how to collaborate (Hoaglund et al., 2014).

The evidence suggested then that teachers need the training to engage in dialogue that asks the correct questions, helps teachers to be explicit in the explanations of their pedagogy, and the ability to challenge each other's assumptions. It was necessary to discover what experiences the teachers and leaders in my study had to build these data conversation skills. Furthermore, were these skills evident in the local PLC teams as they met every week? While dialogue and teacher interaction are a critical part of data discussion, one must consider other PLC characteristics as well.

PLC teams had several characteristics supported by data use. Thessin (2015) found that the PLC structures, if not in place, could reflect why teachers do not use data as a part of the PLC cycle. Several conditions are necessary if a PLC is to use data. These conditions include school-based PD, PD for leaders, and access to outside or vertical expertise. First, the PD, stated above, needs to be school-based (Thessin, 2015; Lippy, D. & Zamora, 2012; Lotter, Yow and Peters, 2012; Hardy 2016), so that learning occurs in context. Learning in context helps teachers to make an immediate change and assess the results quickly. However, Thessin (2015) also showed that district level PD supported the process. One school in this study, which had 91 percent of the teachers who perceived PLC work improving their practice, had 8-10 district level training sessions on PLCs (Thessin, 2015). Sompong et al. (2015) offered further support by stating that while working and learning together in the school is critical, help from outsiders and others in the district is as well. Owen (2014) also found that bringing in outside experts or attending conferences, can shield schools from becoming stagnant with their ideas. This research shows that a variety of PD may best support PLC effectiveness. A combination

of school-based, district-based, and potential outside support can be influential in teacher practice. As it pertained to my study, it was essential to learn what PD was supporting teacher practices, as well as what teachers perceived to have the most impact on their practice. However, research has shown that leaders must receive PD as well.

PD for leaders is relevant to data use. Leaders often lacked an understanding of PLC work and data use (Hubbard et al., 2013). Ripple and Buttram (2015) found that anyone playing a formal leadership role in assisting in PLCs and data discussions must have an opportunity for PD as well. Ripple and Buttram (2013) found of four districts studied, the one exhibiting the highest level of PLC behaviors, such as shared norms, teacher trust, and collective responsibility was supportive of PD for principals, as well as teachers. Further support was offered to leaders by placing PLC work as a constant agenda item at the district level PLC meetings. Not only can developing a leader's ability to use data effectively, utilizing other outside expertise, in addition to the leader, can increase data use effectiveness.

Marsh et al. (2015) noted that a change in instructional delivery most prominently occurred when there was access to vertical expertise or an expert from outside the core group of PLC members. This expertise involved content-area knowledge, paired with interpersonal skills. One without the other appeared to be ineffective (Marsh & Farrell, 2014). Jimerson and Wayman (2015) found that some of these experts support to be instructional coaches, content-area specialists, or other school-based teacher leaders or experts. The realm of this support could be from data collection, tying data to curriculum, instruction and assessment, and modeling.

Lotter, Yow, and Peters (2014) added to the understanding of PD, with research on how instructional coaches supported the PD process. The analysis showed that when teachers co-construct knowledge with their coaches, or attend common PD together, and then implement learning within their contextual setting and reflect together, there is a substantial impact on what is learned. The learners build a shared language, or as Jimerson (2014) says, "shared mental models." Jimerson (2014) suggested a blending of both outside PD, combined with building level learning through inquiry. Huguet et al. (2014) supported the idea that coaches can play a crucial support role in mentoring teachers on how to progress through a data cycle (Buttram & Ripple, 2015).

Furthermore, finding support for teachers new to the PLC process through an apprentice stance, or observers on the periphery (Lave, 1997, as cited in Owen, 2014) maintains sustainability. At the same time, new members bring in new ideas and thinking, much like outside experts and professional training. Ripple and Buttram (2014) found that support by an outside expert increased the PLC dimensions within a team. These specialists included instructional coaches, as well as the principal, ELL teachers, or reading or math specialists. The leader-based support on the needs of the team.

Marsh and Farrell (2016) noted that teacher leads, or PLC leaders, can also serve as an expert. This individual can model data use through explanation and demonstration. The leader can show the various ways to elicit information from data, how to make data meaningful, and what types of responses might occur. Both the coach or team lead also can connect teachers with other experts to assist with instructional strategies or other resources. Two kinds of expertise, as found by Marsh and Farrell (2016), were needed:

data use and content-knowledge. The more content-knowledge teachers had, the more likely they were to adopt an inquiry approach to instruction (Slavit et al., 2013; Schildkamp and Poortman, 2015). Finally, Buttram and Ripple (2015) discussed the support of teachers going to other teachers to build capacity. Going to other teachers was a consideration in making sure there were teacher leaders well trained in data-use so as not to spread misuse and to serve as a bridge between experts and teachers (Ripple & Buttram, 2015).

Regardless of the type of support provided, the evidence shows that some critical elements of supports must exist. Clear goals and alignment of support from the district level down to the teacher must be in place. Leaders at all levels must have a strong foundation for PLC work and data use as it applies to inform instruction and student learning. Finally, all members involved must be able to see and hear that the words and actions of leaders and experts align with an improvement stance for data use.

Specific Skills for Data Use

Allen (2013) identified two types of resources; instructional resources, and conceptual resources. Instructional resources include access to instructional strategies, student tasks, and assessment instruments. Conceptual resources are those such as the ability to ask the right questions to inquire and to analyze student learning. Wayman and Jimerson (2013) stated there are six areas that teachers must be competent in to use data effectively. They must understand how to ask the right questions, know how to integrate data with curriculum, instruction and assessment, know how to analyze and interpret data

and link it to classroom practice, have computer skills for accessing and compiling data, and understand how to collaborate around data.

Posing questions and engaging in dialogue are practices that caused a change in instructional delivery (Marsh et al., 2015). Without knowing the questions to ask about data, the enormous amounts of data can be overwhelming (Jimerson & Wayman, 2015). The instructional discussions that followed data discussions had the most significant impact on instructional change. It would be ineffective to spend time only on accessing and analyzing data if teachers do not spend time responding to data. The framework presented in my study intentionally focused on all phases of the data cycle and how teachers were achieving the final stage, altering instruction. The leader at one school attributed increased student growth to the ability of teachers to engage in a continuous improvement cycle (Kallemeyn, 2013) as part of a routine. In other words, PLCs and inquiry processes were the venue for creating organized routines for using and learning from data.

The goal of using data is to make instructional decisions based off strong inferences about data. The ability to analyze, interpret and to apply or act on data resulting in changed classroom practice is termed “data literacy” (Jimerson & Wayman, 2015). This instructional change would result in a change in delivery, not simply be re-teaching content in the same manner as originally taught (Marsh et al., 2015). Teachers may also decide to reorder the sequence of the curriculum. It is at this juncture that teachers have truly fit curriculum, instruction, and assessment together (Jimerson & Wayman, 2015). Another dimension to this understanding is the ability to choose the

right assessment or data to get the information needed to make instructional decisions. Jimerson and Wayman (2015) explained “Assessment Literacy” as the match for the right assessment for the data that is needed. Teachers need support in building these skills through modeling, PD, and expertise of colleagues with expertise in interpersonal skills and content knowledge (Jimerson & Wayman, 2015).

Jimerson and Wayman (2015) found through interviews with teachers that technical skills of accessing and compiling data were critical. Categories for these skills include those that were needed to keep and track data, and those are necessary to access data. Without these skills, teachers were less likely to use data that was available to them. Another hindrance to data use is timing. If teachers are trained on how to access data, such as in the summer, but will not be using data until much later, this can hinder teachers' ability to use the data (Jimerson and Wayman, 2015).

Teachers need to learn to challenge each other’s practice and not just make it a point to agree. It is this cognitive dissonance that stimulates new learning and understanding about problems of practice (Louie, 2016; Owen, 2014; Slavit et al., 2013). When teachers simply agreed with each other, Allen (2013) defined it as a “validation of practice” (p. 203), rather than taking a reflective stance that promoted deeper thinking and dialogue. Without this type of dialogue, teachers walked away without new learning. DeGroot, Endedijk, Jaarsma, Simons, and Buekelen (2014) gave an example of this type of dialogue. These authors found that teachers who backed their thinking with reasons, as well as elaboration, questioning, and contradiction of each other's thoughts, produced optimal learning. Slavit et al. (2013) supported this thinking and added the need to look

closely at data and invite “critical analysis” (p. 10) and propose alternatives. Some of these data experiences may include support for dialogue around data analysis, solving problems of practice, researching best practice, and looking at student work. However, these opportunities to practice should be authentic (Hoaglund et al., 2014).

Louie (2016) shared how teachers need to be careful not just to validate colleagues, but to push for critical reflections (Louie, 2016; Owen, 2014). Critical thinking causes the teacher to walk away with an instructional or conceptual resource. Allen (2013) stated that this cognitive dissonance stimulates new learning and understanding about the problems of practice. Since PLCs add a social dimension to reflection, the practices indicated by these authors help more clearly define the kind of reflective questioning and discussions that need to occur for learning to happen (DeGroot, Endedijk, Jaarsma, Simons & Beukelen, 2014). The capacity to engage in productive dialogue around a variety of topics is a foundational skill that overlays all other abilities. It needs taught and practiced in authentic situations (Hoaglund et al., 2014). These authors suggested that this support comes from mentors or internal support. Finally, collaborating with colleagues from outside the initial team influenced data use (Schildkamp and Poortman, 2015).

A final skill recognized in the research was the ability to know which type of data to use to inform practice. Data for reporting, providing accountability and for driving and altering instruction are all used. This study focused on the latter. Buttram and Ripple (2014) found that the strongest PLCs for data use included a variety of data in the analysis. Formative and interim tests, versus comprehensive summative tests, were most

often used. These schools also included student work as data for informing instruction. Wells & Feun (2013) found that one successful district had teachers use their data, in this case, mandated common formative assessments. However, teachers used common formative assessments (CFAs), and the leadership provided assistance and communicated expectations. District B in the study also paid teachers to develop CFAs (Wells & Feun, 2013).

Conclusion

This literature review began by looking at how the research viewed using data to alter instruction. That lens, a conceptual framework, provided a data cycle model (Ackoff, 1989; Mandinach & Jackson, 2013; Marsh et al., 2006 as cited in Marsh & Farrell, 2014) used for observation of PLC teams and the practices occurring within. A review of the literature showed what factors inhibit the work of data within the PLC team to alter instruction. Finally, the literature showed what can positively affect the use of data for making an instructional change.

Implications

The AdvancEd report (2015) indicated that PLC work and data use were both in need of improvement in the local district. The accreditation team recommended continued PD in these areas. The results of this research revealed what practices teachers were using to alter instruction based on data. Furthermore, an understanding of what kind of support had an impact on teachers' skills identified effective PD practices or internal support practices that district leaders replicated during district or building level PD. This research identified gaps in the system that inhibited the building of educator knowledge

to use data effectively, and this understanding of these gaps could influence the organization of PD and the communication of practices. These findings led to my thinking on how to provide consistent internal support for sustainability. They also suggested what behaviors and actions to continue because they are perceived to be supporting the PLC process. The constructs of useful data use learned in the literature review, combined with results of this study, informed a white paper about data use, and supporting and inhibiting factors for data use in local PLC teams.

Summary

Despite access to data and opportunities to use data through the PLC process, there is still a gap between data and practice (Marsh et al., 2015). This gap is present between having data and using data to inform instructional practices. The next section of this study describes the case study approach that was used to investigate the practices of three local PLC teams, as well as the design and approach. The participants, which included the teachers, the principal, and the local PD director, are described, and their level of participation and the duration are clarified. The data collection section will describe the collection tools used, which included observation, archival data, and interviews and the purpose of choosing each type of data. Finally, the approach to data analysis concludes in section 2. This section tells the how and when of data collection, the process for data transcription and coding, and possible biases.

Section 2: The Methodology

In this qualitative case study, I investigated how PLC teams were using data to alter instruction as described in the theory of action data use framework. In this study I took a close look at the PLC process and sought to understand what happens during this process, that is, trying to learn how PLC teams are using data to alter instruction.

In the sections that follow I explain the research design and approach and justification for using the qualitative case study design over other methods. Following this description is a clear account of the criteria for selecting participants, what procedures I used to gain access to participants, as well as the method of relationship building used. Also included is the identification and description of data collection tools and how the collected data will be analyzed and presented.

Qualitative Research Design and Approach

For this research study, I used an instrumental case study approach. This design was necessary to delve into the practices, expectations, and experiences of those participating in building-level PLC teams to answer the research questions. I collected data and analyzed it through an inductive process that gathers information on the data-driven practices of PLCs in a local school (Merriam, 2009).

A case study by Thornton and Cherrington (2014) provided a detailed understanding of the actions of the professional leader on the effectiveness of the PLC, as well as what type of interactions existed. In much the same way, I sought to understand what data practices were occurring in PLC teams in the district and what organizational and policy structures influenced those practices. I this study began by looking at

routinized practices and structures teachers use in PLC team meetings. This study widened to the principal and district PD director to get a clearer picture of the support for the process given to teachers in a PLC by the more extensive system.

A qualitative case study allows the researcher to understand the perceptions and interpretations of those experiencing a phenomenon (Merriam, 2009). This approach enables the researcher to uncover implicit experiences of individuals and how those participants make meaning of what has happened to and in them. In research completed by Schildkamp and Poortman (2015), a case study allowed the team to magnify the focus by looking deeply into the work done by the team and observing interactions and resulting actions of the PLC. Social interactions of teachers who co-construct new knowledge together build each other's capacity for data use (Schildkamp & Portman, 2015). Thus, a case study allows the opportunity to see which networks of social interaction have supported teachers in their understanding of data and data use (Farley-Ripple & Buttram, 2015). Other types of research considered were a phenomenological study or a narrative analysis (Merriam, 2009). I considered phenomenology as a research approach as it too is a way to seek to understand lived experiences. However, it limits the opportunity to observe what is happening in the here and now, such as the work done in PLCs. In a narrative analysis, the researcher seeks to learn the lived experiences of individuals through a story. While knowing the background of my participants and learning their story through interviews, this approach did not allow the observational piece of how individuals are currently acting based on past experiences. Thus, I chose a

qualitative case study that would allow for a real-time investigation, as well as delving into past experiences.

Participants

The criteria for selecting participants reflects two of the standard practices necessary for a PLC to use the data cycle, described in the framework. First, the teams chosen for this study had to meet regularly, meaning once a week, except for exceptional circumstances, such as a shortened work week. A variety of data might be used by the PLC team (Gummer & Mandinach, 2015), such as assignments, common formative assessments, and summative assessments. However, at a minimum, common formative assessments must be used, as those were found to provide a shared experience and increase the transparency of teacher talk (Heredia, Furtak, Morrison & Renga, 2016). The number of participants in this study totaled 13. PLC teams were made up of 3-4 individuals. An interview occurred with every team member. Three teams represented three grade levels: second, third, and fifth. Interviews occurred with only teachers from those teams, along with the building principal and the district PD director. This limited scope allowed an in-depth study of the teams in action.

Gaining access to participants involved multiple steps. First, I contacted local instructional coaches in the district and shared a brief synopsis of the study and the criteria established for the PLC teams in the study. Because instructional coaches work across buildings, they knew which leaders might support this research in their buildings and had some knowledge of the inner workings and goals of the building and PLC teams. Upon the referrals from coaches, I contacted the building principals suggested by the

coaches, starting at just one school. Again, explaining the study and its intent as well as the team criteria, I sought permission to proceed and asked the principal for additional advice on which teams to study. The first principal interviewed was more than willing to help and was excited about the study. However, logistics of small teams and the involvement of too much time on my part as researcher led to this not being a good sample. This restriction resulted in finding a larger school where the principal was willing to be involved in the study. Once the principal suggested possible teams with which to meet and who fit the criteria, it resulted in three teams that would be in the study. I met with each group independently, explained the research and what requirements existed for each team member who participated in the study. It was critical to share how I would use and share the information from the study and the time commitment that would be involved. It was also important to state how this study could benefit the school, the team, and the students. Teachers had the opportunity to read the consent form and decide after having time to think it over. The forms were not collected at this meeting. I independently collected the consent forms and worked with the teachers to set up times for observations.

The initial contact with the participants served the relationship building between the participants and myself through communication of clear intent and purpose. I built trust by stating the confidentiality of the research, the use of pseudonyms, and by sharing a summary of how each team became part of the process. I adhered to my role as a researcher during the PLC observations, and no interaction occurred during the observation. The research included the perspectives of all teammates through the

interviews, but I did not express any personal viewpoints and beliefs. Also, the interviews were conducted one at a time, so each person interviewed felt safe to speak freely.

I took several measures to protect the participants' rights during this study (Creswell, 2012). First, all permissions followed the guidelines required by Walden and the local school district. These permissions included the informed consent documents signed by the participants. Permission followed the process dictated by the local school district. Participants learned about pseudonyms used in the final research paper via the consent forms. The consent forms also shared how the results of the study would not be discussed outside of the study or between myself and other participants. The documents provided the assurance that participation in this study in no way would impact the interviewee's job or was evaluative in any way, and participation was completely voluntary. Also, I examined my biases, and I did not try to influence or provide personal perspectives to the team members or interviewees. I recorded the transcriptions word for word, and there was no alteration to the data. Participants knew they could withdraw from the study at any time without consequences. Institutional Review Board (IRB) approval had been given by both the Walden IRB (approval number 03-15-18-0108350) and the study district's IRB before any research began.

Data Collection

The process for how data were generated, gathered, and recorded to be accessible for the final review of the study was a multiple step process. For this study I collected three types of data. These included observations, a collection of the mission vision and values of the school (School Improvement Plan), and interviews. The observation of the

PLC provided information about what was happening in the PLC as viewed through the lens of the theory of action framework. The mission, vision, and values informed me of what the school values were, what the district and principals hoped to accomplish, and if data use and PLC work were a part of the school goal. The interviews provided information about teacher perceptions regarding the prior support teachers had been given by the district, principals, or colleagues to use data to alter instruction. The data collection process took about 10 weeks.

I observed three local elementary PLC teams. These observations occurred during the school day at the local school site and exposed similarities and differences in practices that offered multiple perspectives on data use through immersion in the community of practice at a team level (see Datnow et al., 2013). I studied the interactions and dialogue of each team, observed what type of data the team used, what conversation occurred, and teachers' responses to data.

Observations

The first tool was an observation protocol (see Appendix B) specifically designed to categorize the behaviors and actions of the PLC team into one of the four parts of the theory of action framework. I designed the protocol to give descriptions of the activities that might occur in each of the four phases to guide the observer to record data in the correct phase consistently.

The observation protocol based on my framework, included sections for each part of the framework. Within each section, there was a place for types of data, dialogue, actions, and notes. I studied three teams once weekly, which provided teams with the

opportunity to complete 1-2 cycles, from instructional planning to modifying instruction based on data. I completed notes during observation and rechecked after each meeting to be sure the details were descriptive enough to interpret later. This review occurred before the following meeting.

Interviews

The second type of data gathering tool was three sets of semi structured interview questions. I created a set of interview questions for the teachers in the PLC teams, the principal, and the district PD director. The district PD director influences the PD received by all teachers in the district. I interviewed each teacher team member individually (see Appendix C for interview questions). Thus 11 interviews took place. One additional interview took place with a teacher who only participated in the PLC process one time during the observations. However, this individual was a part of the data review at the study site, and this interview helped add to the total picture of how the research school was using data. Also, I interviewed the principal one time (see Appendix D for interview questions) and the curriculum director one time (see Appendix E for interview questions). In total, 13 interviews were included for analysis. Each conversation occurred outside regular school hours, at a location designated by the interviewee, and they lasted between 22 minutes and 1 hour and 10 minutes. Through the interviews I sought to learn what was affecting the teachers' understanding and capacity to use data for instructional practices. The interviews occurred after completion of the observations.

I conducted interviews with PLC team members to learn the history of how they came to the level of understanding they had and what influenced their practice, and how

the school and district leaders supported them. I conducted semi structured interviews using questions created from information in the literature review to determine what was essential to learn and understand about the participants, school, and district. Follow-up questions clarified the preestablished questions.

An interview with the school leader and with the district PD director who leads PD uncovered how they support the use of data in the PLC. These interviews revealed many facets of the factors that supported PLC work, such as the organizational context of the leader. For example, this means the kind of leadership activities that the leader conducted, what structures were in place in the school and PLC, and what resources or tools teachers received for support. Analysis of these practices, as they related to one another and the context of the PLC work done in the building revealed what supports were aiding or hindering the team's ability to use data to alter instruction. (see Datnow et al., 2013). What happens in a school and a district at an organizational level shapes what happens when teachers collaborate around data (Datnow et al., 2013). Because organizational structures and policies shape data use, in the study I explored the policies set at the district level that influenced the work of the building level PLC team.

I audio recorded and transcribed all interviews. I took notes on each sheet of questions as the interviews happened. Transcription occurred in the weeks following the interviews. NVIVO12 was the program used to upload the transcribed documents and assist in the coding and development of themes. This program housed the entire data set, including the interviews, observations, and school improvement plan and district mission, vision, and values statements, and it served as an inventory reference (see Merriam,

2009). All coding and themes resulted from the analysis of the data within NVIVO. I used a professional transcriber, which saved time and expedited the analysis processes.

School Documentation

Farley-Ripple & Buttram (2014) found that when the district and the principal created clear visions and expectations, PLC implementation was considerably stronger. Thus, the school and district mission, vision and values statements were gathered from the district website, in the form of the school improvement plan, for further documentation of what expectations were communicated in writing as related to PLC work or data use. NVIVO 12 housed these documents, where they were coded with the observations and interview transcriptions to add to the total picture of collected data. These communicated expectations provided further evidence of what actions are being taken to support teachers in the use of data by making it clear to all what each level, district, and school, is expecting from data use.

Triangulation

Data triangulation took place through interviews and observations of PLC teams, as well as the collection of the school improvement plan and district mission, vision, and values statement. Triangulation means to use two or three different measures to assure internal reliability (Merriam, 2009). The interview data points came from teachers, the principal, and the PD director, giving a wide range of perceptions and information. The observations encompassed multiple grade levels, including second, third and fifth. Each method contributed to the overall themes and patterns that emerged in the research. These

various sources of data provided validity and reliability by cross-examining the data sources and seeking familiar, emerging trends (Merriam, 2009).

My role in this study was as an observer and interviewer. The role of research observer allowed for minimal disruptions at the site. Additional PLC team meetings, which were unplanned, were attended when extended an invitation to do so. This school is not one I have worked indirectly and as such, I had little knowledge of this school and the culture. I have been in limited schools in the district as an instructional coach and teacher. Since this is a large district, it was possible to choose a school in which I had not worked. I did know some teachers. However, since it was a new team and school for the teachers, there is little concern about personal bias. While attending PLC team meetings, I did not engage in the conversation, but instead, observed and took notes. During interviews, the teachers answered semi-structured interview questions, but I did not interject personal opinions.

Data Analysis

Data collection began with the observation of PLC teams during their weekly PLC meetings. The observation of three teams included a total of 11 teachers. Field notes were analyzed after all the observations to ensure that the records were detailed enough to later make meaning from them. The observations completed included eight for the 2nd and 5th-grade teams and 7 for the 3rd-grade team. This number of observations allowed for observation of a full learning cycle. There was not enough time to conduct any further observations, as the school year had come to an end. While I intended to gather all PLC

notes, this was not necessary, as notes were recorded electronically on the template (Appendix B) during the observations.

The interviews occurred one on one. Eleven classroom teacher interviews, one principal interview, and one district PD director interview occurred. The eleventh teacher was a part of the school-wide data team and added to the overall picture of what was occurring around data use building-wide. Transcription from the interviews, done by a professional transcriber, occurred the weeks following the completion of the interviews. An analysis of the transcribed interview data revealed general recurring themes, categories, and codes. This data analysis was highlighted and coded through Open Coding, followed by Axial Coding (Merriam, 2009). Open coding requires the researcher to be open to all bits of data as possible answers to each research question, making notations on the side of the notes (Merriam, 2009). Two approaches were used to begin finding and creating codes, referred to in NVIVO as nodes. The data was coded to answer the first research question that explored how teachers were using data to alter instruction. Codes that described what the inhibiting and supporting factors were for using data to modify instruction followed the first codes. Finally, I looked at the data from the lens of the framework to make codes for how the use of data occurred. These codes sought to understand the process that teachers used. These codes emerged into smaller categories that had similar meanings and relationships. This part of the process is Axial coding. Evidence of similar patterns and themes across data were compiled to narrow the data into themes. Coding of the observational data began after all data collection, except for

the transcriptions. Coding of the transcriptions started as each transcript was received. The digital tool, NVIVO 12, helped find and sort themes.

To reduce possible bias, a school in which I had not worked was selected as the study site. However, as stated by Merriam (2009), it is difficult to eliminate personal bias. Thus, I identified and monitored biases as data was collected and interpreted. The field notes and interview sheets included any comments on the personal bias if it was realized. Team members participated in a member check on their interviews to ensure the accuracy of representation. This member check was a summarized version of the interview, which included researcher interpretation, thus increasing the saturation of data as interviewees could add on or change the summary and assuring accurate representation of the information shared. These member checks may also expose personal bias (Merriam, 2009).

Data Analysis Process

Three types of data were analyzed; interviews, observational data, and the school improvement plan. The data analysis began by uploading the first documents, the school improvement plan and district mission, vision and values statements into NVIVO 12, the qualitative analysis program used for this study. The school-based document was the school improvement plan, as this was the document shared by the principal when asked where to find the mission, vision and values statement. Document analysis occurred through the lens of altering instruction. Any references to how these documents supported teachers' ability to make decisions regarding altering instruction, was coded into the program. These codes later connected to how these documents might have

offered additional support to teachers as they related to using data to alter instruction. Team meeting coding, done through two lenses, occurred upon completion of the coding of archival data. First, I used the research questions as a lens. Thus, ideas grouped related to how teachers used data to alter instruction and what supported teachers or inhibited their ability to use data to alter instruction. The second lens was the conceptual framework (Ackoff, 1989) which allowed a perspective of how teachers went through the process of looking at, making meaning and creating an action based on data. Notes were taken on the data teachers accessed, the interactions and dialogue that occurred to analyze and turn the data into information, how teacher combined the data with understanding and expertise to turn it into actionable knowledge, and the response teachers made to act on the data. These four phases were taken directly from the work of Ackoff (1989) as he explains the data use cycle.

Data Analysis Results

This section identifies results in three areas. These areas include using data to alter instruction, factors that inhibit the use of data to alter instruction and support that is in place to build teacher capacity to use data to guide instructional practice. In order to build background on how teachers arrived on instructional change decisions, the first section includes what type of data teachers in the XYZ District were using in professional learning communities, as well as the value they gave to each type of data. The value placed on data often led to which data was most widely used. A description of the two ways that instruction can be altered led to what the instructional change looked like based on teacher use of data. This section concludes with what prevented teachers from using

data as leverage for instructional change within their classroom. This leads to an understanding of what might need to be the district focus if the teachers are to use data to make an instructional change. Finally, the last section shows the perceived supports that are in place that built teacher capacity to use data.

Findings from the Data and Research Questions

Before answering the first research question, "How are PLC teams using data to alter instruction?", it is important to note what data teachers were collecting at the study site and the value the teachers gave to the data. Specifically, the initial findings discuss the types of data, the value is given to data, how teachers altered instruction, decisions based on numeric and observational data and factors that support and inhibit teacher capacity to use data. The types of data teachers use influences the decisions they can make, while the value teachers give to data impacts which data is used. Studying how teachers were altering instruction showed how teachers were using numeric and observational data to make decisions. Finally, the results for factors that inhibit or support teachers in data use to shed light on what may need to be changed or what might need to be sustained to continue building teacher skills. Each of these areas leads to an understanding of what is currently supporting teacher use of data to make an instructional change, and what is limiting data use for such a change.

Types of Data

There were two types of data used by teachers in my study. These included behavioral and academic. Academic data was divided into formative and summative data. The research question, how are PLC teams using data to alter instruction? can be clarified

by identifying how the type of data effects decisions that are made and gives insight into which data type most often leads to instructional change.

The behavioral data often came in the form of observation. In the PLC meetings, teachers were observed discussing behavior that was getting in the way of learning, as well as in the way of a student's ability to get along socially. While the MTSS (Multi-tiered system of support) team tracks student data in the multi-tiered system, much of the discussion included sharing with team members' the behavioral actions of students, and how to respond to the teacher concerns. The PLC team discussions also included how students responded to academic tasks and how to alter those tasks to get a different response from the student when needed. The discussions often involved delving into all levels of a student's day, such as home situations, interaction with other students, what might be the most challenging time of day for the child and other similar factors. These conversations also included information on what parents had shared about a child. While behavioral data does not seem to be directly related to altering data for instructional purposes, it became clear that teachers valued the whole child and sought to increase academic outcomes by meeting the social, emotional and behavioral needs of the child. The principal noted, "I know we are specific to, kind of, in all of these questions, achievement, but the behavior is very---that piece I think we tend to overlook as an instructional component, and it is huge."

There were several types of academic data used. These data pieces include two types, formative and summative. The types of formative included anecdotal records, observation, formative assessments, and common formative assessments. The first type

of formative data is anecdotal records. These are records kept by teachers through notetaking or running record reading assessments. Running records are completed one-on-one with the student and allow the teacher insight into what strategies a student uses or does not use when reading. The classroom teacher collects this type of data. When a teacher watches and listens to how a student is doing on daily classroom activities, this is observational data, the second type of formative data. An additional type of formative data occurs when teachers gather formative data through observation and may collect it through small classroom tasks such a quick write or exit ticket. A common formative assessment, the final type of formative data, is much like a formative assessment but is given by all the teachers in the grade level or content area so that teachers can bring it to a team meeting for discussion. These are the types of formative assessment that were either used during PLC team meeting discussions or noted during interviews.

The second type of academic data is summative data. The Star test is a norm-referenced test, given roughly once a month, which shows the student performance results in a summative fashion and offers a comparison of that student's performance linked to others of the same age and grade level. Teachers used this data in weekly discussions, collected it on an all-school excel spreadsheet, and considered it when making decisions regarding individual placements, such as intervention groups, advanced placement or summer school. The Star is a summative type of data that is used as an assessment of learning, rather than for learning. A new type of summative data to the research site this year was the Wyoming Test of Proficiency and Progress (WYTOPP).

All schools across the state give this assessment, and it provides summative data several times a year through interim tests and a summative assessment in May.

Value Given to Data

The research indicated that teachers valued specific data more than others. Each type of data and the importance placed on it will be discussed here. These types include formative, common formative, and summative. Teachers use formative assessment the most to access student thinking, while common assessments were useful for team meeting discussions. Summative was the least valued. This information is relevant to my study as it was found that what teachers' value is what they use and allows me to look at whether the data that is used is suitable for making an instructional change.

Each of the types of data was given different values by those interviewed based on the intended outcome. There were many references made to formative assessments during the interviews, along with what made them critical pieces of data for teachers. Teachers were asked to share which type of data helped them gain the most access to student thinking. Formative assessments were the data piece that teachers valued, to know and understand their learners. Ms. Hill (Pseudonym) stated that "I see my anecdotal notes and common assessment driving my instruction more." Ms. Hill also shared, "I probably depend more on the conversations I had with my PLC, but around, like, our note-taking and our conferring notes and what we are noticing and what does that mean, you know, to get to actual student thinking?" In addition to being able to access student thinking with formative data, teachers also believed the formative information was timelier regarding giving and getting feedback and not as invasive, taking up less time

from the school day. As stated by a third-grade teacher, it is quick. It is at the moment. It is very personal. It comes directly from the student. Formative allows for a quicker picture at the moment and allows you to be quicker in your response.

Flexibility was another value placed on formative assessment. One teacher noted that when creating a common formative assessment (CFA), the team can create an assessment that accesses what the teacher taught, whereas a summative assessment, like Star, cannot do that. Another teacher added to this by noting that CFA's are a working document that teachers can change. Thus, teachers can learn what it is that they want to know from students because it matches their instruction.

A final value that teachers shared was that of common assessments being data that is important for team data discussions. The PD director even went so far as to say, "Well, the CFA's should be seen synonymously as the whole point of PLC's. If PLC's are waiting for the next Star test before they make a new instructional decision, we have waited far too long. So, we need something timely." He added that teachers using this data could have a discussion that occurs early enough in the instructional process, that a change of instruction can occur more quickly. Thus, the information can be processed through the PLC conversation to create a change in instruction.

There was little discussion about the value of the summative assessments, such as Star and WYTOPP for teachers. However, teachers referred to this data often during the PLC team meetings. Some teachers used the Star as a second data piece. This data allowed the teams to ask questions around student performance, such as if the score represented the work that students do daily in the classroom. Mr. Mills (Pseudonym)

suggested that assessments that were more summative and gave him a better view of how a child was doing holistically. Thus, while there indeed was value in summative assessments, teachers seemed to place more value on the formative.

Altering Instruction

PLC teams are altering instruction in a variety of ways. Some decisions led to instructional change, that was either a surface level change or a deep change. There were also decisions made from data that led to a change that was not instructional but may affect the outcome of instruction. These two types of decisions are clarified in the preceding paragraphs, and a full description of the actual type of changes being made conclude this section. The information shared is relevant to understanding exactly what type of changes teachers are making as a result of data and answers the first research question.

The goal of using data is to inform instruction and be able to make an actionable change that will improve student success and achievement. Hence, the first research question in this study is, "How are PLC teams using data to alter instruction?" Data gathered through observation and interviews found there were two main types of decisions made based on data. The first was decisions that led to instructional change and the second was decisions that led to a change that did not affect instruction but led to an increase in student achievement. However, as the researcher, I had to consider that there are multiple forms of data that teachers can use. So, first, I needed a mindset about data that moves beyond numerical data. Also, this study indicates that while instructional change is one way to reach a decision as a result of making meaning of data, there are

other decisions based on a multitude of data, which are not a direct connection between teacher and student. For example, in one instant, a decision was based on behavioral data to allow a student to move flexibly between classrooms, based on his needs for the day. Thus, the instructional changes that teachers make are twofold: data to change instruction directly and data that causes a change in students that increases achievement but is not directly related to instruction.

There are two layers of instructional change. The first is a surface level change. A surface level change does not create a change in pedagogy or create new thinking about instruction for the teacher. It does not question the "what" or "how" before making an instructional change (Marsh et al., 2015). It can be as simple as using a test score, without looking deeply into the result, to move a student from one group to another. Deep change, on the other hand, asks teachers to challenge their own beliefs and seek new ideas and pedagogy to meet the instructional needs of a child. Teachers understand the why behind decisions they are making (Marsh et al., 2015). The following discussion describes the ways teachers make an instructional change from these two perspectives.

Decisions based on Numeric Data

Teachers made many decisions based on numeric data. Those findings included surface level decisions such as changing interventions or enrichment, regrouping students, deciding on summer school placement, and scheduling. Deeper level changes were altering curriculum, changing practice, and increasing instructional time. These results show specific examples and make team decisions explicit.

Teachers in this case study used data to make profound changes in several ways. However, it is important to note that not all these changes were based on assessment, but also from observation and more formative types of information. Teachers in this study were making surface level and deep level changes based off numeric data. Numeric data is referring to any data in which students were assessed and scored. Most commonly occurring were changes in instruction regarding intervening with students or providing enrichment. For example, in one second-grade team meeting, the teachers were trying to decide which instruction best met the students' needs concerning intervention. Their choices were to continue an intervention because the child was showing progress, change the intervention because the child did not show progress, add another level of intervention because more progress was needed or to exit the student from interventions, but monitor their progress to be sure they maintained proficiency. Multiple decisions were made such as keeping one student in the Read Live Program to cement her understanding, even though she was at the forty-fourth percentile. One child was moved from Read Live to Leveled Literacy Intervention (LLI) as teachers felt that was a better instructional fit. The teachers exited one child from interventions, and it was decided to retest one student, as the score did not match what the teachers saw in daily student work and performance. These decisions were made by looking at numeric data, the Star scores, as well as teacher observation and expertise on student performance in the classroom. The third-grade team also did some necessary regrouping in the classroom based on data. Finally, Star test data and student performance were used to decide which students qualified for summer school.

The data revealed two other types of decisions. Mr. Mills (Pseudonym) shared that his team used data to decide whether or not his team would use a curriculum they purchased the following year again. As a result, they decided not to. While it may be likely that this was a team-based decision resulting from a discussion, it was not evident in the interview. The fifth-grade team used data regarding a specific math test. They looked at questions students struggled on and made the decision that they were not spending enough time on the concepts. No action was taken specifically to instruction; instead, they would review the missed items. This action was surface level as teachers drew a general conclusion about why students did poorly and chose to review the material in much the same way. Thus, decisions based on data can result in curricular changes or cause teachers to reconsider the amount of time they are spending on concepts.

In addition to decisions that resulted in surface level changes, decisions based on numeric data also led to some deep level changes. An unusual pattern emerged here. Most of the deep level changes resulted when teams went through more phases of the data cycle (Ackoff, 1989). The next paragraph describes each phase and decision that teachers reached.

A decision made by the second-grade team during a March PLC team meeting, after using data, was to be more mindful of what practices they are using for conventions and share them the next time they met. They also decided they were not clear on what second-grade writing should look like, so the action was to seek out the third-grade teachers to learn what their expectations were. Finally, they decided that they needed to

give the students a test to see if they know it and just are not applying it. This action began in phase one of the data cycle, accessing data. Teachers brought the results of scored writing papers to the meeting. They reported that the highest area of concern was conventions. The teachers then began phase two of the cycle, which was to analyze data to turn it into information. They engaged in dialogue around the common errors in writing, such as where to do the end punctuation and proceeded with a discussion about how to improve writing. The team then started to make meaning by asking questions such as this question by Ms. Manning (Pseudonym), "Are we conditioning our kids to not attend to writing?" The teachers discussed the reading and writing connection and how there must be a reading connection first. Ms. Manning suggested that perhaps the team needed to do some reading about what to do when students are not applying what they know. Another teacher questioned if she is spending enough time on how to edit in the writing process. Once the teachers started to make some meaning of the data, they began to form some actionable knowledge, which is phase three of the data cycle. The teachers discussed having students use a writing checklist, trying to bring conventions more regularly to their attention, and reading their writing aloud to their partner. They also considered using the same passage, with punctuation in different places, to show students how it can sound differently based on where the punctuation occurs. This discussion led the teachers to phase four, which resulted in the decisions mentioned earlier. The teachers decided that since their writing tasks were now shorter, they would have more time to attend conventions, as they are spending less time on the actual writing. They wanted to attend more to conventions and bring them to a heightened awareness with kids. This

change in practice is because when the writing was longer, they did not have time to attend conventions. In May, this was the follow-up discussion: teachers were continuing the daily, real-life practices, so that students could apply their learning. The teachers were going to have the students re-do an assessment activity to see if this practice is making a difference. Finally, the following week, they decided to bring a high, medium and low newspaper book (student work) to look at that data. As is evident from this description, when there was an opportunity for a full cycle data discussion, teachers were able to create knowledge they could act upon, as well as follow-up on later, to make decisions about effective practice.

The fifth-grade team demonstrated a similar process in their PLC meeting. First, they brought a math test to share. They discussed what four looked like and how they arrived at the score. The teachers asked questions about the calculation. The test was broken out into specific skills. In phase two, another teacher talked about a specific question that gave the students difficulty. When the teachers began to make the data into meaningful information, they noted that there was only one lesson on the concept. The results were to possibly take out the test question or potentially go to the intervention lesson to give it more focus. There was also a suggestion to have the adult volunteer give these students extra lessons on this from the intervention page. It is unclear as to whether this team followed up on these actions, but they did engage in all four phases of the data cycle.

A final opportunity to see how teachers are making decisions based on numeric data presented itself when the PLC met with a teacher from another grade. This teacher

had a leadership opportunity to organize Star data so that grade-level teams could ask questions and look at trends and patterns and make meaning differently. The lead teacher assigned each student a colored sticky note based on which quartile they started the year in, making this an opportunity to observe trends. Then, based on trends, Mr. Mills, the lead teacher, moved the students sticky note to the quartile in which they currently were performing. Mr. Mills displayed this on a presentation board, and it created a visual picture of how students were growing. This experience took place with the fifth-grade team. It then led to a data discussion about what teachers noticed, aided by some questioning from Mr. Mills. For example, he asked, “Which kids that are static are in interventions right now?" The teachers followed with a discussion about what interventions each child received. They then paired what they noticed with observational data about what was evident by a child's performance in class. Ms. Camp (Pseudonym) asked if the students that are increasing were in interventions. The team noticed a pattern on the data board based on the color-coding scheme that many students remained stuck in the same area, and many of the interventions did not seem to be working for lower kids. A teacher then asked, "What does it say if they are static and are in intervention?" Mr. Mills asked what went well for the yellow kids that have moved way up. Ms. Camp responded that these are highly motivated kids. Ms. Lock (Pseudonym) noticed that the low kids are not moving, but neither are the high kids. The intervention is not working. The dialogue progressed to some reasons why. One teacher suggested that there is resistance to test taking and clicking quickly. Another asked, “Are interventions helping? Maybe these kids need a different intervention.” A different consideration was, “Are they

getting enough Tier 1?" Ms. Simms (Pseudonym) added, "Maybe interventions that they dislike are not a good fit?" She also noted that kids in the Read Live intervention were not progressing and questioned what is happening in the Read Live intervention. Finally, the group moved into phase 4, which is a response to data. Here are some of the actions they decided to take. For one child, they were going to talk to mom about absences. They thought it might help to talk to some kids that can do better, about working harder on the test. The team considered moving some kids out of Read Live if other data supports it. Thus, they did not want to rely solely on numeric data. Mr. Mills suggested that they look at keeping kids in the classroom for Tier 1 instruction, rather than going to interventions during this time. The group thought they might need to look at the schedule so that the team could meet the needs of more students. Ms. Simms also added that they "consider hitting the ground running next year. If kids are low, start faster." Finally, Ms. Camp suggested they look at data more often, so that kids are not going a full quarter without any support. Thus, many actions were considered by this team from regrouping kids in interventions, reconsidering time spent in Tier 1 intervention, scheduling, getting started on interventions sooner and increasing the time spent looking at data.

Teachers are making a variety of decisions based on data. However, my research indicates that when teachers engage in many phases of the data cycle, they reach decisions with a deeper level of understanding and question the "what" or "how." This query often leads to an adjustment in pedagogy and decisions affecting student achievement.

Decisions Based on Observational Data

Observational data, from teacher anecdotal records, formative assessment, and behavior observation, also leads to many actionable decisions by teacher teams. Sometimes these decisions are a change in instruction and other times they are a change that will increase a student's chances for success. As with the numeric data, observational data has two categories: surface level changes and deep level changes.

Surface level decisions made by teachers were varied. One team member talked about using data to make decisions about placing students in different classrooms. Ms. Ford (Pseudonym) describes this practice. “We do share kids, not only with myself and my main teaching partners but, if necessary, to provide support to a student, we would also do it with the other teaching partners. So, for instance, there's a student who can have difficult or challenging behaviors, be unengaged, and refuse to participate and so, if they're not successful for an afternoon with me, we would potentially put them in someone else's science or math class in the afternoon and then they would come right back in here." This practice allows an opportunity for student success. Another example shared by Ms. Miller (Pseudonym), a second-grade team member, is that when they discuss data and a team member notices that other kids with other teachers are understanding, they can ask, "What am I missing or what did you do differently?" This questioning can lead to a change in instructional practice. Ms. Lock even indicated, "We've done some swapping with students to teach different things that way." While this practice may be deep level change, it is not clear as a researcher how the process went that led to these decisions. Thus it cannot be labeled as a profound change. Finally, Ms.

Simms noted that informal discussions also lead to ways to support students. For example, she had a student who was needing extra support for his We the People social studies unit. Ms. Ford suggested pairing him with some of her students with the same question for support. In these instances, teachers used observational data to make decisions about sharing students, regrouping students, or asking each other for their expertise in instruction.

Finally, some changes occurred at a deeper level, but not only because of data, but also as a part of the PLC process. A piece of the PLC process that often led to decision making is when teachers engage in dialogue that exposes their expertise. For example, one discussion revolved around observational data where the teachers noticed the students were not sticking with a book. Ms. Manning shared that she knew that a good strategy is to "hook" them into a series. This strategy also allows for conversations between the students**.** As an action, the teachers brainstormed how they could create a space in the commons area where they could locate series books. While this may not directly affect student instruction, the teachers felt that students engaging in books would increase their reading ability. Another teacher noticed that students struggled when answering text-based questions. Ms. Manning suggested that the students needed to be looking for textual evidence after they have read the question first. This piece of shared expertise led to the decision for each teacher to give their students the opportunity to practice this skill. The second-grade teachers discussed any special needs of students, such as a switch to fluency instruction vs. phonics. This decision was not data based, but instead, PLC based. PLC based means that it was more about a conversation starting,

perhaps from observational data, in the team meeting. The teachers regrouped students according to needs if necessary. Thus, two things occurred because of teachers using observational data to make a deep level change. First, a conversation around observational data led to teachers sharing their expertise, which led to making a change. Secondly, the conversation itself led to a change in instruction.

Teachers are making a variety of decisions based on data. However, the research indicates that when teachers engage in many phases of the data cycle, they reach decisions with a deeper level of understanding and question the "what" or "how." This questioning often leads to an adjustment in pedagogy and decisions affecting student achievement.

Factors That May Inhibit the Use of Data to Alter Instruction

One question my research asked was what factors inhibited the use of data to alter instruction. Many factors limited teacher use of data for making instructional change. These inhibiting factors include data literacy, data beliefs and teacher buy-in, data access and data alignment, time, trust and relationships, sustainability and change, systemic support, resources and compliance. A discussion of these inhibitors allows for a deeper understanding of what limits teachers use of data and can provide insight into changes that could be made to build teacher capacity for using data to alter instruction. Teachers have a variety of experiences that shape their beliefs and practices and thus, influence the work they do each day. The interview process in this case study was designed to find out what teachers, the principal, and the district PD director perceived to be inhibiting factors in data use.

Data Literacy

One factor that may inhibit the use of data to alter instruction was noted by teachers was their ability to generate assessments, as well as to understand and interpret them. Dr. James (pseudonym), the PD director, referred to this as a need for higher data literacy. Data literacy was defined earlier as "The ability to transform information into actionable instructional knowledge and practices by collecting, analyzing, and interpreting all types of data" (Gummer & Mandinach, 2015, p. 2). Teachers must be able to understand what the data is telling them to do something new instructionally. The PD director noted that it is an area where teachers need more support as they attempt to interpret data results and share those results with others. An example given is to know the difference between a reference test and a criterion test and how these types of assessments give you completely different information. When teachers do not understand the basics of assessments, it can result in teachers just reporting out a score and not attaching any meaning to it. A piece of the data literacy piece mentioned by the teachers was the ability to compile the data in a meaningful way. Ms. Hill noted, "I feel like I'm much better about compiling data from my students from common assessments than I am with accessing data from Star or WYTOPP. I know there are wonderful resources that are there, but I could get lost in trying to find what I am looking for." A 5th-grade teacher shared that she had tried all different types of ways to keep track of data to compile it in a meaningful way for her team and students. She felt it was something she needed to get better at, primarily since she viewed it as powerful for her team.

While numeric data can be difficult for teachers to understand, such as that found in summative assessments like Star, many teachers noted that they wanted more support on the common formative assessments. One teacher felt that the use of CFAs was mandated, but that there wasn't any help and support behind it. Another grade level teacher added that even though the district sent out the requirements of a good CFA, which did mean teachers understood it well enough to create them, adding that there was little modeling for the creation of a common formative assessment. While teachers felt like they are a beneficial tool, concerns were expressed in their abilities to create and align these as a tool to access student understanding, as well as how to look at that data. Another teacher noted that they felt like their triad was behind on creating CFAs. That it would be beneficial to work with other second grades teams to find out what they are doing and the thinking behind their process. The lack of ability in creating these assessments also led to a lack of confidence in what the test might be suggesting. One teacher noted that there was concern about whether the test was assessing what they wanted it to assess. Adding to this concern, another teacher noted that because of the lack of training on CFA's, there was a question about the reliability of the assessment.

One teacher put it a different way. When looking at test data, she questioned what data she should use to make an instructional change. "Should I change it because of these test scores or because of this test and then you kind of look like, well, was it the test? Was it the questions? Was it the wording of it? Were they not able to read it, you know, especially like with math? Well, the kids very low in reading did -- was he not able to do it because he couldn't read it, or I think those are some -- a lot of barriers." Another

inhibiting factor for one teacher was the inherent difficulty in finding what the actual learning targets should be. She noted that she felt like more training was needed on CFAs, but added, “But I feel like we need a little bit more definition of what our targets are and what proficiency looks like--define learning targets, and then we can figure out how to assess and how to change based on those assessments, change our instructional practices.” Also, Ms. Ford said that there has been a lot of change in the district-used assessment, but that those assessments were not formative. She suggested that it might be time to revisit the current assessments and how the how information is broken apart and shared with the teacher, and how the district is using the information. Thus, many teachers felt their capacity to create and assess with common formative assessments was a factor inhibiting their ability to use data to make instructional changes

Another inhibiting factor was the type of PD offered. The PD director shared that the district was committed to providing the funds for teachers to attend training that they need, although he added that teachers might not always be taking advantage of that opportunity. Several individuals alluded to the need to have PD that was school, or district based, versus that which occurred in another city, such as the Solution Tree summits. Ms. Manning noted that training such as these takes you out of your context. Thus, you try to find sessions to attend that will help you the most. While she generated some ideas, she felt it did not move her forward in understanding the connection of the power of the CFA to drive instruction. The PD director distinguished that some data used in the research district is tailored and personalized to our state and district in such a way that he wonders, "if some of those "go out to an event” trainings would be helpful in the

first place." Another perspective he added to outside PD was that summits, like Solution Tree, are not always responsive to teacher needs. He believes the district is starting to realize that they need different kinds of training. Ms. Manning made the analogy that if we are to give kids a choice in their learning, the teachers should have a choice too. This perception adds another dimension to consider in PD opportunities: choice. Without choice, PD can be inhibiting because teachers are all in different places in their learning. Ms. Miller felt that if the local district was going to hold PLC work to a certain standard, that there should be more local training on district used data so that teachers could learn what data to drill down on, as well as understand what kinds of meaning teachers can assign to the data. PD, therefore, was a potential inhibitor, as it needed to be more needs based, context, and the district should provide choice for teachers.

Data Beliefs and Buy-In

The research unveiled many beliefs about what teachers' value about data, how that value creates buy-in, and what causes them to either buy-in or comply. This data also reveals what Senge (2006) referred to as varying mental models. In this case, teachers held different assumptions and pictures of what data was useful and valued. First, Ms. Miller noted that she highly values observational data. However, she felt that often, she felt when questioned about it, she would not be able to prove her data. A third-grade team member stated that she didn't value unvetted data. This teacher did not know how the district collected this data or what the district collected, so it had little meaning to her. This uncertainty left her feeling like she was wasteful of her time. Ms. Baird felt that CFA's were not as valued by others. Teachers talk about summative assessment the most,

so she perceived these as more important. Contrary to Ms. Baird's (Pseudonym) perception of the importance of summative assessment, the PD director noted that CFA's were the tools that were timely and should be being used by the PLC teams. Ms. Hill felt that summative data wasn't as usable when it came to accessing student thinking. It was hard to decipher whether you were testing reading, their ability or their thinking. Hence, teachers value data differently. Ms. Lund (Pseudonym) shared a final perspective on the value of data. She feels that if data doesn't shift your beliefs on how kids learn, it is hard to buy-in to it. The interview data gave some understanding of what caused some teachers to buy-in to specific data more readily.

When teachers do not value the data, they don't seem to buy-in to the data. One suggestion, made by the principal, as to why teachers don't "buy-in" is that they feel like data is being done to them, rather than with them. She noted that if there is a reason to change, there must be an urgency to do it, as well as an understanding of why. Ms. Miller added to this thinking by stating, "Why are we still taking the Star, other than the fact that you tell me it's a benchmark?" This individual clearly does not understand the why of what she is being asked to do. Ms. Manning shared that if the beliefs you have are a mismatch to the training you are in, it is difficult to buy-in. The PD director added, "The point of having to make a new instructional decision gets very personal for people, and they take it personally, and they're very reluctant to engage in new practices." Buy-in thus is another inhibiting factor for data use.

Data-Access/Data Alignment

The ability to create or use data that aligns with instruction and the ability to access data are two more inhibiting factors shared by interviewees. Ms. Ford shared, “I think some of the barriers are just, also things we've talked about, you know. Not being sure that it was a good alignment, to begin with." Ms. Manning added that their team spent time in conversation asking if the CFAs were assessing what they wanted them to assess. Meaning, according to Ms. Miller, is most easily derived from well-aligned data. Another restriction to data use is the ability to access data. Limited accessed to data makes it difficult to look at the bigger picture. Mr. Mills spend time working as a Title One teacher in his previous district. He was able to access and compile data in such a way that the school could look at trends and patterns in data. However, as a lead in the research school, which shares data with other teachers, he is unable to access any data other than grade level data. Instead, the data must be compiled by a different individual first. Why this matters, according to Mr. Mills, is that it makes it difficult to make connections about the effectiveness of different intervention programs. Dr. James noted that the limitation of data access has grown, even nationwide. He associated this limitation with increases in cybersecurity and the increased discussions about privacy. However, at a more local level, teachers indicated that they needed more training in what reports to access, such as in the Star database. Thus, while narrow in scope, there was some indication that data access was an inhibitor.

Time

Teachers shared multiple perspectives on how time was a limiting factor in being able to use data to alter instruction. Lack of time seemed to slow down many facets of the data use process. First, it takes time to develop CFA's. Ms. Manning shared, "I think one of the most powerful PD s we had, we were given time to collect CFAs and that was the first time our team discussed like, "Our CFAs aren't even meeting what we're supposed to." She added, "You can't have somebody's brain be hijacked about other things and pressured to do something. To get good quality work, just like you provide for your students, you have a safe and environment that you give them time to explore." As part of that safe environment, it also takes time to build trust between teams. According to the principal, time is needed to empower teachers to trust and connect personally. Ms. Miller added that this trust was vital because it allows the group to be able to question each other and have tough conversations. One team member noted that they only met for 30 minutes each week due to scheduling, thus limiting their time together. The PD director added to this by saying that some teachers only meet 20 minutes a week and when this occurs, it delays what teachers are talking about. This time constraint then now dates the data and the time for instructional change has passed. Ms. Lock shared an experience in which one of her past teams did not meet consistently and had little time to talk. She compared it to her current team and found that when you don't have time to be in the conversation, it is not as impactful for students. She also connected this thinking to curriculum, instruction, and assessment. Ms. Lock noted that to deliver proper instruction, you also need to know good instructional strategies and be familiar with the

curriculum. All these things take time to develop and learn. Ms. Ford noted that having time to compile data is restricting. Even at that, once teachers collect data, much like Dr. James shared, the time for instructional change has passed. Finally, the principal shared that it takes time to model PLC work. First, the teachers modeled, then practiced, and then gradually the principal released to teachers to try it on their own. It is evident, that time is an inhibiting factor.

Trust and Relationships

The importance of trust and relationships was evident at all levels of the school system, from teachers trusting each other to trusting what the district was asking them to do. When teachers did not trust, it limited what teachers were willing to do and how much they were willing to interact and share with their teams. At the district level, teachers were distrustful when they were asked to collect data or create CFAs when clear communication did not exist about why they were doing it. Or, in the case of CFAs, when teachers were expected to create them but did not feel supported in doing so. The principal believed that leaders could not build trust if you do not take time to reflect and share. At the teacher level, teachers felt they had to trust each other to open up and make their practices explicit. Ms. Miller said, "I've been in that situation, you know, where people are scared to let you in because they think that you're judging them." Trust, therefore, has been perceived to be an inhibiting factor.

Sustainability/Change

A pattern that emerged in the interview data was a reoccurring discussion on change. The school site in this study is relatively new, with new leadership. Also, as is

often the case in schools, there have been many teachers either new to the school or new to the grade level. As such, teachers shared how this change took time and restricted the level of teams in their involvement in the work around data for an instructional change. Mr. Mills told the story of his team and how they all are relatively new to the grade level. They spent time learning the grade level, building relationships, feeling comfortable in their instruction, and primarily focusing on what they needed to do as individual teachers. This focus made it difficult to move beyond their internal challenges, to focus on their peers and their instructional needs. Ms. Miller added that she felt like her group was always in survival mode, meeting the necessary job details of tasks, such as getting grades in the grade book. She did share that in the second year, they were beginning to move on and begin to move forward to a focus on data and instruction. Ms. Mills also indicated that when forming a new team, it was necessary also to review the philosophy, beliefs and how they could be successful. Since this is a relatively new school site, Ms. Lund also felt that a great deal of time was spent building the culture and the community, which led to less instructional discussions at the beginning. Finally, Ms. Miller suggested the possible need to have a local PLC training to help with transition and change in this district. Change takes times, and there is a need to adjust and create new learning. The time needed for this can cause teachers to move away from efforts to engage in conversation and actions that lead to data used to make an instructional change.

Systemic Support

Systemic support relates to how PLC work is supported through a network, from the district level involvement, via the principal, to the teacher in the classroom.

Analyzing the data from this view allowed the opportunity to look for gaps that might be inhibiting the use of data for instructional purposes. One potential inhibitor that was noted was merely the size of the district. Concerning expectations, the PD Director shared the struggle of deciding how broad or how narrow to keep the PLC expectations. If the focus of expectations was too specific, it is a mismatch for professionals. For example, Dr. James shared that what a welding teacher at the high school needs is fundamentally different than what the first-grade teacher who is teaching little ones to read needs. This challenge was also present in determining a mission, vision and values statement. If you get too narrow, it leaves people out. If it is too broad, he indicated that you are not saying much worthwhile. Furthermore, Dr. James indicated it is even difficult to find the forum where you could talk about these. He stated, "It's getting twelve hundred people all headed in the right direction and feeling good about the hundreds and hundreds of the folks that are-- sometimes it's not until problems pop up that we recognize we've kinda got to backfill some work."

The school action plan was a third piece of data considered in my study. As such, the teachers were asked during the interviews how familiar they were with the school improvement plan. Most noted that they had been exposed to it but could not cite what was on it. Another teacher shared that he had been responsible for writing it. While a school-based action plan can assist with the mission, vision, and values of a school, there was no indication that this was an inhibiting factor as it relates to data-based instruction. This action plan would need further exploration.

The only reference to a systems-based influence from a teacher standpoint was that of the need for a more systems-based approach to interventions. Ms. Camp shared, “I think we talk a lot about like what we're going to enrich in and how we're are going to determine you what to enrich in. But I don't necessarily think we talk about systems to do these types of intervening." It is not clear if this teacher is referring to a school-based or district-based system. However, it might be important to note that when teachers don’t feel capable of organizing interventions, it may limit their abilities to use new practice to alter instruction to meet individual needs.

Resources

School districts have many resources that teachers can choose to use. However, in the XYZ District, it was found that teachers were often not aware of these resources or chose not to use them. For example, the district has a data analyst whom Dr. James describes as brilliant. He could tell you what is true or not true about any set of data. However, few people reach out to him. Also, the district has provided a resource called Global PD to building principals. This PD is an online resource that Dr. James feels is underused. Dr. James himself is highly trained in data teams but is called on tiny to come out and support school PLCs. Thus, while resources exist, they are not being used to build teacher capacity to use data. Dr. James shared several reasons why he believes teachers do not make use of resources. We need to advertise what is out there better. “We make some assumptions that the great opportunities we've passed along to building leaders that they passed along to all their teachers and maybe they have, and maybe they haven't. I know that principals on the side have come up to me and said, "I just let it fall

through. I haven't logged on myself.” Finally, he talks about the long-standing problem of internal expertise. He believes people do not maximize internal expertise because they have a hard time believing that somebody local could be the answer. Thus, a further inhibitor of data results from teachers and principals not making full use of the resources available to them.

Compliance

Several of those interviewed noted that compliance was an inhibiting factor in data use. Some examples of compliance expectations shared were a strict adherence to instructional programs, having an expected number of grades in the grade book, and creating and using CFAs. One teacher shared a time that he wanted to use another program to support kids who were not understanding. However, he learned he needed to adhere to the district program. He felt this limited his ability to seek out alternative instruction. Several teachers revealed that they felt the grade book requirement was inhibiting their ability to generate meaningful data. For example, they were creating work for the grade book but felt it wasn’t meaningful. One teacher described it as a type of pressure. Ms. Manning shared, “Well, we didn't really even have time to create one good assessment. And then we're trying to find, you know, a million more assessments." Ms. Hill added that the problem is confounded when the grade book is continually changing. Finally, teachers felt there was the expectation to create and use CFAs, but there was little support behind it. Dr. James shared that it might even be possible that teachers were creating CFAs to comply with the expectations but may not be using them for a PLC

conversation. This data shows that the need to comply, without having support, can inhibit teachers' ability to use data.

Conclusion

A variety of factors can inhibit the use of data to alter instruction. As discussed, this can range from not having access to data, not understanding the data, or not be building relationships that allow teachers to interact and share. A broad view of these inhibitors needs to be taken, as many come from influences beyond the work of the PLC.

Support to Build Teacher Capacity to Use Data to Guide Instructional Practice

My final research question asks, what support have existing PLC teams received from their schools or the district to build their capacity to use data to guide instructional practice? There are many supports given in the research district, as well as the school level, to help teachers make use of data to alter instruction. Some of these supports are a direct relationship to data and instruction, while others are indirect support. The supports discussed are relationships and trust, training and supports, leadership, systemic support, school-based resources, expectations and beliefs. Relationships and trust allow teachers to network and share ideas and data (Zhang, Yuan, and Yu, 2016), while understanding teacher training and supports reveals what is influencing practice. Leadership and systemic support at a district level are addressed to learn how these two entities support teachers. Wells and Feun (2013) indicate that it is important to consider expectations, as those can increase the likelihood of data use. Finally, it is important to understand what school-based resources are available for teachers to ask questions and get advice, while knowing what the school believes are about data can show what data gets used and how.

Understanding what supports have been effective for teachers, can allow these same supports to be duplicated and improved. Relationships are the first support piece to be discussed.

Relationships/Trust

The interviews at Antelope Ridge told a strong story about the importance of relationships and trust. Teachers shared information that created a clear picture of the role this plays in communication in the building. This insight resulted in understanding what teachers can do because they have trust, what relationship building allows regarding teacher effectiveness, and what teachers did to build trust at the research site. Teachers share numerous examples of how trusting each other supported them. First, trust allowed the teachers to feel safe to ask questions. Ms. Hill shared that feeling trust allowed her to ask questions about data and if she saw something that worked well in another classroom, she could ask questions to help her understand the practice better. Ms. Miller added, "It's being comfortable to ask those questions and to be able to ask the other side of, well, tell me why you think that? I'm not just going to go along with you." So, questions allow teachers to challenge each other as well. Another teacher shared that in the environment created; she did not feel threatened if another teacher disagreed with her. A final teacher added that feeling free to ask questions increased the team's effectiveness. She felt they spent less time trying to figure out where kids were at, due to the constant conversation, and less time trying to figure out where each other's heads were. Knowing each other well helped them be more focused on the data. The support teachers felt through trust also allowed teachers more confidence to share student work, as well as try new things.

Ms. Lund shared that trust and respect for colleagues gave her the confidence to engage in a new practice, even when it did not feel quite right to her. Thus, trust allowed a level of engagement and sharing that teachers found critically important to their growth.

Much like trust, relationship building supported teachers in many ways. First, because they knew and were comfortable with one another, they were willing to seek each other out for support. Ms. Ford even noted that they had a saying in the building. “The answer is in the room.” Ms. Baird perceived the principal as someone she was willing to seek out for help. She did concede that it did take some time and bravery to seek out her colleagues for advice. It appeared that teachers who know each other well also understand the instructional practices of their peers and their beliefs as well (Ms. Manning). Another factor influenced by relationships was accountability. “You feel an accountability so that the relationships even outside your PLC are significant" (Ms. Lund). Trust supports teachers by moving the conversation forward and helps teachers ask good questions. It opens up a willingness to share, according to Ms. Manning, practices, both good and bad. The open conversation allows the opportunity to find each other’s strengths, and in the instance of the second-grade team, Ms. Miller said that it helped them establish their roles. In the case of the 3rd-grade team, trust allowed teachers to share students for Tier 1 instruction, as well as to let students be fluid between classes when special needs required it. Relationships support teachers by allowing the shared practice, honest conversations, and a sense of safety.

It is clear how relationships support teachers instructionally. However, the research interviews also allowed insight into what helped to build those relationships. A

practice alluded to several times in the interviews was that in which the 3rd and 4th-grade teams had lunch together. Ms. Lund said this time together helped teachers get to know each other better. This time allowed teachers to know more about each other's instructional practice, as well as to learn about each other personally. She added that this informal meeting gave teachers the opportunity to discuss what was genuinely urgent in their classrooms. Ms. Lock contrasted this with her own experience of not spending enough time with one of her past PLC teams. She explained that teachers were not as aware of what they wanted to accomplish instructionally, which she deemed was not as impactful for students. The teachers were making a strong effort to build relationships. However, the principal saw relationships as a key to effective practices as well.

Being new to the building this year, the principal shared that it was critical at first to learn about the culture of the building. She also indicated an effort to be visible, accessible and consistent. One way that she learned about the teachers was to be very purposeful in listening intently and making connections with the staff. Ms. Manning noted that all the principles she had worked for had this same belief. They believed making connections would move people forward. The principle established that building relationships allowed teachers to feel that her office was a safe place to come and share struggles. Ms. Baird said she decided that there was not a good or bad question, and she felt safe to ask her principal or other colleagues. An intentional move that the principal made to build trust so that teachers felt safe to share mistakes was to model. Her modeling occurred through conversations, feedback, and activities during all school team meetings. Through conversation, she encouraged teachers to come to her if needed. One

specific example of feedback is what was known as the "3 M's. The 3 M's was a weekly memo in which the principal took the opportunity to notice and give reinforcement for positive things she saw happening in the building. During staff meetings, she modeled thinking first and then gave teachers the opportunity to share out similarly. Also, in staff meetings, she intentionally built-in opportunities for sharing takeaways, again, allowing teachers to know and understand each other better. Finally, the principal shared the importance of celebration. Celebrating the positives built a trustful environment. Because of her many activities, the principal made many efforts to build trust and relationships in the school.

Trust and relationships, in this case, seem to allow a great deal of interaction for teachers. It allows them to share practices, learn new practices, know whom to seek extra help from and as a result, affect their instructional change. Trust and relationships may be a critical factor in using data to alter instruction. To alter instruction, teachers must know ways to do so.

Training/Support

An interview question asked about the training and support interviewees had received to gain some understanding of how training and support influenced teacher practice. While there were factors identified earlier that inhibited teacher uses of data, there were found to be several practices concerning training and support that built teacher capacity for data use. This analysis considered training and support at both a school and district level.

The evidence suggests the school had many supports in place to help teachers build their understanding of PLCs and data use. First, the leader provided many supports. Many teachers mentioned a template that was given to use during PLC time. When asked why this template provided support, Ms. Hall (Pseudonym) stated that the part of the template that asked about what the teams next actions would be was helpful. It keeps that final piece of the data cycle at the forefront of the team's mind. Another teacher added that the template had a section that asked the teachers how they were using data to drive instruction. Also, many teachers again mentioned modeling as a support piece. The principal described her modeling in this way: First, she modeled. Then she stepped out of the conversation and let others talk and ask questions, then listened to those questions, and again modeled behavior for others to follow. Then she reinforced when she saw it done well. She offered support when she did not. The principal also provided resources and tools, as well as additional feedback. Teachers noted that the principal gave feedback in person, on Monday Memos, and on PLC notes submitted weekly. Another piece of support provided by the principal was a PLC rubric. Teachers were asked to review this rubric several times a year, set goals, and decide what kind of support they needed to meet those goals. Then, when teachers revisited the rubric, they could self-assess on how they were doing. The principal believed this self-assessment empowered teachers to make a change because the information was coming from them, not her. The principal also encouraged teachers to seek support from other colleagues. Ms. Lock had this to add, "The new leadership that we've had this year has been very supportive of what that PLC process should look like. If you didn't understand it, she is meeting with you and sitting

down with your team. She sat down and developed our norms with us and didn't tell us what to say or what to do but just listened to us, and then gave us feedback as to what she heard. And that really helped us narrow down our decision on what our norms would look like." Seeking out colleagues such as other teachers, teachers in other buildings, instructional coaches, the principal, or content coordinators at the district level, was a common practice when teacher needed content, instructional and data support. A unique project that occurred during this research was a trend analysis done by a couple of teachers in the building. One teacher collected the data, and Mr. Mills put the data into a format in which teachers could study trends that were occurring with the Star data. The principal worked with Mr. Mills to be sure he knew how to present the information and ask questions about the data. She later met with him again to see what feedback he had and how it might drive their next steps. Some individuals also mentioned the Excel Spreadsheet being a useful tool to support them when compiling data. As far as school level training, one teacher described a staff development day in which the principal shared out information, led group conversation, taught or presented information, and shared her expectations. The teachers and leaders alike made it clear that there was a great deal of support at the building level for the work of PLCs and data use.

At a district level, there was a variety of support and training. One way that the PD Director supported PLC work was to make it a permanent agenda item on both the principal teams meeting agenda, as well as the agendas of the elementary and secondary academic councils. He also mentioned that teachers could go to the Solution Tree summits upon request. Finally, the director shared that the superintendent also supported

the process. He said, “In fact, the superintendent, I think it was last year or the year before said, "You've got new teachers, untrained people. And we expect that they do this PLC work, you need to get your people training those who haven't had it. Maybe a refresher for those that have.” Teachers felt they knew the district expectations saying they were getting the message from the district that PLCs are essential, and they were giving teachers time to meet. One teacher felt like district leadership was getting the message to leaders in schools that there was a high expectation for PLC work. Thus, teachers knew that meeting in PLCs was part of what they were expected to do.

Training to support the PLC work in the district were varied, and many teachers shared many different experiences. Some noted that they had received district support to interpret and understand summative assessments, such as Star and MAP. Others received support for alignment of curriculum, instruction, and assessment through authors such as Marzano and McTigh and Wiggins. Most teachers reported having attended a PLC summit, either on their own or as a mentor, with a mentee. The principal described training she had in the past that she considered helpful. The principal talked of when PLCs first came to the district. The district lead team spent numerous hours with Solution Tree representatives, reflected and self-assessed at the building site and creating an action plan, and brought in some principals from across the state that was doing it well. The team also got to visit an outside team model the process. The PD director also did an online video to train teachers regarding common formative assessments. He clarified the purpose of common and formative assessments and what they mean. This video was given to the principals to share with staff. The director shared that a mechanism for

communicating learning and expectations were to use the principal as a conduit. Thus, the district has provided support for training through PLC summits, as well as local district classes. These pieces of training do not seem to be district-wide, concerning everyone participating, but instead, options that teachers have.

There had been many influences for teachers from both school and district efforts to support and train these teachers in both PLC work and data use. It became clear that preparation for this type of work takes experience and many types of interactions as many components must be understood and implemented. Ms. Ford described it best when she explained that, “You need to be well trained in the beginning in a variety of fields, that all come together to make one.”

Leadership

Every leader has their style and way of doing things. For this study, it was important to delve into the leadership style of the principal as it relates to how this style supports teachers and thus, supports their capacity to engage in PLCs and use data. The perspectives of how a leader can support teachers was taken from the principal, as well as from the teachers.

The principle describes herself as a transformational leader. Being a transformational leader means empowering the work of others through facilitation and support. She describes that she supports teachers' collaboration and finding strength in one another. Since she describes herself as leading from behind, she can then jump in and support and coach when needed. She also leads through modeling so that teachers know it is safe to try new things and make mistakes. Ms. Manning shared similar leadership

styles in other leaders she had that she felt made them supportive leaders. First, they set high expectations. However, like the study site principal, they allowed teachers to fail and learn. Past leaders also took the time to understand teacher and teacher beliefs, and they modeled through their actions. This description matches very closely with what the Antelope Ridge principal was trying to do. Mr. Mills, a grade-level teacher in the building, was given the task to use his data expertise to present data to grade-level teams. This experience empowered him to serve as a teacher leader. Thus, the leadership style of this principal provided much-needed support for teachers. Finally, the teachers and principal indicated support that happened because of excellent communication. The leader gave feedback through emails, personal communication and meetings, and clearly communicated expectations.

Another component of leadership is autonomy. Autonomy allows teachers choice and freedom to make decisions. This leader allowed the teachers to set their own goals together, which Ms. Lock suggested held teachers to greater accountability. She also allows teachers some flexibility, such as partners in new ways and supports teachers who identify needs-based PD. In this case, the third-grade team was able to go to a conference that would support their need to improve their content area literacy. Thus, the principal believes her transformational style empowers teachers, and she uses it to provide teachers with autonomy to make their own choices and learn from mistakes.

Systemic Support

Systemic support refers to the way the district and school level connect to provide consistent, planned support. Systemic refers to the whole. Thus, in this case, the support

provided is not only provided for the research school but all schools. This support includes training, data access, people as resources, forums for shared understanding and a shared mission, vision and goals.

The data makes very clear that teachers should have the opportunity to attend Solution Tree summits if they feel they need this training. This summit serves to introduce teachers to the fundamental beliefs the district holds about the PLC process and PLC work. It is from this group that the big four questions that teachers should be asking in their PLC time derived: What do we want students to learn? How will we know if they have learned it? What will we do if they do not learn? What will we do if they already know it? Many teachers referred to these questions as part of their PLC process.

The district also has a shared mission, vision and values statement. Within that statement, it states, "We will maximize learning by making data-driven decisions." The statement continues to clarify that as a district, scientifically researched best practices and multiple learning opportunities for students are valued. Thus, this district statement serves to communicate this belief to all stakeholders.

A third systemic support effort was the mentor program. This program pairs new teachers, or new to the district teachers, with an experienced mentor. This person works together with their mentee to offer whatever support they can. Ms. Simms noted that she attended a PLC summit with her mentee. Ms. Camp discussed having a mentor that supported her through questions and feedback in her first year. This program offers teachers support, that while it may not be data specific, new teachers can ask questions if needed.

The district provides support through data access. The district provides access to all online assessments, such as the WYTOPP and Star. They also provide a place online through the campus program, Infinite Campus, which allows teachers to view data. While it is not evident from interviews what this entailed concerning data presentation, several teachers mentioned this.

The PD director mentioned two district-wide venues where principals and teachers could express concerns. The first was the academic councils, both elementary and secondary. He expressed that PLC discussion was a standing line item on the agenda for these meetings. Also, the director holds leadership team meetings with all principals. Leadership team meeting also had a PLC line item. These two forums support data use and altering instruction because the attendees can ask questions or express concerns at these meetings.

The final systemic support piece is that of human resources. Interviewees mentioned a multitude of resources as potential support. It is important to note that while available, not all teachers availed themselves of these, as noted in the section that discusses inhibiting factors for data use. The PD director himself is a resource. He noted he has data team training from the International Center for Leadership in Education and their training with data teams is phenomenal. Also, Dr. James and Ms. Ford mentioned Mr. Huckfeldt (Pseudonym), the district data analyst. Dr. James shared that he is brilliant and, “Could tell you what you could believe is true or probably shouldn't believe is true about any data set that you could put in front of him. He's that adept at making sense of data.” The district also provided content area coordinators that teachers can contact at any time. Thus, there are human resources

for teachers to utilize in their efforts to build their capacity to use data effectively and alter instruction accordingly.

School-Based Resources

Some resources teachers found supportive were based just at the research site. First, the most significant resource accessed by teachers was each other. When asked whom they would go to for content, instruction or data support, the overwhelming response was colleagues in the building, including the principal. Ms. Camp also mentioned the technology instructor. Ms. Baird also specifically noted a teacher who had expertise in data interpretation. Thus teachers went to those in which they respected their expertise. Some teachers mentioned instructional coaches but explained that this had become a limited resource as they were no longer readily available. However, at least four teachers in this building had been instructional coaches, and other teachers respected them for their knowledge and expertise. Thus, the most significant resource in the study site was the teachers themselves.

Expectations

According to Wells and Feun (2013), high expectations increased the likelihood of teachers using data to assess their instructional effectiveness and make a change. Several expectations for data use were evident at the research site. At the district level, teachers were expected to engage in PLC work as described by the Dufour's. This work included using the four data questions described in the systemic support section. The data use expectation at the district level was that all teachers must be assessing students with the Star test and using CFA's for the short cycle of PLC work. When asked the question,

how did you learn to integrate curriculum, instruction, assessment, and data? Ms. Miller stated, “I've never worked in a building that that wasn't expected. You know, you were supposed to be – you were supposed to teach the curriculum. You were supposed to look at your assessments to know what they got or what they didn't get. What are you going to reteach? Where do you go from there?" The PD director, when asked what the expectations were, he stated that teachers were expected to be "in the work" and shared that he has also communicated to leaders what PLC work should look like and what it should not. Thus, there is an expectation to use data and integrate curriculum, instruction, and assessment.

At the building level, teachers are expected to test frequently using the Star assess, and then report on a building-wide excel sheet, how the teachers are helping students falling below the 40th percentile. Ms. Lund said that the teams are expected to do monthly reviews on this data. Regarding PLC work, the principal asked each team to set norms together, turn in PLC notes, and meet regularly. During this research period, teachers met weekly. Teachers are also given time during staff meetings, 3-4 times a year according to the principal, to look at a PLC rubric. They score themselves and set goals based on this rubric. These are the building level expectations that exist to support data use and instructional change.

Beliefs

The communicated beliefs of the principal and the beliefs of teachers as they center around data use, affect what data gets used and how. Thus, I wanted to elicit the

beliefs of those at the study site. There were many beliefs held by interviewees that were supportive of data use.

First, teachers believed they needed to use data, and that data use did lead to making them better teachers. While summative data is essential, teachers felt they could view data in different ways, not just numbers. Ms. Manning added that they rely heavily on the data that they gather daily to alter instruction, such as conferring and conversations. Daily data exposes more student thinking. Put another way, Ms. Simms added that data tells where a student's head is. Ms. Baird added that they did not want to "put all their eggs in one basket" meaning they wanted to use multiple data points to define how students were performing. During observation, the third-grade team demonstrated this belief. They often spent time looking at the whole child. How was he performing in other classrooms? Who were his friends? What did the parents have to say? They were looking at the whole child. Another belief is that all kids are learners and that the teams must support all kids. The principal added several beliefs as well. She believed that a building must have a positive culture and celebrate the "quick wins." She believed that Star is necessary, but other assessments during short cycle PLC work are essential. Thus, the beliefs of teachers shaped their daily activities as well as what type of activities they chose to do to gather data.

Much like inhibitors, the factors that support data use are wide-ranging as well. These factors move beyond the apparent work within a PLC, to external supports such as having resources to go to or being able to attend outside PD. When studying the

relationships of these inhibitors and supports, patterns and relationships begin to emerge that shows how all factors influence one another.

Patterns, Relationships, and Themes

An important part of this research was studying the patterns, relationships and themes that occurred. The patterns gave an overall sense of participant perspectives and helped to identify recurring perspectives. The identification of relationships generated an understanding about the interactions between data and the purpose for data, as well as the interactions between teachers in the study environment. Finally, the themes provide a broader picture of what factors proved to be the most important when building a foundation for building a learning community that can use data to alter instruction. These themes make clear what the inhibiting or supporting factors may be when teachers are attempting to use data to make instructional change. Thus, answering the research question about what inhibits and supports data use for making decisions about altering instruction. This results are relevant to the research as the descriptions generate a picture of overall patterns, relationships and themes that were found and provide a summative picture of this data.

Patterns

There were several patterns noted while analyzing the data in this research. The research found that when framing these observations around the research questions, patterns existed about what may inhibit data use or support it, thus allowing teachers to alter instruction. All teachers in the research believed data was valuable. When asked what data best-supported student thinking, most teachers, the principal and the PD

director noted that it was the formative data, such as observation and common formative assessments that allowed teachers to see the clear thinking of students and change instruction quickly. Teachers in the study had a variety of training but had not had a great deal of the same training, aside from the PLC summit, a national conference. Training on common formative assessments lacked for many teachers. Their confidence and ability in themselves and these assessments were limited, which fell contrary to teachers' beliefs that this was a great tool to use to make an instructional change. Some teachers noted time was an issue in creating, using and analyzing these assessments. Another constant factor shared by teachers is that data was only a piece of understanding a child. There was a strong emphasis that multiple aspects of a child must be considered. Thus, a whole child approach was commonly taken. Finally, teachers and the principal made an overwhelming reference to relationships and relational trust. These teachers relied strongly on one another. These patterns will be described further through relationships and themes.

Relationships

The coding process revealed several relationships. First, there was a relationship between the type of data used and how it affected the kind of action taken. For example, often, behavioral data often dictated a student’s placement in another class. However, a shift to a new intervention group was a combination of observational data and Star data. There was also a relationship between the PLC as a venue and spending time together, even beyond the PLC, to get to know students well. This in-depth knowledge of students generated a variety of data to make decisions regarding the whole-child. Furthermore, it

was evident that conversation created knowledge and shared expertise that can affect the capacity of teachers to make instructional decisions. The time to interact and talk is thus an essential piece to the PLC process; however, it often occurred outside formal PLC time. As described more fully in the themes, trust is essential for teachers to be willing to share knowledge and expertise, as well as students. Regarding data, teachers noted a healthy relationship between formative data and the ability to understand student thinking to alter instruction. When there were good relationships between people, teachers felt an increase in accountability. One teacher said that data was not always related to the change in instruction. Sometimes, it was just the conversation between teachers and sharing what they know and understand. Several teachers noted a relationship between compliance, such as entering grades in the grade book, and the quality of assessments. The following themes explore data use more fully.

Themes

Several themes emerged as a result of my study. These themes include how beliefs shape data use, the importance of relationships, the role played by leadership, the need for data literacy, and the benefits of contextual learning. I will first explore the beliefs teachers have about data and the effect these beliefs have on data use.

Theme 1: Beliefs Shape Data Use

Teachers use data based on individual beliefs about data. A teacher's approach to students and student understanding can shape whether data is valued and what type is valued. Mr. Mills shared that data is appreciated when it's the right tool for the right job. For example, if you want to know if students understand author’s purpose, as CFA is the

right tool. If you want a holistic view of how a child is doing, you will assess using Star. Ms. Miller referred to this assessing purposefully. Several teachers added that numeric and observational data serve each other well in how teachers can see if there is a correlation. Teachers gave great value to CFAs and formative data for accessing student thinking and making an instructional change. Ms. Ford shared that formative is quick and "in the moment" and allows you to be quicker in your instructional response. CFAs access student thinking, which is important to make an instructional change, but must be meaningful, not just to put a grade in the grade book. The principal added that it was this ongoing data piece of formative assessment that was being communicated to principals at the principal's meetings as the focus of PLC conversations. In addition to formative assessment as a strong piece of data, teachers also value when the assessments match instruction. Tammy shared that this allows teachers to say, "So you've received instruction. Did you learn or not learn from that instruction? If so, what is next, if not, also what is next?" Finally, many teachers also mentioned knowing the whole child, from who their friends are to knowing the parents and learning the child's background. The principal added the importance of making connections and developing meaningful relationships.

The second part of this theme derived from the data is what the teachers believed data was. Data was not just numbers but conferring and having conversations with kids. Ms. Lund added that it is daily check-ins, turn and talks, share-outs. Also, it's necessary to have different types of data, such as instructional, or behavioral. This multitude of

information helps to get to the root of why they are not growing. The findings section discussed in detail the type of data teachers used in this study.

Cleary, beliefs can affect data use. The teachers believed that data is essential to drive instruction but firmly believed in the formative day-to-day data as key to accessing student thinking. These teachers also unveiled their mental models about what data was. It was not just numbers, but conversations and relationships. Thus, another critical theme discovered in this research is about relationships.

Theme 2: Relationships

Relationships were an overwhelming emerging theme in this research. However, relationships occurred at multiple levels: relationships, networking, and resources. There were many levels of relationships and relational trust. These include teacher to teacher, teacher to principal, principal to principal and district to principal and teacher. Multiple interview answers mentioned the word trust in many different scenarios. The interviews revealed trust as an important component of a teacher's ability to alter instruction. Teachers identified the need to trust one another to be open about data, be reflective and honest about their instructional practice, to challenge one another, and to buy-in to what principal and district leaders were asking them to do.

Teachers and the principal alike shared that when there is a trustful environment, it can open opportunities for improved instructional practices. This trusting environment is vital to this research because if a teacher team is going to use data for instructional change, they must understand how to change instruction. First, teachers shared, when asked whom they went to for support for content, data or instructional support, a leading

answer was each other. They also indicated coaches, the principal, people from other buildings, or coordinators. Ms. Baird shared it was not until she got brave enough and got to know people, that she was willing to reach out. Teachers indicated that within their PLC teams, trust allowed for an increase in shared expertise. Teachers opened up about instructional practices and made practice explicit. Ms. Lock stated that teachers became more willing to ask each other what they were doing in their instruction to have success. Within that, Ms. Manning suggested that PLC conversation then allowed for honest reflection about practices and whether they were working or not. Another teacher noted that she felt she could trust her team to share frustrations and challenges in instruction. Peers could give authentic feedback in this trusting environment. A question posed to teachers was about challenging each other's assumptions. Teachers noted that they didn't always agree with a colleague's ideas but were willing to allow each other to try new things and share how it went. Ms. Camp added she does not feel threatened when someone disagrees with her because of the environment her team has built. Mr. Mills noted that when teachers do not trust each other, and it takes time, it is difficult to have those tough conversations or give feedback. The principal acknowledges that trust is essential to create an "ours" mentality vs. mine and yours and recognizes there must be safe in sharing. Finally, Mr. Mills added that this trust must extend to a district level. For example, if teachers are expected to use and generate CFAs, there must be support for this creation and implementation. When asked to do something without help, Mr. Mills contends it causes a lack of trust. The principal also suggested the need for trust between principals to have the same kind of conversations as teachers have, in a safe space. Thus,

a sense of trust between school teams can significantly alter the conversations that allow teachers to use knowledge to make an instructional change.

In conjunction with trust, relationships are stronger when teachers understand each other beyond professional interactions. These teachers often ate lunch together, had conversations before and after school about each day's learning, and spent the time to learn about each other. Several teachers noted that when they built relationships, they had increased accountability. Ms. Simms pointed out that when they got to know each other better, "We're more focused in where we're headed with our questioning in our data. It's not as broad of trying to figure out where our kids are at and where each other's heads are at." Ms. Manning stated that teachers feel more comfortable in sharing student work, which can help teachers create a better understanding of expected outcomes. Many teachers suggested that good relationships assisted in knowing who to reach out to for help with content, instruction or data support. Relationships built on trust opens up the conversation. Teachers felt safe to share data and practice. Teachers were willing to share students because they became more evident on beliefs and what other teachers are doing instructionally. This sharing generated another opportunity for altering instruction. Teacher relationships and trust open up the chance to make changes in teaching. It also allows professionals to learn whom they can connect with for expertise.

The connections professionals were making, for the sake of this research, will be referred to as networking. Networking was a prominent theme that emerged. Teachers needed the opportunity to communicate with each other, other teachers in the building, and other teachers in the district. However, it is also clear that this networking must work

from the district level down to the teacher as well. As shared by the PD director, there are resources that teachers are not utilizing in the district, whether it is personal or training opportunities. Teachers cannot use resources if there is not an awareness of the resources. Thus, a piece of networking is excellent communication. The PD direct noted the principal serves as a conduit for communication between the district and teachers. However, the research data was not able to conclude why some communication didn't exist. The principal did indicate her efforts to increase networking between teachers in the upcoming year by intentionally planning neighborhood PLCs, which would combine grade levels. Many teachers, as well as the principal, wished for more opportunities to meet with other grade levels or principals.

Resources that can extend a teacher's understanding of how to use data and make an instructional change. When teachers have healthy relationships, in which they understand strengths and weaknesses, they have an increased understanding of where to go for help. When teachers reach out, they can tap into another individual's expertise. One type of expertise that teachers found helpful in this study was when, as a new teacher, they had a mentor. This mentor allowed a safe space to go for individual help and feedback on instruction. The professional director believed that a limitation to teachers using some in district resources, such as personnel, was the concept of internal expertise. He noted that often he thinks people do not consider someone an expert if they are not more than 45 miles from home. Because resources are critical to increased teacher understanding and expertise, and teachers must know about these resources, this section includes resources as part of relationships. As Ms. Manning stated about influential

principals, “They knew the power of making connections with people would move people forward.” Because of the full cycle and connected nature of curriculum, instruction, and assessment, it seems necessary to think about all the support resources available to increase teacher success as this process influences how teachers arrive at assessment data in the first place.

Theme 3: Leadership

Another common theme in this research is the influence of leadership. The interviews explored what type of leadership and the actions of the principal that influenced the PLC team’s ability to use data to alter instruction. The identified leadership style was that of a transformational leader. The principal described her efforts as sitting back, letting others lead the conversation, listening and learning, and stepping in to facilitate as needed. The principal added that this style is essential for supporting PLC teams because it causes them to find strength in each other and coach each other’s needs. Thus, how a principal leads can build teacher efficacy.

Contributions that were made by the principal, beyond just her leadership style, added to the ability of teachers to work effectively in teams, thus generating data use and altered instruction. The principal at this site provided several support pieces, such as a template for the PLC. This template included a section that asked teachers to reflect on data. The teachers were given a rubric on effective PLCs that they used to reflect on their practice and set goals. The principal expected teachers to take notes, establish norms, and in one instance, gave support for norm building. As evidenced by both teachers and the principal, modeling about expectations occurred through conversations, feedback on PLC

notes, and by example in whole staff meetings. One type of modeling was to show that it was okay to fail and learn. The principal defined it as creating a safe space. Finally, the teachers completed their team evaluations of their PLC process, which allowed teachers to have ownership of their own PLC process for improvement. While most of these efforts support the PLC process, it is this process that generates a competent team that can use data and makes informed decisions.

Theme 4: Data Literacy

Begin with a clear topic sentence for this section setting up the theme. And capturing what the overall theme is. The PD director at this study site shared that to do proper PLC work, that involves making a new decision, you must be able to understand what the data is telling you. In other words, a teacher must have data literacy. However, both teachers and the PD director indicated that this was an area of need.

Teachers need two levels of data literacy support. They needed that which deals with numeric data and that which deals with formative data. As far as numeric data, teachers indicated a need to understand the reports that they can generate from the Star test. Also, an observation of the third-grade team revealed that teachers were uncertain about which part of the data is most important, such as the percentage or scale score. Another observation with the fifth-grade group made apparent the need for a greater understanding of what a reasonable growth indicator was. The team lead on this day explained that a child who started at 50% and ended at 50% had made a year's growth. Thus, the lead was clarifying what the data meant to this teacher. The PD director noted

that when teachers do not understand this data, they merely report out scores to parents but do not know what the score means.

Another factor that inhibits teacher use of data is the ability to create and use CFAs, even though this would appear to be the expected data that should be a critical piece in PLC work. Teachers felt they had had very little training, needed support in identifying targets and what proficiency looks like, how to write an assessment that aligns with expected outcomes and how to tell if an assessment is reliable or not. These teachers indicated that if data is to be used to make instructional decisions, an understanding of the data must be in place.

Theme 5: Contextual Learning

Begin with a clear topic sentence for this section setting up the theme. Teachers shared some specific ways that learning new information was important to them. They noted that it needed to be in the context of the school or district environment or in the context of the data they were being expected to use. For example, many teachers stated that they would like to be able to work more with same grade level teams across the district or to be able to go and watch other grade level PLC teams. On teacher indicated that working individually with a teacher who is active in an area would be beneficial. Another suggestion was to continue some of the work around observing each other during instruction. These observations have occurred at the research site, but teachers felt this process was beneficial. Ms. Baird gave a similar example of her experience at another school. First, her group took notes on the information presented. Then they partnered up and practiced the concepts learned, followed by practicing and observing

each other in the classroom and then providing feedback. The principal added that it was essential to slow down as a building and reflect on what was occurring through share-out time and leveraging some of the things the teachers are doing well. One teacher noted how crucial it was to her to have an internal expert on data, another teacher, come in and give them a visual of their data. Finally, several teachers suggested that while some information could come from outside conferences, such as the PLC summit, it often takes you out of your context. For example, Ms. Miller said something locally can make it more personal, such as what kind of data do you want us to look at and what might I get out of this data? The PD director added that our assessments are tailored very specifically to our state and district. Also, he conceded that there might be a need for different kinds of training. Thus, the need for contextual learning that can take place within the school or district was a common theme. The PD director even suggested that there is a building level obligation to grow PLCs and best practice at the school site.

Salient Data and Discrepant Cases

While the school action plan provided information on goals, the interviews revealed that teachers were not overly familiar with its contents. Thus, it was not possible to see any relationships between the plan and teacher decision making. Also, relationships were a critical theme in this research. It may have been beneficial to have a second round of interviews to explore relationships further. This may have created a clearer picture of how vital knowing each other on a personal level, rather than just professional, is to teachers. It might be important to note that in the field notes I wrote that this research took place in the last quarter of the school year. This timing may have

affected what was observed to some degree, as the teachers were winding down their year and spent some time on the end of year housekeeping items, such as class placement for the following year and summer school. However, these activities did provide some insight into what factors teachers considered for these types of placements.

Evidence of Quality

Multiple efforts were made to assure the accuracy of data through the study procedures. Triangulation occurred in several ways. First, three types of data were gathered. These included interviews, field notes through observation, and archival data in the form of the district mission, vision and values statement, as well as the study site action plan. The interviews came from three levels of professionals: teachers, the principal, and the district PD director. The field notes included a key to help with coding the observations, to increase the accuracy of where I was placing each action. I noted bias in the field notes, as well as reviewed the field notes after meetings to clarify the notes and assure clarity of the written information. An audio recording of the interviews took place, and I took notes of any potential themes or patterns shared during the interviews. After transcription, the interviews were compared a second time to the audio. This review allowed for the accuracy of the transcription. Each participant received a summary of the interview to read and check for accuracy, as well as to add to the interview if desired.

Summary

There were multiple pieces of evidence showing that teachers at the research site use data to alter instruction. However, there are varying perceptions of what constitutes data. While there are numeric data points teachers use, most teachers rely more on

formative data when making an instructional change. Furthermore, the teachers depend heavily on one another. Teachers reach out to each other, district personnel and teachers in other buildings for expertise. Thus, this study emphasized the importance of relationships. If teachers are to reach out, there must be a comfort level with one another to share practices and question each other explicitly. The questioning may also be to challenge the others thinking. A primary purpose of data use is to make changes in instruction. Teachers cannot make changes unless there is the capacity to do so. This study discovered that teachers most frequently make changes when a conversation occurs, and new ideas are generated. Thus, time for relationship building and the sharing of ideas must be present. It is the relationships and dialogue that are often shifting instruction. The PLC process is one venue for this dialogue to occur. To improve dialogue, the PLC process must be a strong one. For example, if teachers don't know new practice, a good open relationship with a conversation rich PLC can change this. In the conceptual framework, Ackoff (1989) contends that it is the combining the data with understanding and expertise, which can form actionable knowledge, and then using that knowledge to act. However, teachers need time to be in the conversation. Thus, there is an important connection between teacher relationships and the ability to use data and make an instructional change.

Teachers revealed that formative data, as well as common formative assessments, gave the most access to students and the most significant understanding of the whole child. However, teachers also frequently shared that the capacity to create reliable and valid common assessments didn't exist. Teachers referred to numeric data, such as Star,

to get a holistic view of student performance. However, the PD Director shared that teachers must know how to interpret this data to know precisely what the data is saying about a student. This often is not the case. Thus, data literacy was a critical inhibiting factor in this study.

The principal is a conduit that serves to create support for teacher effectiveness. First, the principal can intentionally work to build relationships in the building, as occurred at this study site. This individual can model risk-taking, which in turn creates trust and a safe environment. The principal can also model questioning and inquiry. Regarding resources, the leader can communicate what district resources are available to teachers. When district-level decisions are made, the principal can communicate the purpose, creating a greater sense of trust and buy-in. The principal role in this research was critical to the success of data use to alter instruction. Not only must the principal provide opportunities for the teachers to learn how to use data, but they must also communicate data expectations and resources clearly and model the expectations so that teachers feel safe to open up and take risks regarding data.

Section 3: The Project

Introduction

The project for this study was a white paper. The goals of this paper are to communicate the existing problem, present a summary of the findings, and explain what the research indicates related to these findings. Limitations and possible considerations to address these limitations will be given.

Rationale

A white paper is a venue to share knowledge and research on a topic. According to Malone and Wright (2018), white papers were originally used in marketing to identify a problem and offer a solution for it. In my study, it provides specific recommendations based on the findings in my research. Through the data analysis in my research I discovered how teachers are using data to alter instruction and what inhibitors and supporting factors exist, as perceived by teachers, when using data to alter and make changes in instruction. These findings prompted the literature review that informed my white paper. The literature review research focused on the themes that emerged and I consulted the research findings to outline my recommendations in the white paper.

Review of the Literature

Five themes emerged as a result of this research. These themes include (a) beliefs shape data use, (b) relationships, (c) leadership, (d) data literacy, and (e) contextual learning. A further literature review on these themes resulted in an understanding of the importance of these findings and the potential impact that can result for teachers in

professional learning communities, their leaders, and the district. I found relationships, leadership, data literacy and contextual learning as prevalent topics in the literature.

Focus on Relationships

The literature review and study at the local school site made it very evident that schools must attend to relationships. To adequately assess students using data and to open up all the instructional opportunities therein, relationships built on trust must exist (Zhang et al., 2016) Hence, I looked for literature about the importance of relationships and trust, but in addition, I sought to understand how this trust could be built at a school and district level.

There are many reasons trust must be created by leaders if teachers are to access their full potential when looking at data, making sense of it, and following with instructional action. Trust allows confidence in seeking out new information (Kalkan, 2015). Teachers are more likely to feel free to ask for help and share ideas if they trust one another (Ahn, 2017). This includes sharing student achievement, sharing students for instruction, and sharing ideas in a willingness to help all students (Hallam, Smith, Hite, Hite, & Willox, 2015) In the study by Hallam et al. (2015), trust opened up the willingness for teachers to observe one another resulting in deprivatized practice. When teachers begin to deprivatize practice, they tend to increase problem-solving conversations, which can lead to altered instruction (Hallam et al., 2015). Finally, trust opens up further collaboration beyond the PLC time. One teacher in the study stated, "I think collaboration is all day long. It is an environment" (Hallam et al., 2015, p. 206).

While trust and relationships are clearly impactful, it is essential to understand how leaders and teachers build these two concepts.

There are two levels at which this review addresses building relationships. The first is at a leader level and the second is the relationships built between teachers. While the research primarily refers to principals, those who lead principals can apply these strategies as well. The first area to be considered is networking and communication.

If leaders are to build trust among teachers or other stakeholders, there needs to be a clear line of communication (Balyer, Özcan, & Yildiz, 2016; Cherkowski, 2016). Clear communication builds trust. When leader actions are transparent, and there is constant communication, it enhances mutual understanding and collaboration (Zhang, et al., 2017). An example of this communication is to share the visions for the implementation of new programs or new plans (Ahn, 2017; Cherkowski, 2016). While clear communication is essential, there are some other leader characteristics that build trust in a school.

Teachers take the lead from their leaders. First, leader modeling impacts the view teachers have about risk-taking and using data that may expose their vulnerabilities. Leader role modeling involves demonstrating the skills and behaviors expected of teachers (Lancaster & Di Milia, 2015). It might be through an actual demonstration or a leader modeling through daily actions and conversations. One type of modeling found to be helpful by Zhang et al. (2017) was to "demonstrate and analyze authentic dialogue" (p. 233). School leaders can show teachers that conflicts are inevitable but have the potential for in-depth and meaningful interactions. Principal Robert, in a study by Cherkowski

(2016), modeled ongoing professional learning. He taught in an English class to model openness and willingness for feedback and suggestions. Robert stated, "Being mindful of one's own learning is an essential skill for principals wanting to lead a learning community" (p. 637). This principal also modeled instructional strategies, which can aid in giving teachers ideas for altering instruction. This modeling can be effective at multiple levels of leadership in a district. The leader's management style can also encourage trust.

Kalkan (2016) found that teachers trust the principal and colleagues most in the school. One way to build trust is to avoid top-down management and encourage shared decision making in the school (Hallam et al., 2015). Allowing shared decision making generates teacher empowerment (Balyer et al., 2016). Teachers want to be a part of the decision-making process (Lancaster & Di Milia, 2015) and have autonomy to make some of their own decisions (Ahn, 2017). This type of distributive leadership allows the teacher to take the initiative in teaching and learning, which gives them the decisional power to make instructional decisions relative to data (Zhang et al., 2017). Ahn (2017) found that when teachers generate the new ideas, there is more buy-in. Ahn refers to this as "voluntary will," (p. 86). The work of Ahn parallels Cherkowski's (2016) finding from Principal Robert that allowing teacher decision making results in teachers feeling involved, valued, and important. Teacher decision making can also be called teacher autonomy. Autonomy allows teachers to self-reflect, set goals, and make decisions that are a good fit for the team (Hallam et al., 2015). At times, the decisions may lead to failure. However, Zhang et al. (2017) claimed that failure can lead to learning. In order

for teachers to be willing to try new ideas, it is crucial for the leader not to place too much emphasis on accountability. The principal also should avoid micromanagement, which suppresses critical thinking and innovation (Zhang et al., 2017). Thus, the management style of the leader can influence how teachers trust, interact, and feel empowered. Further findings also indicate that how a principal's interactions with teachers can build trust.

When a principal is available, it impacts trust. The principal who listens, values opinions, and understands how sharing can expose a teacher's vulnerabilities (Hallam et al., 2015) will have teachers who know the principal is available to talk and share struggles and issues (Lancaster & Di Milia, 2015; Balyer et al., 2016). In other words, they are in tune with what is happening with teachers (Cherkowski, 2016). The principal who is aware of what is happening with teachers can also determine when they are asking teachers to do too much. Hallam et al., (2015), cautions that teacher overload leads to mistrust. Not only must a leader attend to interactions with teachers, but the leader must also be intentional with relationship building between teachers. Principals build relationships by creating a set of shared experiences for teachers (Lancaster & Di Milia, 2015). Balyer et al. (2016) call relationship-building social attractiveness. Principals in this study intentionally organized social activities to create better communication, trust, and social attractiveness. Teachers need the opportunity for mutual sharing of teaching to build relationships (Zhang et al., 2017). The time spent together can be personal and job-related. Hallam et al., (2015) states that teachers need time to share personal pieces of their lives, such as family events, personal interests, and other aspects. The leader can

also ensure relationship building by protecting time allotted for discussion of teaching and learning (Cherkowski, 2016). Finally, the physical arrangement of the school can encourage relationships by making sure that teachers have physical access to one another (Ahn, 2017). The principal is not the only one who can make intentional efforts to build relationships and trust. The literature suggests ways in which teachers can also be deliberate in relationship building.

Teachers can build trust by listening carefully to the complete thoughts of their colleagues (Hallam et al., 2015; Cherkowski, 2016). When benevolent and open, teachers allow colleagues to feel safe to share struggles and successes. Teachers must be able to openly express themselves to generate dialogue (Zhang et al., 2017). Ahn (2017) suggests that casual conversation is the gateway to building trust. A safe environment allows the teacher to share failure, uneducated questions, and to have views contrary to their colleagues without being afraid (Lancaster & Di Milia, 2015). In other words, it allows for difficult conversations that move learning forward (Cherkowski, 2016). Finally, teachers build trust by avoiding telling others what they should do (Ahn, 2017). These findings provide teachers with an understanding of what they can do to build trust with their colleagues.

The research makes it clear that if teachers are to use data to alter instruction, there exists a need to make sure relationships are strong. Data alone cannot cause instructional change. The interaction of individuals to make meaning of data and share instructional practice to create sound actions for instruction is imperative. Teachers who

trust one another and their leaders are more likely to use their full capacity (Kalkan, 2016).

Build Data and Assessment Literacy

The study at the research site provided evidence that there is a need for data literacy training. However, the literature reveals two types of training that may be necessary. These include assessment literacy and data literacy. Assessment literacy is defined by Mertler (2003) as "the readiness of a teacher to design, implement, and discuss the assessment strategies, measurement tools, evaluation criteria, decision making milestones, as well as formative and summative tests" (as cited in Mellati & Khademi, 2018, p. 2**)**. However, the local study showed that support should be given to teach how to interpret data accurately and understand what it really tells about a student. This ability is considered data literacy, defined as "the ability to transform information into actionable instructional knowledge and practices by collecting, analyzing, and interpreting all types of data" (Gummer & Mandinach, 2015, p. 2). While it is apparent in the research results that teachers were not feeling confident in these two types of literacy, the literature review also suggests why it is essential for teachers to have both data and assessment literacy.

When teachers have both data and assessment literacy, it results in many benefits in instructional practice. First, if teachers want to know if the pedagogy and curriculum materials are effective, assessment knowledge affords this (Mellati & Khademi, 2018**)**. Mellati and Khademi (2018) also found that literate instructors gave feedback more readily, used a variety of assessments in a less intrusive way, considered what student

interests were, and spent more time interacting with learners. Teachers who were not confident in assessment literacy tended to take a more traditional approach. These assessment illiterate teachers also tended to place blame on poor student performance elsewhere (Mellati & Khademi, 2018**)** and were less reflective (Ashraf & Zolfaghari, 2018). Thus, the benefits of ensuring teachers have assessment and data literacy are numerous.

Data and assessment literacy provide important skills to teachers. Despite this, the research shows that the data level of teachers, in general, is low (Schildkamp, Poortman & Handelzalts, 2016) and teachers do not have the skills to construct their own tests (Yan & Cheng, 2015). Through a collaborative approach, teachers need to develop and increase their data and assessment literacy (LaPointe-McEwan, DeLuca, Klinger, 2017). It is not only crucial for teachers, but principals and other leaders need to possess these skills as well (LaPointe-McEwan, DeLuca, Klinger, 2017).

Many studies have been done to see how data and assessment literacy skills can be improved and have included intentional intervention programs (Ebbeler, Poortman, Schildkamp & Pieters, 2017; Zhang & Wong, 2017). In one study, pre-service teachers were taught data literacy through a data chat (Carey, Grainger & Christie, 2017). Teachers were engaged in using real data to learn how to analyze, assess and act. Their confidence to read and interpret data increased and they were able to use data to alter instruction (Dunlap and Piro, 2016). A second study used an external data coach too, and teachers worked collaboratively using the data from their classrooms (Ebbeler, Poortman, Schildkamp & Pieters, 2017). Kippers et al., (2017) conducted an intervention in which

the leaders, teachers and a data expert worked together to solve a problem of practice at the school site. The results of Kippers et al's study were an increase in attitudes about data use and data-based decision making. In an Australian case study, the college prepared in-service teachers for data use by having them take a data literacy course and then following that with a five-week professional experience in a local school (Carey, Grainger & Christie, 2017). The preservice teachers showed an increase in data use confidence (Carey, Grainger, Christie, 2018). These studies are an example of interventions schools have conducted and the positive results that occur.

First, Lapointe-McEwan, et al., (2017) note the importance administration must place on the all data, including qualitative classroom data. This study found it critical to include qualitative classroom data, as well as quantitative, and that leaders communicate this message to teachers. Also, literacy instruction should use the teachers own data to inform their learning, as this will help them engage with the data and learning in a meaningful way (Lapointe-McEwan, et al., 2017). In addition to knowledge about data, teachers also need time to develop their content and instructional pedagogy (Mellati & Khademi, 2018). The curriculum, instruction and assessment piece must be viewed cohesively (Mellati & Khademi, 2018). Finally, Lapointe-McEwan, DeLuca, and Klinger (2017) added that outside expertise helped teachers engage in the learning purposely. There is a need for increased levels of teacher literacy regarding data. The next section will more clearly explain what the literature reveals pertaining to teacher buy-in and understanding.

Contextual Learning

Contextual learning includes learning which takes place within the school environment and is found to be highly effective for teachers (Lund, 2018). The research study at the local site suggested a need for PD that would support data use and understanding, with both assessment literacy and data literacy. Teachers felt that time to develop these skills at a school and district level could be beneficial. The literature review suggests that there are many advantages to offering building-based PD.

While teachers can learn about teaching and learning from outside entities, they must have time to spend within their practice as well (Lund, 2018). First, when teacher work and learn in teams, they create shared understanding, have timely discussions to address instructional issues effectively, help share the responsibilities, provide shared expertise, and bring new instructional ideas for altering lessons (Gao & Wang, 2014). Working in teams can help teachers narrow in on a problem of practice. For example, in a study by Lund (2018), the group wanted to improve interpersonal communication with students. The team had in-service training, but also took advantage of the opportunity to observe one another with a focus on interpersonal interaction. This practice had the added benefit of making teacher beliefs more transparent.

Horn et al., (2017) conducted a study in which the researcher has studied teacher interactions during team meetings. They learned that site-based teacher team boosts teacher engagement with new instructional practice. Many types of conversations existed, from those that merely focus on pacing to those that analyzed student work to understand misconceptions and discuss how to attend to these instructionally. The researcher referred

to these as collective interpretation meetings. The most involved of these led to instructional change, although not all did. In these high depth meetings, there was dialogic discourse exchange among multiple participants, addressing of problems of practice, troubleshooting, and addressing of future work.

Several studies revealed the advantages of school-based PD. The first was a study in Israel in which school improvement was part of a reform movement (Avidov-Ungar, 2016). While there were two areas of focus, one was school-based PD. Since it was a reform, the initiative took a top-down approach with the workshops conducted by an external expert. However, the principal decided on presentation topics. This PD was to enable the school to meet their own personal needs, which would result in uniform pedagogical language and engage teachers in collaborative learning. When the teachers in this study learned in this way, they were able to construct a new language together. This example is the first of several advantages found with school-based PD (Avidov-Ungar, 2016). The second study was a case-comparison study of two schools provided support for contextual PD (Zhang & Wong, 2017). One school leader led in a top-down manner and the other centered more on the needs of the teachers. In the traditional setting, the focus was more on accountability. Thus, teachers were less likely to focus on improvement, but rather, focused on doing well on the test. In the teacher-centered approach, school-based learning occurred to work on instruction and an inquiry approach was used. This research showed teachers should not just be in a lecture style PD, but rather an interactive one that allows for them to make meaning together. According to Zhang and Wong (2017), when teachers were allowed freedom to experiment with new

learning, they could create their own understanding behind why certain instructional practices worked or did not work. The teachers in the study by Zhang and Wong (2017) did use the support of external experts and leaders and it was found that teachers need professional resources and leader support for innovation (Zhang & Wong, 2018). A final study by Gao and Wang (2014) showed that curriculum and assessment requirements alone could not change instruction. Similarly, providing classes and district level support alone, did not change instruction either. However, just providing classes and district level support did not either. When leaders combined classes and district level support with a positive teacher team that discussed, generated ideas and reflected, the move to inquiry occurred (Gao & Wang, 2014). This study also showed the importance of alignment to curriculum and instruction. Thus, there are many benefits to school-based PD. However, according to the literature, if school-based PD is to be successful, some characteristics must be considered.

An initial consideration is that teachers should have an active part in the planning of PD so that it is relevant and supports teachers through empowerment. Teachers must remain involved through to the evaluation portion of the PD (Avidov-Ungar, 2016). The goals and objectives of PD should be communicated clearly and be created with the participants to generate meaning, motivation and a sense of achievement (Avidov-Ungar, 2016). They should also be measurable (Avidov-Ungar, 2016). The PD should also include collaboration and reflection (Ebbeler, Poortman, Schildkamp & Petiers, 2017). Teachers must collaborate, use a problem of practice from their own context, and use a concrete and explicit set of steps during data analysis (Ebbeler, Poortman, Schildkamp &

Petiers, 2017). After learning, a study by Zhang and Wong (2018) noted that teachers must be able to experiment with new ideas in order to synthesize new learning. Teachers also need time to explore and reflect. Lapointe-McEwan et al., (2017) discovered that using experts to support the learning creates learning that is directed and purposeful. Leaders may also generate successful PD when an outside data coach works with teachers using data from their own context (Ebbeler, Poortman, Schildkamp & Peters, 2017). Zhang et al. (2017) also supported the use of external experts. Finally, one study suggested the benefit of finding ways to bring current research to teachers, as opposed to teachers seeking out the research. This recommendation was a result of the time it takes for teachers to do so (Lapointe-McEwan, DeLuca, Klinger, 2017). The research suggests many ways to make internal PD successful and provide the most benefit to teachers.

The project for this study is a position paper or white paper. This genre is appropriate for this study as it provides recommendations to the research district and leaders. This paper will summarize the problem investigated, how it was investigated, the findings and recommendations, based upon an additional literature review. The district PD director, as well as the local principal who took part in the study and allowed the research to occur at the school are the recipients of this paper. The principal may choose to share it with the teachers involved in the study. The paper may have the potential to be shared in other venues as well. In particular, the district director may wish to present the paper to principals at the leadership or academic councils. This will be up to the discretion of the PD director.

The search for this literature was conducted using the general themes that emerged as the topic areas explored in the review. Those themes were that beliefs shape data use, relationships, data literacy, and contextual learning. These were used as the primary search terms. Trust was paralleled with relationships in most research, so was also used as a search term. When an article proved to have relevant research, the reference list in the back gave further research on the topic, provided it was within the last five years. An additional search, as it was mentioned often in the interviews, was modeling. However, when this term was used, it revealed little information. Instead, the importance of modeling was revealed through literature on effective leadership. Each topic was researched with the purpose of determining the impact of the practice, as well as the benefits. Thus, the review provided evidence to be used in the final recommendations within the white paper.

Project Description

The resources to support this project are very limited. Upon final approval of this study, a copy of the white paper will be made and shared with the principal and district PD director. I will provide the opportunity for follow-up questions that these two entities may have. In that case, the resource needed will be time, so that a meeting can be scheduled, and questions can be answered. It is important to note a limit for the recommendations of this paper is the narrow scope of the research. While this was a thorough investigation of the study site, it was only one site. The PD director will likely want to gather further evidence of teacher needs, prior to considering the recommendations regarding contextual learning and data and assessment literacy. A

potential solution to this would be to conduct a brief survey asking teachers and principals of what the perceived needs are in regard to data and assessment literacy.

The timeline for this project is simple. The paper will be presented within a month of when I receive a doctoral degree. Any follow-up, requested by the involved parties, can be any time during the 18-19 school year. The evaluation questionnaire will be given to the principal and director at the same time as the white paper.

The roles and responsibilities of others involved in this project are straightforward. Those that are given the position paper will be asked to read it and ask any follow-up questions they have. These individuals are also welcomed to set up a time to meet to see if there are follow-up questions or clarifications. Finally, they will be asked to fill out a brief questionnaire.

Project Evaluation Plan

A simple, formative questionnaire will be shared with participants. The set of questions is intentionally open-ended. Decorte et al., (2019), found that the use of open-ended questions allowed the participants to be open with their comments. They could vent feelings and indicate if the targeted participants approved the study and found value in it. This questionnaire in my study will seek to provide feedback for the helpfulness of the project and whether there are remaining questions that I can potentially answer. The purpose for this approach is to allow opportunity for participants to provide me with feedback. This feedback may have implications for further research. In addition, it offers insight into whether this type of research is beneficial for the district involved. Finally,

the evaluation provides the recipients a chance to voice the effectiveness of the research and to ask any unanswered questions.

The goals for this project are to provide information to the participating parties. This study took an in-depth look of what data teachers are using, decisions made as a result of the data, and what practices teachers and leaders perceived to be supporting and inhibiting the process. It is difficult for those stakeholders impacted to have the knowledge or the time to conduct this type of research. The goal of the evaluation will be to discover if this research was helpful and to discover what other research may need to be conducted.

The key stakeholders in this project are the district and school leaders, as well as teachers in the district. However, the influence of the project ultimately extends to students, as student achievement is the sole reason for conducting the research at hand.

Project Implications

This research delves deeply into the interactions and relationships of teachers. When teachers and other leaders interact in new ways, it can lead to new results for students. This research provides ways in which to enhance the interactions and understandings of teachers and leaders, by showing ways to build common understandings and language between educational participants. In addition, it shows how leaders can empower teachers to be innovative and creative and inspire this change.

When teachers move out of a role of isolation, and become creative and innovative, the possibility of making an impact on all learners increases. becomes important to all stakeholders as new ideas and learning increase success for all. This

approach has the potential to create social change by closing the equity gap and make learning accessible to all.

Section 4: Reflections and Conclusions

A reflection on the research process concludes this study. This reflection includes the project's strengths and limitations, recommendations, the impact of the research process on myself as a scholar, the importance of this research, and implications for change on the topic of study and what future research might occur.

Project Strengths and Limitations

This project yields some very specific information for those seeking to improve data use and instructional change. Because it is a case study, the data collected provides insight that is descriptive and specific to the location. Multiple pieces of data were gathered from multiple levels, providing for a clear picture of how data is being used to alter instruction. In addition, it offers an inside look at the perceptions of participants about what hinders data use for altered instruction. The behaviors that support the use of data can be celebrated and continued. The suggested recommendations are not specific in nature and can be applied across contexts, in this way being generalizable. Those reading this project can make changes that are deemed most appropriate for the level at which it applies, such as school or district.

A limitation to this project is the limited number of people it may impact, depending upon how it is used. Also, the study that led to the literature review was only a single case study. This may make the results less generalizable without further research or understanding.

Recommendations for Alternative Approaches

While the initial problem regarded a gap in practice of teachers having numerical and observational data and using that data to make instructional change, another problem was apparent. Teachers often did not have the training needed to use data for making instructional change. Therefore, an alternative definition of this problem could be that teachers do not always have the training needed to use data to alter instruction. Thus, an alternative approach to this project could have been a PD plan targeted for either the building level or district level. Research suggests that contextual PD is valuable as it allows for timely discussions and a focus on problems of practice at the school site (Gao & Wang, 2014). Avidov-Ungar (2016) added that contextual PD allowed for teachers to build understanding together. The PD program could include goal setting, utilizing an expert, and considering the characteristics that were found to be important to school-based PD. A generically outlined plan allows for each school to consider the characteristics without having to conform to a district plan and instead setting needs-based goals. At a district level, the PD director could choose to share at leadership team meetings, choosing from those concepts indicated as important by the principals. For example, the PD director may choose what was learned about modeling and do some actual modeling of data with the principals at the principal meeting. The director may also lead this PD and other team meetings through example, much like the leadership recommendations in the project. PD can be a useful approach, but for this project, sharing the results and recommendations in a white paper was my preferred approach.

Scholarship, Project Development and Evaluation, and Leadership and Change

The processes used in a doctoral study helped me learn a new way of thinking. I learned to question assumptions in new ways and to explore where personal and group beliefs originated. In terms of the processes that are specific to the research and development of the project, I have learned to keep out opinions and jargon. I know that my research must be reliable, and when ideas are included in the writing, there must be a citation to give credit for the idea. The project process made me aware of the responsibility that comes with providing a recommendation. Recommendations must be based on prior research and not on individual beliefs. It has become significant for me to be a moral researcher with mindful intentions. As a result of this study, I have a heightened awareness of the decisions being made in my professional life and am able to see the theoretical foundations that lead to certain decisions. I am able to recognize the complexity of a problem and to think about questions the opposing view might have. I have also become more open-minded with my colleagues and willing to try new instructional ideas. I believe that this is generating new thoughts for me about social change. I used to believe that social change was just about making the world a better place but have come to see it as more. It is about interacting in new ways for improved outcomes. This was made apparent in my research with relationships coming to the forefront as a key change agent.

Reflection on Importance of the Work

PLCs have great potential for enacting social change. If they are engaged in correctly, PLCs change relationships and provide the venue that takes us from isolation to

collaboration. Through shared cognition, teachers can solve problems in new and innovative ways. This research adds to the body of knowledge about what inhibits and supports teachers when using data to make instructional change. As a result, it also adds to the knowledge of how relationships and networking support idea sharing and lead to instructional improvement.

Implications, Applications, and Directions for Future Research

If teachers and leaders can learn to build relationships on trust, the resulting action of increasing shared expertise can be instrumental in creating educational change. When teachers engage in productive dialogue about what students know and understand and make educational decisions based upon this shared interaction, student achievement can result. This achievement can equitably impact all students, as the sole purpose is to use data to inform the educational needs of all. When teachers and leaders become more proficient at data and assessment literacy, the decisions made are based on aligned and targeted teaching and assessment. The result is an accurate assessment of where students truly are. In terms of future research, there may be a need to continue to study how collaborative relationships can be formed.

Conclusion

Education is a complex endeavor. While there are many answers, there are also many questions. However, despite the multitude of challenges, it remains a human field. As such, it is not surprising that a key finding in this research was the importance of building relationships and looking at teachers and schools as individual entities. First and foremost, school leaders must focus on building relationships and making connections. In

addition, the leaders in a district must find ways to empower teachers and build the capacity needed for success. Finally, this must be done in a way that can be readily applied in the context of the workplace, thus providing effective pedagogy for all students.

References

Ackoff, R. L. (1989). From data to wisdom. *Journal of Applied Systems Analysis, 16,* 3-9.

AdvancEd. (2015). Report of external review team. 2016 Advanced Education, Inc.

Allen, D. (2013). Reconstructing professional learning community as collective creation. *Improving Schools, 16*(3), 191. doi:10.1177/1365480213501056

Ahn, J. (2017). Taking a step to identify how to create professional learning communities: Report of a case study of a Korean public high school on how to create and sustain a school-based teacher professional learning community. *International Education Studies, 10*(1), 82-92. doi:10.5539/ies.v10n1p82

Ashraf, H. & Zolfaghari, S. (2018). EFL Teachers' assessment literacy and their reflective teaching. *International Journal of Instruction, 11*(1), 425-436. Retrieved from https://ezp.waldenulibrary.org/login?url=https://search.ebscohost.com/login.aspx?direct=true&db=eric&AN=EJ1165237&site=eds-live&scope=site

Avidov-Ungar, O. (2017). School-based professional development as an organizational learning mechanism: The significance of teachers' involvement. *International Journal of Educational Reform, 25*(1), 16. doi:10.1177/105678791602500102

Balyer, A., Özcan, K., & Yildiz, A. (2017). Teacher empowerment: School administrators' roles. *Eurasian Journal of Educational Research, 17*(70), 1-18. doi:10.14689/ejer.2017.70.1

Bocala, C. and Parker-Boudett, K. (2015). Teaching educators habits of mind for using data wisely. *Teachers College Record. 117* (4), 1-20. Retrieved from

https://ezp.waldenulibrary.org/login?url=https://search.ebscohost.com/login.aspx?direct=true&db=edswss&AN=000353192300004&site=eds-live&scope=site

Cantalini-Williams, M., Curtis, D., Eden-DeGasperis, K., Esposto, L., Guibert, J., Papp, H., & Roque, C. (2015). Exploring the benefits of a collaborative inquiry team in education (CITE) initiative to develop a research community and enhance student engagement. *Brock Education: A Journal of Educational Research and Practice, 25*(1), 55-72. doi:10.26522/brocked.v25i1.439

Carey, M., Grainger, P. &Christie, M. (2017). Preparing preservice teachers to be data literate: A Queensland case study. *Asia-Pacific Journal of Teacher Education, 46*(3), 267-278. doi:10.1080/1359866x.2017.1402860

Chen, P., Lee, C., Lin, H., & Zhang, C. (2016). Factors that develop effective professional learning communities in Taiwan. *Asia Pacific Journal of Education, 36*(2), 248-265. doi:10.1080/02188791.2016.1148853

Cherkowski, S. S. (2016). Exploring the role of the school principal in cultivating a professional learning climate. *Journal of School Leadership, 26*(3), 523-543. doi:10.1177/105268461602600306

Creswell, J. (2012). *Educational research: Planning, conducting and evaluating quantitative and qualitative research*. Boston, MA: Pearson Education.

Datnow, A., Park, V., & Kennedy-Lewis, B. (2013). Affordances and constraints in the context of teacher collaboration for the purpose of data use. *Journal of Educational Administration, 51*(3), 341-362. doi:10.1108/09578231311311500

De Groot, E., Endedijk, M. D., Jaarsma, A. C., Simons, P. R., & van Beukelen, P. (2014). Critically Reflective Dialogues in Learning Communities of Professionals. *Studies in Continuing Education, 36*(1), 15-37. doi:10.1080/0158037x.2013.779240

Dunlap, K. & Piro, J. (2016). Diving into data: Developing the capacity for data literacy in teacher education. *Cogent Education, 3*(1), 1-13. doi:10.1080/2331186x.2015.1132526

Ebbeler, J., Poortman, C. L., Schildkamp, K., & Pieters, J. M. (2017). The effects of a data use intervention on educators' satisfaction and data literacy. *Educational Assessment, Evaluation and Accountability*, *29*(1), 83–105. doi:10.1007/s11092-016-9251-z

Farley-Ripple, E. and Buttram, J. (2014). Developing collaborative data use through professional learning communities: Early lessons from Delaware. *Studies in Educational Evaluation, 42,* 41-53. doi:10.1016/j.stueduc.2013.09.006

Farley-Ripple, E. and Buttram, J. (2015). The development of Capacity for data use: The role of teacher networks in an elementary school. *Teachers College Record, 117*(4), 1-34. Retrieved from https://eric.ed.gov/?id=EJ1056727

Feldman, J. j., & Fataar, A. a. (2014). Conceptualising the setting up of a professional learning community for teachers' pedagogical learning. *South African Journal of Higher Education, 28*(5), 1525-1540.

Gao, S., & Wang, J. (2014). Teaching transformation under centralized curriculum and teacher learning community: Two Chinese chemistry teachers' experiences in

developing inquiry-based instruction. *Teaching and Teacher Education, 44*, 1–11. doi:10.1016/j.tate.2014.07.008

Gerzon, N. (2015). Structuring professional learning to develop a culture of data use: Aligning knowledge from the field and research findings. *Teachers College Record, 117*(4).

Gray, J., Kruse, S., & Tarter, C. J. (2016). Enabling school structures, collegial trust and academic emphasis. *Educational Management Administration & Leadership, 44*(6), 875-891. doi:10.1177/1741143215574505

Gray, J., Mitchell, R., & Tarter, C. J. (2014). Organizational and relational factors in professional learning communities. *Planning & Changing, 45*(1/2), 83.

Gray, J. A., & Summers, R. (2015). International professional learning communities: The role of enabling school structures, trust, and collective efficacy. *International Education Journal: Comparative Perspectives*, *14*(3), 61.

Gummer, E., & Mandinach, E. (2015). Building a conceptual framework for data literacy. *Teachers College Record*, *117*(4),

Hallam, P., Smith, H., Hite, J., Hite, S., & Wilcox, B. (2015). Trust and collaboration in PLC teams: Teacher relationships, principal support, and collaborative benefits. *NASSP Bulletin*, *99*(3), 193-216. doi:10.1177/0192636515602330

Hardy, I. (2016). In support of teachers' learning: specifying and contextualizing teacher inquiry as professional practice. *Asia-Pacific Journal of Teacher Education, 44*(1), 4-19. doi:10.1080/1359866X.2014.987107

Heredia, S., Furtak, E., Morrison, D., & Renga, I. (2016). Science teachers'

representations of classroom practice in the process of formative assessment design. *Journal of Science Teacher Education, 27*(7), 697–716. doi:10.1007/s10972-016-9482-3

Hoaglund, A. E., Birkenfeld, K., & Box, J. A. (2014). Professional learning communities: creating a foundation for collaboration skills in pre-service teachers. *Education, 134*(4), 521–528.

Horn, I. S., Garner, B., Kane, B. D., & Brasel, J. (2017). A taxonomy of instructional learning opportunities in teachers' workgroup conversations. *Journal of Teacher Education, 68*(1), 41–52. doi:10.1177/0022487116676315

Hubbard, L., Datnow, A., & Pruyn, L. (2014). Multiple initiatives, multiple challenges: The promise and pitfalls of implementing data. *Studies in Educational Evaluation*, 4254-4262. doi:10.1016/j.stueduc.2013.10.003

Huguet, A., Marsh, J. A., & Farrell, C. C. (2014). Building teachers' data-use capacity: Insights from strong and developing coaches. *Education Policy Analysis Archives, 22*(52). doi:10.14507/epaa.v22n52.2014

Jimerson, J. B. (2014). Thinking about data: Exploring the development of mental models for "data use" among teachers and school leaders. *Studies in Educational Evaluation, 42*, 5-14. doi:10.1016/j.stueduc.2013.10.010

Jimerson, J. J., & McGhee, M. M. (2013). Leading inquiry in schools: Examining mental models of data-informed practice. *Current Issues in Education, 16*(1), 1-21. Retrieved from https://www.researchgate.net/publication/266136733_Leading_Inquiry_in_School

s_Examining_Mental_Models_of_Data-Informed_Practice

Jimerson, J.B. & Wayman, J. C. (2015). Professional learning for using data: Examining teacher needs and supports. *Teachers College Record, 117*(4), p. 1-36.

Kalkan, F. f. (2016). Relationship between professional learning community, bureaucratic structure and organisational trust in primary education schools. *Educational Sciences: Theory & Practice*, *16*(5), 1619-1637. doi:10.12738/estp.2016.5.0022

Kallemeyn, L. (2014). School-level organizational routines for learning: Supporting data use. *Journal of Educational Administration, 52*(4), 529-548. doi:10.1108/JEA-02-2013-0025

Kippers, W. B., Poortman, C. L., Schildkamp, K., & Visscher, A. J.. (2018). Data literacy: What do educators learn and struggle with during a data use intervention? *Studies in Educational Evaluation, 56*, 21–31. doi:10.1016/j.stueduc.2017.11.001

Lalor, B., & Abawi, L. (2014). Professional learning communities enhancing teacher experiences in international schools. *International Journal of Pedagogies & Learning*, *9*(1), 76–86. doi:10.1080/18334105.2014.11082021

Lancaster, S., & Di Milia, L. (2015). Developing a Supportive Learning Environment in a Newly Formed Organisation. *Journal of Workplace Learning*, *27*(6), 442-456. doi:10.1108/jwl-08-2014-0061

LaPointe-McEwan, D., DeLuca, C., & Klinger, D. A. (2017). Supporting evidence use in networked professional learning: the role of the middle leader. *Educational Research*, *59*(2), 136–153. doi:10.1080/00131881.2017.1304346

Lippy, D. & Zamora, L. (2012). Implementing effective professional learning communities with consistency at the middle school level. *National Forum of Educational Administration & Supervision Journal*, *29*(3), 51-72.

Lotter, C. l., Yow, J. y., & Peters, T. t. (2014). Building a community of practice around inquiry instruction through a professional development program. *International Journal of Science & Mathematics Education*, *12*(1), 1-23. doi:10.1007/s10763-012-9391-7.

Louie, N. L. (2016). Tensions in equity- and reform-oriented learning in teachers' collaborative conversations. *Teaching and Teacher Education*, 5310-19. doi:10.1016/j.tate.2015.10.001

Lund, L. (2018). When school-based, in-service teacher training sharpens pedagogical awareness. *Improving Schools*,1-15. doi:10.1177/1365480218772638

Marsh, J. A., Bertrand, M., & Huguet, A. (2015). Using Data to Alter Instructional Practice: The Mediating Role of Coaches and Professional Learning Communities. *Teachers College Record*, *117*(4).

Marsh, J. A., & Farrell, C. C. (2015). How leaders can support teachers with data-driven decision-making: A framework for understanding capacity building. *Educational Management Administration & Leadership*, *43*(2), 269-289. doi:10.1177/1741143214537229

Mellati, M., & Khademi, M. (2018). Exploring teachers' assessment literacy: Impact on learners' writing achievements and implications for teacher development. *Australian Journal of Teacher Education*, *43*(6), 1–18.

doi:10.14221/ajte.2018v43n6.1

Merriam, S.B. (2009). *Qualitative research: A guide to design and implementation*. San Francisco, CA: Jossey-Bass.

Owen, S. (2014). Teacher Professional Learning Communities: Going beyond contrived collegiality toward challenging debate and collegial learning and professional growth. *Australian Journal of Adult Learning*, *54*(2), 54-77.

Peppers, G. J. (2015). Teachers' Perceptions and Implementation of Professional Learning Communities in a Large Suburban High School. *National Teacher Education Journal*, *8*(1), 25-31.

No authors listed. (2019). *Star Assessment*. Wisconsin Rapids, Wisconsin: Renaissance Learning, Inc.

Schildkamp, K., Karbautzki, L., & Vanhoof, J. (2014). Exploring data use practices around Europe: Identifying enablers and barriers. *Studies in Educational Evaluation*, *42*, 15-24. doi:10.1016/j.stueduc.2013.10.007

Schildkamp, K. and Poortman, C. (2015). Factors influencing the functioning of data teams. *Teachers College Record*. *117*(4), 1-42.

Schildkamp, K., Poortman, C. L., & Handelzalts, A. (2016). Data teams for school improvement. *School Effectiveness & School Improvement*, *27*(2), 228–254. doi:10.1080/09243453.2015.1056192

Senge, P.M. (1990). *The fifth discipline: The art and practice of the learning organization*. New York, NY: Currency Doubleday.

Senge, P. M. (2006). *The fifth discipline: The art and practice of the learning*

organization. New York, NY: Currency Doubleday.

Sheehy, D. d., Bohler, H. h., Richardson, K. k., & Gallo, A. a. (2015). Professional learning community: Thriving while facing the challenges of faculty life together. *Transformative Dialogues: Teaching & Learning Journal*, *8*(1), 1-13.

Sims, R. L., & Penny, G. R. (2015). Examination of a Failed Professional Learning Community. *Journal of Education and Training Studies, 3*(1), 39-45. doi:10.11114/jets.v3i1.558

Slavit D., Nelson T.H., Deuel A. (2013). Teacher groups' conceptions and uses of student-learning data. *Journal of Teacher Education, 64*(1), pp. 8-21. doi:10.1177/0022487112445517

Sjoer, E., & Meirink, J. (2016). Understanding the complexity of teacher interaction in a teacher professional learning community. *European Journal of Teacher Education*, *39*(1), 110-125. doi:10.1080/02619768.2014.994058

Sompong, S., Erawan, P., & Dharm-tad-sa-na-non, S. (2015). The Development of Professional Learning Community in Primary Schools. *Educational Research and Reviews*, *10*(21), 2789-2796. doi: 10.5897/ERR2015.2343

Stewart, C. (2014). Transforming professional development to professional learning. *Journal of Adult Education, 43*(1), 28-33.

Tan, Y. M., & Caleon, I. S. (2016). Problem finding in professional learning communities: A learning study approach. *Scandinavian Journal of Educational Research*, *60*(2), 127-146. doi:10.1080/00313831.2014.996596

Thessin, R. A. (2015). Learning from one urban school district: Planning to provide

essential supports for teachers' work in professional learning communities. *Educational Planning, 22* (1), 15-27.

Thornton, K., & Cherrington, S. (2014). Leadership in professional learning communities. *Australasian Journal of Early Childhood*, *39*(3), 94-102.

Vanblaere, B., & Devos, G. (2016). Relating school leadership to perceived professional learning community characteristics: A multilevel analysis. *Teaching and Teacher Education*, 5726-5738. doi:10.1016/j.tate.2016.03.003

Wells, C. M., & Feun, L. (2013). Educational change and professional learning communities: A study of two districts. *Journal of Educational Change, 14*(2), 233-257. doi:10.1007/s10833-012-9202-5

Wyoming Department of Education. (2018). *Wyoming Test of Proficiency and Progress*. Cheyenne, Wyoming: Wyoming Department of Education

Yan, Z. & Cheng, E. C. K. (2015). Primary teachers' attitudes, intentions and practices regarding formative assessment. *Teaching & Teacher Education, 45*, 128–136. doi:10.1016/j.tate.2014.10.002

Yi, C., & Mitchell, C. (2015). Interactions between professional learning communities and the educational culture where they are employed: Comparative research across Beijing and Ontario schools. *International Studies in Educational Administration* (Commonwealth Council for Educational Administration & Management (CCEAM)), *43*(2), 39-52.

Zhang, X., & Wong, J. N. (2018). How Do Teachers Learn Together? A Study of School-Based Teacher Learning in China from the Perspective of Organisational

Learning. *Teachers and Teaching: Theory and Practice*, *24*(2), 119-134. doi: 10.1080/13540602.2017.1388227

Zhang, J., Yuan, R., & Yu S. (2016). What impedes the development of professional learning in China? Perceptions from leaders and frontline teacher in three schools in Shanghai. *Education Management Administration & Leadership*, *45*(2), 219-237. doi:10.1177/1741143215617945

Appendix A: The Project

Exploring How Teachers Used Data to Affect Instruction

By Laura Ann Drake

MA, Walden University 2011

BS, University of Wyoming, 1989

Walden 2019

Overview of Study

The purpose of this study was to look closely at several local PLC teams, observe what phases of the data cycle were present, what type of data PLCs used, and how educators make decisions from that data. Ackoff's model, particularly phase four, set the conceptual foundation in this study. This four-phase data cycle allows educators to make meaning of data. The fundamental research questions seek to understand how teams use data to alter instruction, factors that inhibit the use of data, and what support was present to use data to guide instructional practice. This case study used observations, interviews, and artifacts to determine how teachers in a local setting used data. Furthermore, this study captured the perceptions of how training, professional development or other support built the capacity of these teachers to make instructional decisions relative to data.

The problem arises from research findings discovered in the literature review, which represent national trends, and local data gathered from the accreditation report, a principal survey, and information taken from participants in a local PLC class. Nationally, it was found that some teachers are not using data to inform instruction and make an instructional change. Marsh et al. (2015) described a current gap in practice as the "data-practice divide" (p. 2). The gap exists between having and interpreting data and making meaning in such a way that there is an actionable change in instruction. Teachers often fail to respond to data or use it in simplistic ways that do not alter instruction (Marsh et al., 2015; Schildkamp & Poortman, 2015; Marsh & Farrell, 2015). There is a lack of skills and understanding about what questions to ask about data, how to

understand what the results show and how to respond instructionally (Huguet et al., 2014). The knowledge and understanding of how to build school capacity for data use and how this information can alter instruction are limited (Farley-Ripple & Buttram, 2015). Datnow, Park, and Kennedy-Lewis (2013) suggested the need to look more closely at how teachers are interacting and responding to data to understand why some teams see positive results, while others do not. These findings provide relevance for this study on the PLC process. While research shows this is a national problem, it exists at the local level as well

Local Problem

At the local district level, professional learning communities (PLCs) are the tool used for creating data discussions that should result in data-driven decisions and the initial expectation for how teachers interact when discussing student data. The problem is that the 2015 accreditation study (AdvancEd, 2015), conducted at the XYZ District (pseudonym), and each school level, found that work still needs to be done to improve the PLC process and the data use and decision-making process therein. Teachers are not using data as leverage for instructional change within their classrooms. A closer look at PLC teams can reveal how teachers are interacting and responding to data and I can ask teachers about previous experiences and what supports have been given to build their knowledge of how to make meaning from data to create an actionable change. The focus of this study was at the district elementary school level, as this sample is where my interest lies. This executive summary points to a gap in practice between research asserting the efficacy of PLCs exploring and effectively using student learning data to

create positive actionable change, and a lack of understanding about how PLCs at the local level are using data to alter instruction, and a lack of understanding of what support PLC members receive from their schools or the district to build their capacity to use data to guide instructional practice (AdvancEd, 2015).

Research Questions

This research aimed to address the data/practice divide, or the gap between collecting data and using data to change instructional practice by seeking to learn how teams are currently using data to alter instruction and what factors may inhibit or support such practice. It also sought to discover what type of support teachers received to use data to alter instruction. If, as research has shown, teachers often are not making the best use of data to guide instructional improvement, what might be hindering this final piece of the data cycle? This study took a close look at the PLC process and sought to understand what happens during this process. Teams were studied closely to see when they completed a full data cycle (Ackoff, 1989) and what occurred to make that happen. The underlying inquiry formulated in the interview protocol explored what dialogue and actions occurred to guide the process, what these teachers perceived the supports were, and what supports the leaders, from both the school and the district, see as their contributions and support to PLC teams?

This study addressed the following research questions:

RQ1-Qualitative: How are PLC teams using data to alter instruction?

Sub Question-Qualitative: What factors may inhibit the use of data to alter instruction?

RQ2-Qualitative: What support have existing PLC teams received from their schools or the district to build their capacity to use data to guide instructional practice?

Results of the Study

The results unveiled ways in which teachers are using data, efforts being made to change instruction, factors that teachers perceive to be inhibiting their use of data, and what supports are in place to assist with using data to alter instruction. The PLC observations and interviews revealed how teachers at the study site were using data to alter instruction.

Altering Instruction

PLC teams are altering instruction in a variety of ways. There were decisions that led to instructional change, that was either a surface level change or a deep change. There were also decisions made from data that led to a change that was not instructional but may affect the outcome of instruction. These two types of decisions are clarified in the preceding paragraphs and a full description of the actual type of changes being made conclude this section. The information shared is relevant to understanding exactly what type of changes teachers are making as a result of data and answers the first research question.

The goal of using data is to inform instruction and be able to make an actionable change that will improve student success and achievement. Hence, the first research question in this study is, "How are PLC teams using data to alter instruction?" Data gathered through observation and interviews found there were two main types of

decisions made based on data. The first was decisions that led to instructional change and the second was decisions that led to a change that did not affect instruction but led to an increase in student achievement. However, one must consider that there are multiple forms of data that teachers can use. First, one must have a mindset about data that moves beyond numerical data. In addition, this study indicates that while instructional change is one way to reach a decision because of making meaning of data, there are other decisions based on a multitude of data, which are not a direct connection between teacher and student. For example, in one instance, a decision was based on behavioral data to allow a student to move flexibly between classrooms, based on his needs for the day. Thus, the instructional changes that teachers make are twofold: data to change instruction directly and data that causes a change in students that increases achievement but is not directly related to instruction.

There are two layers of instructional change. The first is a surface level change. A surface level change does not create a change in pedagogy or create new thinking about instruction for the teacher. It does not question the "what" or "how" before making an instructional change (Marsh et al., 2015). It can be as simple as using a test score, without looking deeply into the result, to move a student from one group to another. Deep change, on the other hand, asks teachers to challenge their own beliefs and seek new ideas and pedagogy to meet the instructional needs of a child. Teachers understand the why behind decisions they are making (Marsh et al., 2015). The following discussion describes the ways teachers make an instructional change from these two perspectives.

Decisions Based on Numeric Data

Teachers made many decisions based on numeric data. Those findings included surface level decisions such as changing interventions or enrichment, regrouping students, deciding on summer school placement, and scheduling. Deeper level changes were altering curriculum, changing practice, and increasing instructional time. These results show specific examples and make team decisions explicit.

Teachers in this case study used data to make profound changes in several ways. However, it is important to note that not all these changes were based on assessment, but also from observation and more formative types of information. Teachers in this study were making surface level and deep level changes based off numeric data. Numeric data is referring to any data in which students were assessed and scored. Most commonly occurring were changes in instruction regarding intervening with students or providing enrichment. For example, in one second-grade team meeting, the teachers were trying to decide which instruction best met the students' needs concerning intervention. Their choices were to continue an intervention because the child was showing progress, change the intervention because the child did not show progress, add another level of intervention because more progress was needed or to exit the student from interventions, but monitor their progress to be sure they maintained proficiency. Multiple decisions were made, such as keeping one student in a certain program to cement her understanding, even though she was at the forty-fourth percentile. One child was moved from one reading program to another, as teachers felt that was a better instructional fit. The teachers exited one child from interventions, and it was decided to retest one student,

as the score did not match what the teachers saw in daily student work and performance. These decisions were made by looking at numeric data, the Star scores, as well as teacher observation and expertise on student performance in the classroom. Another grade level also did some necessary regrouping in the classroom based on data. Finally, Star test data and student performance were used to decide which students qualified for summer school.

The data revealed two other types of decisions. One teacher shared that the team used data to decide whether or not to continue to use a curriculum the team purchased. As a result, they decided not to. While it may be likely that this was a team-based decision resulting from a discussion, it was not evident in the interview. The fifth-grade team used data regarding a specific math test. They looked at questions' students struggled on and made the decision that they were not spending enough time on the concepts. No action was taken specifically to instruction; instead, they would just review the missed items. This action was surface level as teachers drew a general conclusion about why students did poorly and chose to review the material in much the same way. Thus, decisions based on data can result in curricular changes or cause teachers to reconsider the amount of time they are spending on concepts.

In addition to decisions that resulted in surface level changes, decisions based on numeric data also led to some deep level changes. A pattern emerged here. Most of the deep level changes resulted when teams went through more phases of the data cycle (Ackoff, 1989). The next paragraph describes each phase and decision that teachers reached.

In March, a PLC team, after using data, decided to be more mindful of what practices they are using for conventions and share them with each other the next time they met. They also decided they were not clear on what second-grade writing should look like, so the action was to seek out the third-grade teachers to learn what their expectations were. Finally, they decided that they needed to collect further data to see if students understood conventions and maybe just weren't applying the knowledge. This action began in phase one of the data cycle, accessing data. Teachers brought the results of scored writing papers to the meeting. They reported that the highest area of concern was conventions. The teachers then began phase two of the cycle, which was to analyze data to turn it into information. They engaged in dialogue around the common errors in writing, such as where to do the end punctuation and proceeded with a discussion about how to improve writing. The team then started to make meaning by asking questions. For example, "Are we conditioning our kids to not attend to writing?" The teachers discussed the reading and writing connection and how there must be the reading connection first. It was suggested that perhaps the team needed to do some reading about what to do when students are not applying what they know. Another teacher questioned if she is spending enough time on how to edit in the writing process. Once the teachers started to make some meaning of the data, they began to form some actionable knowledge, which is phase three of the data cycle. The teachers discussed having students use a writing checklist, trying to bring conventions more regularly to their attention, and reading their writing aloud to their partner. They also considered using the same passage, with punctuation in different places, to show students how it can sound differently based on

where the punctuation occurs. This discussion led the teachers to phase four, which resulted in the decisions mentioned earlier. The teachers decided that since their writing tasks were now shorter, they would have more time to attend to conventions, as they are spending less time on the actual writing. They wanted to attend more to conventions and bring it to a heightened awareness with kids. This change in practice is because when the writing was longer, they did not have time to attend to conventions. In May, this was the follow-up discussion: teachers were continuing the daily, real-life practices, so that students could apply their learning. The teachers were going to have the students re-do an assessment activity to see if this practice is making a difference. Finally, the following week, the team decided to bring a high, medium and low newspaper book (student work) to look at that data. Thus, when there was an opportunity for a full cycle data discussion, teachers were able to create knowledge they could act upon, as well as follow-up on later, to make decisions about affective practice.

A final opportunity to see how teachers are making decisions based on numeric data presented itself when the PLC met with a teacher lead. This teacher had a leadership opportunity to organize Star data so that grade-level teams could ask questions and look at trends and patterns and make meaning differently. What was unique about this opportunity is that the teacher assigned each student a colored sticky note based on which quartile they started the year in. Then, based on trends, the teacher moved the students sticky note to the quartile in which they currently were performing. Displayed on a presentation board, this data created a very visual picture of how students were growing. This experience took place with the fifth-grade team. It then led to a data discussion

about what teachers noticed, aided by some questioning from the teacher lead such as, “Which kids that are static are in interventions right now?" The teachers followed with a discussion about what interventions each child received. They then paired what they noticed with observational data about what was evident by a child's performance in class. The team noticed a pattern on the data board based on the color-coding scheme that many students remained stuck in the same area, and many of the interventions did not seem to be working for lower kids. A teacher then asked, "What does it say if they are static and are in intervention?" The dialogue progressed to some reasons why, such as resistance to test taking, not taking the test seriously, and whether the intervention was an effective one for that child or perhaps the child disliked the intervention. Finally, the group moved into phase 4, which is a response to data. Some of the actions they decided to take were talking to a mom about absences, talk to kids about putting more effort into their tests, move kids to new intervention if other data also supports that decision, and find a way to keep kids in the classroom to receive more Tier 1 instruction. The team also looked at the schedule to see how to meet the needs of kids more efficiently and try to get started with interventions more quickly the next year. There was also a suggestion to increase the frequency of looking at data so not as much time passed between interventions. Thus, many actions were considered by this team.

Teachers were making a variety of decisions based on data. However, the research indicates that when teachers engage in many phases of the data cycle, they reach decisions with a deeper level of understanding and question the “what” or “how.” This

questioning often leads to an adjustment in pedagogy and decisions affecting student achievement.

Decisions Based on Observational Data

Observational data, from teacher anecdotal records, formative assessment, and behavior observation, also leads to many actionable decisions by teacher teams. Sometimes these decisions are a change in instruction and other times they are a change that will increase a student's chances for success. As with the numeric data, observational data has two categories: surface level changes and deep level changes.

Surface level decisions made by teachers were varied. They used data to decide when to place different students in different classroom if this will give a behaviorally challenged student a fresh start. This practice allows an opportunity for student success. Teachers who observe peers having instructional success ask, "What am I missing or what did you do differently?" This questioning can lead to a change in instructional practice. Sometimes teachers swap students for instruction. While this practice may be deep level change, it is not clear as a researcher how the process went that led to these decisions. Thus it cannot be labeled as a profound change. Finally, informal discussions lead to ways to support students. For example, pairing a struggling student with another student to get support on a content presentation. In these instances, teachers used observational data to make decisions about sharing students, regrouping students, or asking each other for their expertise in instruction.

Finally, some changes occurred at a deeper level, but not only because of data, but also as a part of the PLC process. A piece of the PLC process that often led to decision

making is when teachers engage in dialogue that exposes their expertise. For example, one discussion revolved around observational data where the teachers noticed the students were not sticking with a book. One teacher shared the strategy that can "hook" students into a series. As an action, the teachers brainstormed how they could create a space in the commons area where they could locate series books. While this may not directly affect student instruction, the teachers felt that students engaging in books would increase their reading ability. Another teacher noticed that students struggled when answering text-based questions. A teacher discussed how students need to be looking for textual evidence after they have read the question first. This piece of shared expertise led to the decision for each teacher to give their students the opportunity to practice this skill. The team discussed any special needs of students, such as a switch to fluency instruction vs. phonics. This decision was not data based, but instead, PLC based. PLC based means that it was more about a conversation starting, perhaps from observational data, in the team meeting. The teachers regrouped students according to needs if necessary. Thus, two things occurred because of teachers using observational data to make a deep change. First, a conversation around observational data led to teachers sharing their expertise, which led to making a change. Secondly, the conversation itself led to a change in instruction.

Teachers are making a variety of decisions based on data. However, the research indicates that when teachers engage in many phases of the data cycle, they reach decisions with a deeper level of understanding and question the “what” or “how.” This

questioning often leads to an adjustment in pedagogy and decisions affecting student achievement.

Inhibiting Factors

One question my research asked was what factors inhibited the use of data to alter instruction. Many factors limited teacher use of data for making instructional change. These inhibiting factors include data literacy, data beliefs and teacher buy-in, data access and data alignment, time, trust and relationships, sustainability and change, systemic support, resources and compliance. A discussion of these inhibitors allows for a deeper understanding of what limits teachers use of data and can provide insight into changes that could be made to build teacher capacity for using data to alter instruction.

Teachers have a variety of experiences that shape their beliefs and practices and thus, influence the work they do each day. The interview process in this case study was designed to find out what teachers, the principal, and the district professional development director perceived to be inhibiting factors in data use. A critical inhibiting factor, as perceived by the teachers, as well as the professional development director, was exposure to certain kinds of professional development. The research identified teachers perceived needs, perceptions of their ability to use data, thus resulting in their perceived needs, and what support new teachers need in the PLC process.

Data Literacy

A factor that was noted by teachers was their ability to generate assessments, as well as to understand and interpret them. The professional development director, referred to this as a need for higher data literacy. Data literacy was defined earlier as “The ability

to transform information into actionable instructional knowledge and practices by collecting, analyzing, and interpreting all types of data" (Gummer & Mandinach, 2015, p. 2). Educators must be able to understand what the data is telling them to do something new instructionally. The professional development director noted that it is an area where teachers need more support as they attempt to interpret data results and share those results with others. An example given is to know the difference between a reference test and a criterion test and how these types of assessments give you completely different information. When teachers do not understand the basics of assessments, it can result in teachers just reporting out a score and not attaching any meaning to it. A piece of the data literacy piece mentioned by the teachers was the ability to compile the data in a meaningful way. One second-grade teacher noted, "I feel like I'm much better about compiling data from my students from common assessments than I am with accessing data from Star or WYTOPP. I know there are wonderful resources that are there, but I could get lost in trying to find what I am looking for." A 5th-grade teacher shared that she had tried all different types of ways to keep track of data to compile it in a meaningful way but still needed to get better at it.

While numeric data can be difficult for teachers to understand, such as that found in summative assessments like Star, many teachers noted that they wanted more support on the common formative assessments. One teacher felt that the use of CFAs was mandated, but that there wasn't any help and support behind it. Another grade level teacher added that even though the district sent out the requirements of a good CFA, which didn't mean teachers understood it well enough to create them, added that there

was little modeling for the creation of a common formative assessment. While teachers felt like they are a beneficial tool, concerns were expressed in their abilities to create and align these as a tool to access student understanding, as well as how to look at that data. Another teacher noted it would be beneficial to work with other second grades teams to find out what they are doing and the thinking behind their process. The lack of ability in creating these assessments also led to a lack of confidence in what the test might be suggesting. One teacher noted that there was concern about whether the test was assessing what they wanted it to assess. Adding to this concern, another teacher noted that because of the lack of training on CFA's, there was a question about the reliability of the assessment. One teacher put it a different way. When looking at test data, she questioned what data she should use to make an instructional change. "Should I change it because of these test scores or because of this test and then you kind of look like, well, was it the test? Was it the questions? Was it the wording of it? Were they not able to read it, you know, especially like with math? Well, the kids very low in reading did -- was he not able to do it because he couldn't read it, or I think those are some -- a lot of barriers." Another inhibiting factor for one teacher was the inherent difficulty in finding what the actual learning targets should be. She noted that she felt like more training was needed on CFAs, but added, “But I feel like we need a little bit more definition of what our targets are and what proficiency looks like--define learning targets, and then we can figure out how to assess and how to change based on those assessments, change our instructional practices.” An additional teacher added that there has been a lot of change in the district-used assessment, but that those assessments were not formative. She suggested that it

might be time to revisit the current assessments and how the information is broken apart and shared with the teacher, and how the district is using the information. Thus, many teachers felt their capacity to create and assess with common formative assessments was a factor inhibiting their ability to use data to make instructional changes

Another inhibiting factor was the type of professional development offered. The professional development director shared that the district was committed to providing the funds for teachers to attend training that they need, although he added that teachers might not always be taking advantage of that opportunity. Several individuals alluded to the need to have professional development that was school, or district-based, versus that which occurred in another city, such as the Solution Tree summits. One teacher suggested that while attending a national summit was good, it did not move her forward in understanding the connection of the power of the CFA to drive instruction. The professional development director distinguished that some data used in the research district is tailored and personalized to our state and district. National summits, as a result, are not always responsive to teacher needs. He believes the district is starting to realize that they need different kinds of training. One interviewee made the analogy that if we are to give kids a choice in their learning, the teachers should have a choice too. This perception adds another dimension to consider in professional development opportunities: choice. Without choice, PD can be inhibiting because teachers are all in different places in their learning. It was suggested by one teacher that there should be more local training on district used data so that teachers could learn what data to drill down on, as well as understand what kinds of meaning teachers can assign to the data. Professional

development, therefore, was a potential inhibitor, as it needed to be more needs based, context, and the district should provide choice for teachers.

Data Beliefs and Buy-In

The research unveiled many beliefs about what teachers' value about data, how that value creates buy-in, and what causes them to either buy-in or comply. This data also reveals what Senge (2006) referred to as varying mental models. In this case, teachers held different assumptions and pictures of what data was useful and valued. Most people highly valued observational data, however, teachers did not know if this was valued because it is not easily proven. The same was true of CFAs. Teachers felt these were less valued than summative data. Contrary to this, the district PD leader believes that CFAs are not only timely, but PLC teams should be using CFAs. Another teacher values vetted data and believe that if there is little understanding about the origin of the assessment and how it was vetted, it has little meaning. Finally, one teacher shared that if data does not shift your beliefs on how kids learn, it is hard to buy-in to it.

When teachers don't value the data, they do not seem to buy-in to the data. This can occur, according to the principal, when teachers feel data is being done to them, rather than with them. If there is a reason to change, there must be an urgency to do it, as well as an understanding of why. The PD Director added, "The point of having to make a new instructional decision gets very personal for people, and they take it personally, and they're very reluctant to engage in new practices." Buy-in thus is another inhibiting factor for data use.

Data-Access/Data Alignment

The ability to create or use data that aligns with instruction and the ability to access data are two more inhibiting factors shared by interviewees. There was a lack of confidence by some teachers that the CFAs were assessing what meant to be assessed, which resulted in uncertainty if the assessment was a good alignment, to begin with. Teachers become reluctant to make an instructional decision on assessments that do not inspire confidence in the data that results. Meaning is most easily derived from well-aligned data.

Another restriction to data use is the ability to access data. Limited accessed to data makes it difficult to look at the bigger picture. This restriction occurs at two levels. One is data restriction, and the other is the inability to understand how to access data. Increased security and discussions about privacy have restricted some data access, such as knowing which students are on free and reduced meals. Also, there are limits on who can access data. If a school wants to look at trends and patterns in data, there are a limited number of educators who can do this. While data restriction is necessary, one teacher felt that at times it is difficult to make connections about the effectiveness of different intervention programs if the school is not looking at the big picture. As a school data lead, this individual said that he had to rely on others to compile the data before it could be used to make meaning. Thus, this slowed the process. However, at a more local level, teachers indicated that they needed more training in what reports to access, such as in the Star database. Thus, while narrow in scope, there were some indications that data access was an inhibitor.

Time

Teachers shared multiple perspectives on how time was a limiting factor in being able to use data to alter instruction. Lack of time seemed to slow down many facets of the data use process. Time is needed to create CFAs. It takes time to build trust and connect personally to be willing to share instructional practice. Some teachers are limited in minutes, meeting only for twenty minutes each week. Thus, restricting their time to be in conversation and making data less useful, as the opportunity for timely instructional change has passed. Teachers also need time to become familiar with the curriculum and learn about the new instructional practice. Finally, the principal noted that there needs to be time to model PLC work and give teachers time to practice. It is evident, that time is an inhibiting factor.

Trust and Relationships

The importance of trust and relationships was evident at all levels of the school system, from teachers trusting each other to trusting what the district was asking them to do. When teachers did not trust, it limited what teachers were willing to do and how much they were willing to interact and share with their teams. At the district level, teachers were distrustful when they were asked to collect data or create CFAs when clear communication did not exist about why they were doing it. Alternatively, in the case of CFAs, when teachers were expected to create them but did not feel supported in doing so. The principal believed that leaders could not build trust if you do not take time to reflect and share. At the teacher level, teachers felt they had to trust each other to open up and

make their practices explicit. Trust, therefore, has been perceived to be an inhibiting factor.

Sustainability/Change

A pattern that emerged in the data was the discussion on change. When there is a change in teams, change in leadership and change in programs, the focus on data and instructional change can shift. These shifts occur for several reasons. Time is needed to learn new grade level content, set norms, build trust with colleagues, and build culture and community. Teachers in this study also noted that new programs, even like a new guidebook, can cause a shift in focus. These changes were felt to restrict the ability of teams to focus on the work around data for an instructional change. One teacher put it succinctly by observing that when energy is going towards building your abilities as a teacher, it becomes difficult to focus outwardly as a team and PLC that makes instructional decisions based on data. One teacher even suggested the possible need to have a local PLC training to help with transition and change in this district. Change takes times, and there is a need to adjust and create new learning. The time needed for this can cause teachers to move away from efforts to engage in conversation and actions that lead to data used to make an instructional change.

Systemic Support

Systemic support relates to how PLC work is supported through a network, from the district level involvement, via the principal, to the teacher in the classroom. Analyzing the data from this view allowed the opportunity to look for gaps that might be inhibiting the use of data for instructional purposes. One potential inhibitor that was

noted was merely the size of the district. Concerning expectations, the PD Director shared the struggle of deciding how broad or how narrow to keep the PLC expectations. If the focus of expectations was too specific, it is a mismatch for professionals. For example, Dr. James shared that what a welding teacher at the high school needs is fundamentally different than what the first-grade teacher who is teaching little ones to read needs. This challenge was also present in determining a mission, vision and values statement. If you get too narrow, it leaves people out. If it is too broad, he indicated that you are not saying much worthwhile. Furthermore, Dr. James (Pseudonym) indicated it is even trying to find a forum where you could talk about the mission and vision collectively.

Like the district mission, vision and values statement was the school level improvement plan. Teachers were asked during the interviews how familiar they were with the school improvement plan. Most noted that they had been exposed to it but could not cite what was on it. While a school-based action plan can assist with the mission, vision, and values of a school, there was no indication that this was an inhibiting factor as it relates to data-based instruction. This action plan would need further exploration.

The only reference to a systems-based influence from a teacher standpoint was that of the need for a more systems-based approach to interventions. It is not clear if this teacher is referring to a school-based or district-based system. However, it might be important to note that when teachers do not feel capable of organizing interventions, it may limit their abilities to use new practice to alter instruction to meet individual needs.

Resources

School districts have many resources that teachers can avail themselves of. However, it was found that teachers were often not aware of these resources or chose not to use them. One example is the district data analyst. While he can provide great support for understanding data, not many people utilize this support. Also, the Global PD resource provided to building principals is an online resource that the PD director feels is underused. The PD director is highly trained in data teams but is called on very little to come out and support school PLCs. Thus, while resources exist, they are not being used to build teacher capacity to use data.

The PD director shared several reasons why he believes teachers do not make use of resources. First, educators need to be made more aware of what resources are available. He believes that some opportunities shared with principals, are not always passed along to teachers, or utilized by the principals themselves. Finally, he believes people do not maximize internal expertise because they have a hard time believing that somebody local could be the answer. Thus, a further inhibitor of data results from teachers and principals not making full use of the resources available to them.

Compliance

Several of those interviewed noted that compliance was an inhibiting factor in data used to alter instruction. Some examples of compliance expectations shared were a strict adherence to instructional programs, having an expected number of grades in the grade book, and creating and using CFAs. Some examples of why compliance is inhibiting include one teacher who felt the strict adherence to programs limited his ability

to seek out alternative instruction when initial instruction did not work. Several teachers revealed that they felt the grade book requirement was inhibiting their ability to generate meaningful data. For example, they were creating work for the grade book, just for the sake of having a grade, but felt it wasn't meaningful. One teacher described it as a type of pressure. Finally, teachers felt there was the expectation to create and use CFAs, but there was little support behind it. This data shows that the need to comply, without having support, can inhibit teachers' ability to use data

Conclusion

A variety of factors can inhibit the use of data to alter instruction. As discussed, this can range from not having access to data, not understanding the data, or not be building relationships that allow teachers to interact and share. A broad view of these inhibitors needs to be taken, as many come from influences beyond the work of the PLC.

Support to Build Teacher Capacity to Use Data to Guide Instructional Practice

My final research question asks, what support have existing PLC teams received from their schools or the district to build their capacity to use data to guide instructional practice? There are many supports given in the research district, as well as the school level, to help teachers make use of data to alter instruction. Some of these supports are a direct relationship to data and instruction, while others are indirect support. The supports discussed are relationships and trust, training and supports, leadership, systemic support, school-based resources, expectations, and beliefs. Relationships and trust allow teachers to network and share ideas and data (Zhang, Yuan, and Yu, 2016), while understanding teacher training and supports reveals what is influencing practice. Leadership and

systemic support at a district level are addressed to learn how these two entities support teachers. Wells and Feun (2013) indicate that it is important to consider expectations, as those can increase the likelihood of data use. Finally, it is important to understand what school-based resources are available for teachers to ask questions and get advice, while knowing what the school believes about data can show what data gets used and how. Understanding what supports have been effective for teachers, can allow these same supports to be duplicated and improved. Relationships are the first support piece to be discussed.

Relationships/Trust

The interviews at the research school told a strong story about the importance of relationships and trust. Teachers shared information that created a clear picture of the role this plays in communication in the building. This insight resulted in understanding what teachers can do because they have trust, what relationship building allows regarding teacher effectiveness, and what teachers did to build trust at the research site. Teachers shared numerous examples of how trusting each other supported them. It allowed the teachers to feel safe to ask questions about data and ask about something that seemed to be working well in another classroom. Trust enabled teachers to challenge each other and not feel threatened if another teacher disagreed. Teachers believed that feeling free to ask questions increased the team's effectiveness. Because a relationship existed where teachers were in constant conversation, there was the belief that teachers spent less time trying to figure out where kids were and where their colleagues were in their thinking. Knowing each other well helped them focus on data and be open to sharing student work

and trying new things. For one, trust gave the courage to try new practices, even though it was not entirely comfortable to do so. Thus, trust allowed a level of engagement and sharing that teachers found critically crucial to their growth.

Much like trust, relationship building supported teachers. First, because they knew and were comfortable with one another, they were willing to seek each other out for support. These teachers believed, “The answer is in the room.” Teachers felt they could seek out the principal and colleagues for advice. It appeared that teachers who know each other well also understood the instructional practices and beliefs of their peers. Another factor influenced by relationships was accountability. Teachers felt more accountable when they had a relationship with other teachers. The open conversation allowed teachers to find each other’s strengths. Trust allowed colleagues to share students for Tier 1 instruction, as well as to let students be fluid between classes when special needs required it. Relationships supported teachers by allowing shared practice, honest conversations, and a sense of safety.

It is clear how relationships support teacher’s instruction. However, the research interviews also allowed insight into what helped to build those relationships. A practice alluded to several times in the interviews was that in which teams had lunch together. This time together helped teachers get to know each other better, know more about each other's instructional practice, as well as to learn about each other personally. These informal meetings gave teachers the opportunity to discuss what was genuinely urgent in their classrooms.

In contrast, another teacher shared that in a previous team, they did not spend much time together and were less aware of what they wanted to accomplish instructionally, which she deemed was not as impactful for students. The teachers were making a strong effort to build relationships. However, the principal saw relationships as a key to effective practices as well.

The principal reflected on the importance of building culture first and focusing on instruction second. As a leader, it is necessary to try to be visible, accessible and consistent. The principal believed that listening intently and making connections with the staff is critical. One teacher reflected that those principals who made connections and established relationships allowed for a feeling of safety, resulting in a safe place to share struggles and successes, and moving people forward. An intentional move that the principal made to build trust so that teachers felt safe to share mistakes was to model. Her modeling occurred through conversations, feedback, and activities during all school team meetings. Through conversation, she encouraged teachers to come to her if needed. During staff meetings, she modeled thinking first and then gave teachers the opportunity to share out similarly. Also, in staff meetings, she intentionally built-in opportunities for sharing takeaways, again, allowing teachers to know and understand each other better. Finally, the principal shared the importance of celebration. Celebrating the positives built a trustful environment. The principal made many efforts to build trust and relationships in the school.

Trust and relationships, in this case, seem to allow a great deal of interaction for teachers. It allows them to share and learn new practices, know whom to seek extra help

from and as a result, affect their instructional change. Trust and relationships may be a critical factor in using data to alter instruction. However, to alter instruction, teachers must know ways to do so.

Training/Support

An interview question asked about the training and support interviewees had received to gain some understanding of how training and support influenced teacher practice. While there were factors identified earlier that inhibited teacher uses of data, there were found to be several practices concerning training and support that built teacher capacity for data use. This analysis considered training and support at both a school and district level.

The evidence suggests the school had many supports in place to help teachers build their understanding of PLCs and data use. First, the leader provided several supports. Many teachers mentioned a template that was given to use during PLC time which allowed teachers to be mindful of their next action and keep the last piece of the data cycle in mind. The template had a section that asked the teachers how they were using data to drive instruction. Also, many teachers again mentioned modeling as a support piece. The principal described her modeling in this way: First, she modeled. Then she stepped out of the conversation and let others talk and ask questions, then listened to those questions, and again modeled behavior for others to follow. Then she reinforced when she saw it done well. She offered support when she did not.

The principal also provided resources and tools, as well as additional feedback. Teachers noted that the principal gave feedback in person, on memos, and PLC notes

submitted weekly. Another piece of support provided by the principal was a PLC rubric. Teachers were asked to review this rubric several times a year, set goals, and decide what kind of support they needed to meet those goals. Then, when teachers revisited the rubric, they could self-assess on how they were doing. The principal believed this self-assessment empowered teachers to make a change because the information was coming from them, not her. The principal also encouraged teachers to seek support from other colleagues. If there were questions regarding the PLC process, the leader was willing to meet with teams and support what the process should look like. Also, the principal asked each team to create norms. Seeking out colleagues such as other teachers, teachers in other buildings, instructional coaches, the principal, or content coordinators at the district level, was a common practice when teacher needed content, instructional and data support. A unique project that occurred during this research was a trend analysis done by a lead teacher in the building, which allowed teachers to study trends that were occurring with the Star data. The principal provided support, through modeling, to this individual. She later met with this teacher again to see gather feedback and decide next steps. Some individuals also mentioned an Excel spreadsheet is a useful tool to support them when compiling data. As far as school level training, one teacher described a staff development day in which the principal shared out information, led group conversation, taught or presented information, and shared her expectations. The teachers and leaders alike made it clear that there was a great deal of support at the building level for the work of PLCs and data use.

At a district level, there was a variety of support and training. One way that the Professional Development Director supported PLC work was to make it a permanent agenda item on both the principal teams meeting agenda, as well as the agendas of the elementary and secondary academic councils. The teacher could avail themselves of Solution Tree summits upon request. Finally, the director shared that the superintendent also supported the process by suggesting that untrained teachers and new teachers get the training they need. Teachers felt they were getting the message from the district that PLCs are essential, and they were given time to meet. Thus, teachers knew that meeting in PLCs was part of what they were expected to do.

Training to support the PLC work in the district were varied, and many teachers shared many different experiences. Some noted that they had received district support to interpret and understand summative assessments, such as Star and MAP. Others received support for alignment of curriculum, instruction, and assessment through authors such as Marzano and McTigh and Wiggins. Most teachers reported having attended a PLC summit, either on their own or as a mentor, with a mentee. The principal described training she had that was effective were numerous hours of Solution Tree training, self-assessments at every building paired with an action plan, and work with expert principals from across the state. The team also got to watch other teams model the process. The PD director also did an online video to train teachers regarding common formative assessments. He clarified the purpose of common and formative assessments and what they mean. This video was given to the principals to share with staff. The director shared that a mechanism for communicating learning and expectations were to use the principal

as a conduit. Thus, the district has provided support for training through PLC summits, as well as local district classes. These pieces of training do not seem to be district-wide, concerning everyone participating, but instead, are options that teachers have.

There had been many influences for teachers from both school and district efforts to support and train these teachers in both PLC work and data use. It became clear that preparation for this type of work takes experience and many types of interactions as many components must be understood and implemented. As one teacher stated, “You need to be well trained in the beginning in a variety of fields, that all come together to make one.”

Leadership

Every leader has their style and way of doing things. This study delved into the leadership style of the principal as it relates to how this style supports teachers and thus, supports their capacity to work in PLC teams and use data. This support perspective was taken from the principal, as well as from the teachers.

The principle described herself as a transformational leader. Being a transformational leader means empowering others through facilitation and support, promoting collaboration and finding strength in one another and leading from behind. Jumping in and coaching when needed. There is also leadership by modeling. This modeling includes showing that it is safe to try new things and make mistakes, allowing teachers to fail and learn, and modeling relationships by taking time to know each other and understand other’s beliefs. This leadership also includes strong communication and

feedback through emails, personal communication, and meetings, as well as communicated expectations.

Another component of leadership is autonomy. Autonomy allows teachers choice, flexibility and freedom to make decisions and to set their own goals together. One teacher suggested that these actions held teachers to greater accountability. Thus, the principal believes her transformational style empowers teachers, and she uses it to provide teachers with autonomy to make their own choices and learn from mistakes.

Systemic Support

Systemic support refers to the way the district and school level connect to provide consistent, planned support. Systemic refers to the whole. Thus, in this case, the support provided is not only provided for the research school but all schools in the district. This support includes training, data access, people as resources, forums for shared understanding and a shared mission, vision and goals.

The data makes it very clear that teachers should have the opportunity to attend Solution Tree summits. The district also has a shared mission, vision and values statement. Within that statement, it reads, "We will maximize learning by making data-driven decisions." The statement continues to clarify that as a district, scientifically researched best practices and multiple learning opportunities for students are valued. Thus, this district statement serves to communicate this belief to all stakeholders.

Another systemic support effort was the mentor program. This program pairs new teachers, or new to the district teachers, with an experienced mentor. The teacher is supported through questions and feedback. This program offers teachers support, that

while it may not be data specific, allows inexperienced teachers to ask questions if needed.

The district provides support through data access, including online assessments, such as the WYTOPP and Star, and our district student information system, which allows teachers to view data in an online program. While it is not evident from interviews what this entailed concerning data presentation, several teachers mentioned this.

There are two district-wide venues where teachers and principals could express concerns. The first was the academic councils, both elementary and secondary. PLC discussion was a standing line item on the agenda for these meetings. Also, the director holds leadership team meetings with all principals. Leadership team meetings also had a PLC line item. These two forums support data use and altering instruction because the attendees can ask questions or express concerns at these meetings.

The final systemic support piece is that of human resources. Interviewees mentioned a multitude of resources as potential support. It is important to note that while available, not all teachers availed themselves of these, as noted in the section that discusses inhibiting factors for data use. These resources included the professional development director, the district data analyst, instructional coaches, and content area coordinators. Thus, there are human resources for teachers to utilize in their efforts to build their capacity to use data effectively and alter instruction accordingly.

School-Based Resources

Some resources teachers found supportive were based just at the research site. The most significant resource accessed by teachers was each other. When asked whom

they would go to for content, instruction or data support, the overwhelming response was colleagues in the building, including the principal. Thus teachers went to those in which they respected their expertise. Some teachers mentioned instructional coaches but explained that this had become a limited resource as they were no longer readily available. However, at least four teachers in this building had been instructional coaches, and other teachers respected them for their knowledge and expertise. Therefore, the most significant resource in the study site was the teachers themselves.

Expectations

According to Wells and Feun (2013), high expectations increased the likelihood of teachers using data to assess their instructional effectiveness and make a change. Several expectations for data use were evident at the research site. At the district level, teachers were expected to engage in PLC work as described by the Dufour's, assess using the Star test, CFAs for the short cycle work, and to “be in the work.”. The PD Director has also communicated to leaders what PLC work should look like and what it should not. Thus, there is an expectation to use data and integrate curriculum, instruction, and assessment.

At the building level, teachers are expected to test frequently using the Star assessment, and then report on a building-wide excel sheet, how the teachers are helping students falling below the 40th percentile. Teams are expected to do monthly reviews on this data. Regarding PLC work, the principal asked each team to set norms together, turn in PLC notes, and meet regularly. During this research period, teachers met weekly. Teachers are also given time during staff meetings, 3-4 times a year according to the

principal, to look at a PLC rubric. They score themselves and set goals based on this rubric. These are the building level expectations that exist to support data use and instructional change.

Beliefs

The communicated beliefs of the principal and the beliefs of teachers as they center around data use, affect what data gets used and how. Thus, I wanted to elicit the beliefs of those at the study site. There were many beliefs held by interviewees that were supportive of data use.

First, teachers believed they needed to use data, and data use makes better teachers. It is essential to view data in different ways, not just numbers, such as the data gathered daily to alter instruction, such as conferring and conversations. Daily data exposes more student thinking, multiple data points need to be used, and all students are learners, and the team must support all kids. The principal added the importance of a positive culture and celebrating the "quick wins." The leader believed that Star is necessary, but other assessments during short cycle PLC work are essential. Thus, the beliefs of teachers shaped their daily activities as well as what type of activities they chose to do to gather data.

Recommendations Based on Findings

Four themes emerged as a result of this research. These themes include beliefs that shape data use, relationships, leadership, data literacy, and contextual learning. A further literature review on these themes resulted in an understanding of the importance of these findings and the potential impact that can result in teachers in professional

learning communities, their leaders, and the district. I found relationships, leadership, data literacy, and contextual learning as prevalent topics in the literature.

Focus on Relationships

The literature review and study at the local school site made it very evident that schools must attend to relationships. To adequately assess students using data and to open up all the instructional opportunities therein, relationships built on trust must exist. Thus, attending to building relationships and trust is the first recommendation resulting from this study.

There are many reasons trust must be built by leaders if teachers are to access their full potential when looking at data, make sense of it, and follow with instructional action. Trust allows confidence in advice. Teachers are more likely to feel free to ask for help and share ideas if they trust one another. This includes sharing student achievement, sharing students for instruction, and sharing ideas in a willingness to help all students. In the study by Hallam, Smith, Hite, Hite, and Willox (2015), trust opened up the willingness to observe one another, resulting in deprivatized practice. When teachers begin to deprivatize practice, they tend to increase problem-solving conversations, which can lead to altered instruction. Finally, trust opens up further collaboration beyond the PLC time. One teacher in the study stated, "I think collaboration is all day long. It is an environment" (Hallam et al., 2015, p. 206). While trust and relationships are impactful, it is essential to understand how leaders and teachers build these two concepts.

There are two levels at which this paper will address building relationships. The first is at a leader level. While the research primarily refers to principals, those who lead

principals can apply these strategies as well. The first area to be considered is networking and communication.

If leaders are to build trust among teachers, or other stakeholders, there needs to be a clear line of communication (Balyer, Özcan, & Yildiz, 2016; Cherkowski, 2016). Clear communication builds trust. When leader actions are transparent, and there is constant communication, it enhances mutual understanding and collaboration (Zhang, Yuan, Yu, 2017). An example of this communication is to share the visions for the implementation of new programs or new plans (Ahn, 2017; Cherkowski, 2016). The principal at the research site suggested that it is also critical to have leaders explain why changes are being made and being transparent and honest. While clear communication is essential, some other leader characteristics build trust within a school.

Teachers take the lead from their leaders. First, leader modeling impacts the view teachers have about risk-taking and using data that may expose their vulnerabilities. Leader role modeling involves demonstrating the skills and behaviors expected of teachers (Lancaster & Di Milia, 2015). It might be through an actual demonstration or a leader modeling through daily actions and conversations. One type of modeling found to be helpful by Zhang, Yuan, and Yu was to "demonstrate and analyze authentic dialogue" (2017, p. 233). School leaders can show teachers that conflicts are inevitable but have the potential for in-depth and meaningful interactions. Principal Robert, in a study by Cherkowski (2016), modeled ongoing professional learning by modeling. He taught in an English class to model openness and willingness for feedback and suggestions. He stated, "Being mindful of one's own learning is an essential skill for principals wanting to lead a

learning community" (p. 637). This principal also modeled instructional strategies, which can aid in giving teachers ideas for altering instruction. This modeling can be active at multiple levels of leadership within a district. The leader's management style can also encourage trust.

Kalkan (2016) found that teachers trust the principal and colleagues most in the school. One way to build trust is to avoid top-down management and encourage shared decision making in the school (Hallam et al., 2015). Allowing shared decision making generates teacher empowerment (Balyer, Özcan, & Yildiz, 2016). Teachers want to be a part of the decision-making process (Lancaster & Di Milia, 2015) and have the autonomy to make some of their own decisions (Ahn, 2017). This type of distributive leadership allows the teacher to take the initiative in teaching and learning, which gives them the decisional power to make instructional decisions relative to data (Zhang, Yuan, Yu, 2017). Ahn (2017) found that when teachers generate new ideas, there is more buy-in. Ahn refers to this as "voluntary will," (p. 86). The work of Ahn parallels Cherkowski's (2016) finding from Principal Robert that allowing teacher decision-making results in teachers feeling involved, valued and important. Teacher decision making can also be called teacher autonomy. Autonomy allows teachers to self-reflect, set goals, and make decisions that are a good fit for the team (Hallam et al., 2015). At times, decisions may lead to failure. However, Zhang et al. (2017) claim that failure can lead to learning. In order for teachers to be willing to try new ideas, it is crucial for the leader not to place too much emphasis on accountability. The principal also avoids micromanagement, which suppresses critical thinking and innovation (Zhang et al., 2017). Thus, the management

style of the leader can influence how teachers trust, interact and feel empowered. Further findings also indicate that how a principal interacts with teachers can build trust.

When a principal is available, it impacts trust. The principal who listens values opinions and understands how sharing can expose a teacher's vulnerabilities (Hallam et al., 2015) will have teachers who know they are available to talk and share struggles and issues (Lancaster & Di Milia, 2015; Balyer, Özcan, & Yildiz, 2016). In other words, they are in tune with what is happening with teachers (Cherkowski, 2016). The principal who is aware of what is happening with teachers can also determine when they are asking teachers to do too much. Hallam et al., (2015), cautions that teacher overload leads to mistrust. Not only must a leader attend to interactions with teachers, but the leader must also be intentional with relationship building between teachers. Principals build relationships by creating a set of shared experiences for teachers (Lancaster & Di Milia, 2015). Balyer, Özcan, & Yildiz (2016) call relationship-building social attractiveness. Principals in this study intentionally organized social activities to create better communication, trust, and social attractiveness. Teachers need the opportunity for mutual sharing of teaching to build relationships (Zhang et al., 2017). The time spent together can be personal and job-related. Hallam et al., (2015) states that teachers need time to share personal pieces of their lives, such as family events, personal interests, and other aspects. The leader can also ensure relationship building by protecting time allotted for discussion of teaching and learning (Cherkowski, 2016). Finally, the physical arrangement of the school can encourage relationships by making sure that teachers have physical access to one another (Ahn, 2017). Teachers at the research site noted that the

arrangement of the school allowed them easy access to one another. The principal is not the only one who can make intentional efforts to build relationships and trust. The literature suggests ways in which teachers can also be deliberate in relationship building.

Teachers can build trust by listening carefully to the complete thoughts of their colleagues (Hallam, Smith, Hite, Hite & Wilcox, 2015; Cherkowski, 2016). When benevolent and open, teachers allow colleagues to feel safe to share struggles and successes. Teachers must be able to openly express themselves to generate dialogue (Zhang, et al., 2017). Ahn suggests that casual conversation is the gateway to building trust (2017). A safe environment allows the teacher to share failure, uneducated questions, and to have views contrary to their colleagues without being afraid (Lancaster & Di Milia, 2015). In other words, it allows for difficult conversations that move learning forward (Cherkowski, 2016). Finally, teachers build trust by avoiding telling others what they should do (Ahn, 2017). These findings provide teachers with an understanding of what they can do to build trust with their colleagues.

The research makes it clear that if teachers are to use data to alter instruction, there exists a need to make sure relationships are healthy. Data alone cannot cause instructional change. The interaction of individuals to make meaning of data and share instructional practice to create sound actions for instruction is imperative. Teachers who trust one another and their leaders are more likely to use their full capacity (Kalkan, 2016). Thus, this researcher recommends that attention to relationships be a common practice in the district.

Build Data and Assessment Literacy

The study at the research site provided evidence that there is a need for data literacy training. However, the literature reveals two types of training that may be necessary. Some teachers felt they did not have confidence when creating assessments, such as CFAs, and questioned how well aligned the assessments they created were to the standards. This skill is considered assessment literacy. Assessment literacy is defined by Mertler (2003) as "The readiness of a teacher to design, implement, and discuss the assessment strategies, measurement tools, evaluation criteria, decision making milestones, as well as formative and summative tests" (As cited in Mellati & Khademi, 2018**)**.

On the other hand, teachers and the district professional development coordinator suggested that support should be given to teaching how to interpret data accurately and what it tells about a student, such as the Star assessment. This ability is considered data literacy, defined as "The ability to transform information into actionable instructional knowledge and practices by collecting, analyzing, and interpreting all types of data" (Gummer & Mandinach, 2015, p. 2). While it is apparent in the research results, that teachers were not feeling confident in these two types of literacy, the literature review also suggests why it is essential for teachers to have both data and assessment literacy.

These literacies result in many benefits in instructional practice. First, if teachers want to know if the pedagogy and curriculum materials are useful, assessment knowledge affords this (Mellati & Khademi, 2018**)**. Mellati and Khademi (2018) also found that literate instructors gave feedback more readily, used a variety of assessments in a less

intrusive way, considered what student interests were, and spent more time interacting with learners. Teachers who were not confident in assessment literacy tended to take a more traditional approach. These illiterate teachers also tend to place blame on poor student performance elsewhere (Mellati & Khademi, 2018**)** and are less reflective (Ashraf & Zolfaghari, 2018). Thus, the benefits of ensuring teachers have an assessment and data literacy are numerous.

Data and assessment literacy provide essential skills for teachers. Despite this, the research shows that the data level of teachers, in general, is low (Schildkamp, Poortman & Handelzalts, 2016) and teachers do not have the skills to construct their tests (Yan & Cheng, 2015). Through a collaborative approach, teachers need to develop and increase their data and assessment literacy (LaPointe-McEwan, DeLuca, Klinger, 2017). It is not only crucial for teachers, but principals and other leaders need to possess these skills as well (Lapointe-McEwan, DeLuca, Klinger, 2017).

Many studies have been done to see how data and assessment literacy skills can be improved. Many of those studies included intentional intervention programs. In one study, pre-service teachers were taught data literacy through a data chat. Teachers were engaged in using real data to learn how to analyze, assess and act. Their confidence to read and interpret data increased and they were able to use data to alter instruction (Dunlap and Piro, 2016). A second study used an external data coach too, and teachers worked collaboratively using the data from their classrooms (Ebbeler, Poortman, Schildkamp & Peters, 2017). Kippers et al., (2017) conducted an intervention in which the leaders, teachers and a data expert worked together to solve a problem of practice at

the school site. The results were an increase in attitudes about data use and data-based decision making. In an Australian case study, the college prepared in-service teachers for data use by having them take a data literacy course and then following that with a five-week professional experience in a local school. The preservice teachers showed an increase in data use confidence (Carey, Grainger, Christie, 2018). These studies are an example of interventions schools have conducted and the positive results that occur. District leaders can take the following recommendations under advisement as they are related to data and assessment literacy.

First, Lapointe-McEwan et al., (2017) note the importance administration must place on all data, including qualitative classroom data. This study found it critical to include qualitative classroom data, as well as quantitative, and that leaders communicate this message to teachers. Also, literacy instruction should use the teachers own data to inform their learning, as this will help them engage with the data and learning in a meaningful way. In addition to knowledge about data, teachers also need time to develop their content and instructional pedagogy. The curriculum, instruction and assessment piece must be viewed cohesively (Mellati & Khademi, 2018). Finally, Lapointe-McEwan, DeLuca, and Klinger added that outside expertise helped teachers engage in the learning purposely. There is a need for increased levels of teacher literacy regarding data. The next section will more clearly explain recommendations for professional development that lead to teacher buy-in and understanding.

Contextual Learning

The research study at the local site suggested a need for professional development that would support data use and understanding, with both assessment literacy and data literacy. Teachers felt that time to develop these skills at a school and district level could be beneficial. The literature review suggests that there are many advantages to offering building-based professional development.

While teachers can learn about teaching and learning from outside entities, they must have time to spend within their practice as well (Lund, 2018). First, when teacher work and learn in teams, they create shared understanding, have timely discussions to address instructional issues effectively, help share the responsibilities, provide shared expertise, and bring new instructional ideas for altering lessons (Gao & Wang, 2014). Working in teams can help teachers narrow in on a problem of practice. For example, in a study by Lund (2018), the group wanted to improve interpersonal communication with students. The team had in-service training, but also took advantage of the opportunity to observe one another with a focus on interpersonal interaction. This practice had the added benefit of making teacher beliefs more transparent.

Horn et al., (2017) conducted a study in which the researcher has studied teacher interactions during team meetings. They learned that site-based teacher team boosts teacher engagement with new instructional practice. Many types of conversations existed, from those that merely focus on pacing to those that analyzed student work to understand misconceptions and discuss how to attend to this instructionally. The researcher referred to these as collective interpretation meetings. The most involved of these led to

instructional change (although not all did). In these high depth meetings, there was dialogic discourse exchange among multiple participants, addressing problems of practice, troubleshooting, and addressing of future work.

Several studies revealed the advantages of school-based professional development. The first was a study in Israel in which school improvement was part of a reform movement. While there were two areas of focus, one was school-based professional development. Since it was a reform, the initiative took a top-down approach with the workshops conducted by an external expert. However, the principal decided on presentation topics. This PD was to enable the school to meet their own needs, which would result in uniform pedagogical language and engage teachers in collaborative learning. When the teachers in this study learned in this way, they were able to construct a new language together. This example is the first of several advantages found with school-based PD (Avidov-Ungar, 2016). A case-comparison study of two schools provided support for contextual PD.

One school leader led in a top-down manner and the other centered more on the needs of the teachers. In the traditional setting, the focus was more on accountability. Thus, teachers were less likely to focus on improvement, but rather, focused on doing well on the test. In the teacher-centered approach, school-based learning occurred to work on instruction and an inquiry approach was used. This research showed teachers should not just be in a lecture style PD, but rather an interactive one that allows them to make meaning together. When teachers were allowed freedom to experiment with new learning, they could create their understanding behind why certain instructional practices

worked or did not work. These teachers did use the support of external experts and leaders. The study found that teachers need professional resources and leader support for innovation (Zhang & Wong, 2018). A final study showed that curriculum and assessment requirements alone could not change instruction. However, just providing classes and district level support did not either. When leaders combined classes and district level support with a positive teacher team that discussed, generated ideas and reflected, the move to inquiry occurred (Gao & Wang, 2014). This study also showed the importance of alignment to curriculum and instruction. Thus, there are many benefits to school-based PD. However, according to the literature, if school-based PD is to be successful, some characteristics must be considered.

An initial consideration is that teachers should have an active part in the planning of PD so that it is relevant and supports teachers through empowerment. Teachers must remain involved through to the evaluation portion of the PD. The goals and objectives of PD should be communicated clearly and be with the participants to create meaning, motivation and a sense of achievement. They should also be measurable (Avidov-Ungar, 2016). Professional development should also include collaboration and reflection. Teachers must collaborate, use a problem of practice from their context, and use a concrete and explicit set of steps during data analysis. (Ebbeler, Poortman, Schildkamp & Peters, 2017) After learning, a study by Zhang and Wong (2018) noted that teachers must be able to experiment with new ideas in order to synthesize new learning. Teachers also need time to explore and reflect. Lapointe-McEwan et al., (2017) discovered that using experts to support the learning creates learning that is directed and purposeful. Leaders

may also generate successful PD when an outside data coach works with teachers using data from their context (Ebbeler et al. 2017). Zhang, Yuan, and Yu (2017) also supported the use of external experts. Finally, one study suggested the benefit of finding ways to bring current research to teachers, as opposed to teachers seeking out the research. This recommendation was a result of the time it takes for teachers to do so (Lapointe-McEwan, DeLuca, Klinger, 2017). The research suggests many ways to make internal PD successful and provide the most benefit to teachers.

The research shows support for existing practices at the research site, as well as considerations for improvements. There are limitations to this study, as the research was taken from a case-study of one school. It might be necessary to seek further information, particularly regarding data and assessment literacy, from other elementary schools in the research district.

Conclusion

This research reveals the problem of the practice of teacher data use and the ability to use data to alter instruction, at both a national and local level. This study delved into the local practice, via a case study, and discovered what teachers relied on for data, how teachers used data, and what factors were perceived to inhibit or support data use to alter instruction. Based upon both inhibiting and supporting factors, a further literature review provided insight to me for providing recommendations for closing the gap between data use and altering instruction.

Evaluation of Project Study

1. What was most helpful about this research?
2. What questions remain unanswered for you regarding this topic and the themes therein?
3. If you could request additional research on this topic, what might it be? Why would that research be beneficial?

References

Ackoff, R. L. (1989). From data to wisdom. *Journal of Applied Systems Analysis, 16,* 3-9.

AdvancEd. (2015). Report of external review team. 2016 Advanced Education, Inc.

Ahn, J. (2017). Taking a step to identify how to create professional learning communities: Report of a case study of a Korean public high school on how to create and sustain a school-based teacher professional learning community. *International Education Studies, 10*(1), 82-92. doi:10.5539/ies.v10n1p82

Ashraf, H. & Zolfaghari, S. (2018). EFL Teachers' assessment literacy and their reflective teaching. *International Journal of Instruction, 11* (1), 425-436. doi: 10.12973/iji.2018.11129a

Avidov-Ungar, O. (2017). School-based professional development as an organizational learning mechanism: The significance of teachers' involvement. *International Journal of Educational Reform,* (1), 16. Retrieved from https://ezp.waldenulibrary.org/login?url=https://search.ebscohost.com/login.aspx?direct=true&db=edsgea&AN=edsgcl.459423912&site=eds-live&scope=site

Balyer, A., Özcan, K., & Yildiz, A. (2017). Teacher empowerment: School administrators' roles. *Eurasian Journal of Educational Research,* (70), 1-18. doi: 10.14689/ejer.2017.70.1

Carey, M., Grainger, P. &Christie, M. (2017). Preparing preservice teachers to be data literate: A Queensland case study. *Asia-Pacific Journal of Teacher Education, 46*(3), 267-278. doi: 10.1080/1359866X.2017.1402860

Cherkowski, S. S. (2016). Exploring the role of the school principal in cultivating a

professional learning climate. *Journal of School Leadership, 26*(3), 523-543.

Datnow, A., Park, V., & Kennedy-Lewis, B. (2013). Affordances and constraints in the context of teacher collaboration for the purpose of data use. *Journal of Educational Administration*, *51*(3), 341-362. doi: 10.1108/09578231311311500

Decorte, T., Malm, A., Sznitman, S. R., Hakkarainen, P., Barratt, M. J., Potter, G. R., … Frank, V. A. (2019). The challenges and benefits of analyzing feedback comments in surveys: Lessons from a cross-national online survey of small-scale cannabis growers. *Methodological Innovations*. doi: 10.1177/2059799119825606

Dunlap, K. & Piro, J. (2016). Diving into data: Developing the capacity for data literacy in teacher education. *Cogent Education, 3*(1), 1-13. doi-org.ezp.waldenulibrary.org/10.1080/2331186X.2015.1132526

Ebbeler, J., Poortman, C. L., Schildkamp, K., & Pieters, J. M. (2017). The effects of a data use intervention on educators' satisfaction and data literacy. *Educational Assessment, Evaluation and Accountability*, *29*(1), 83–105. Retrieved from https://ezp.waldenulibrary.org/login?url=https://search.ebscohost.com/login.aspx?direct=true&db=eric&AN=EJ1131337&site=ehost-live&scope=site

Farley-Ripple, E. and Buttram, J. (2015). The development of Capacity for data use: The role of teacher networks in an elementary school. *Teachers College Record, 117*(4), 1-34.

Gao, S., & Wang, J. (2014). Teaching transformation under centralized curriculum and teacher learning community: Two Chinese chemistry teachers' experiences in developing inquiry-based instruction. *Teaching and Teacher Education, 44*, 1–11.

doi-org.ezp.waldenulibrary.org/10.1016/j.tate.2014.07.008

Gummer, E., & Mandinach, E. (2015). Building a conceptual framework for data literacy. *Teachers College Record, 117*(4).

Hallam, P., Smith, H., Hite, J., Hite, S., & Wilcox, B. (2015). Trust and collaboration in PLC teams: Teacher relationships, principal support, and collaborative benefits. *NASSP Bulletin, 99*(3), 193-216. doi:10.1177/0192636515602330

Horn, I. S., Garner, B., Kane, B. D., & Brasel, J. (2017). A taxonomy of instructional learning opportunities in teachers' workgroup conversations. *Journal of Teacher Education,68* (1), 41. doi:10.1177/0022487116676315

Huguet, A., Marsh, J. A., & Farrell, C. C. (2014). Building Teachers' Data-Use Capacity: Insights from Strong and Developing Coaches. *Education Policy Analysis Archives*, *22*(52). doi: 10.14507/epaa.v22n52.2014

Kalkan, F. F. (2016). Relationship between professional learning community, bureaucratic structure and organisational trust in primary education schools. *Educational Sciences: Theory & Practice, 16*(5), 1619-1637. doi:10.12738/estp.2016.5.0022

Kekahio, W., & Baker, M. (2013). *Five steps for structuring data-informed conversations and action in education*. (REL 2013-001). Washington, DC: U.S. Department of Education, Institute of Education Sciences, National Center for Education Evaluation and Regional Assistance, Regional Educational Laboratory Pacific. Retrieved from http://ies.ed.gov/ncee/edlabs

Kippers, W. B., Poortman, C. L., Schildkamp, K., & Visscher, A. J. (2018). Data literacy:

What do educators learn and struggle with during a data use intervention? *Studies in Educational Evaluation, 56*, 21–31. doi:10.1016/j.stueduc.2017.11.001

Lancaster, S., & Di Milia, L. (2015). Developing a Supportive Learning Environment in a Newly Formed Organisation. *Journal of Workplace Learning, 27*(6), 442-456. doi:10.1108/jwl-08-2014-0061

LaPointe-McEwan, D., DeLuca, C., & Klinger, D. A. (2017). Supporting evidence use in networked professional learning: the role of the middle leader. *Educational Research*, *59*(2), 136–153. doi:10.1080/00131881.2017.1304346

Lund, L. (2018). When school-based, in-service teacher training sharpens pedagogical awareness. *Improving Schools,*1-15. doi-org.ezp.waldenulibrary.org/10.1177/1365480218772638

Malone, E. A., & Wright, D. (2018). “To promote that demand”: Toward a history of the marketing white paper as a genre. *Journal of Business and Technical Communication*, *32*(1), 113–147. doi:10.1177/1050651917729861

Marsh, J. A., Bertrand, M., & Huguet, A. (2015). Using data to alter instructional practice: The mediating role of coaches and professional learning communities. *Teachers College Record, 117*(4). Retrieved from https://eric.ed.gov/?id=EJ1056829

Marsh, J. A., & Farrell, C. C. (2015). How leaders can support teachers with data-driven decision-making: A framework for understanding capacity building. *Educational Management Administration & Leadership*, *43*(2), 269-289. doi: 10.1177/1741143214537229

Mellati, M., & Khademi, M. (2018). Exploring teachers' assessment literacy: Impact on learners' writing achievements and implications for teacher development. *Australian Journal of Teacher Education, 43*(6), 1–18. Retrieved from https://files.eric.ed.gov/fulltext/EJ1183660.pdf

Schildkamp, K., Poortman, C. L., & Handelzalts, A. (2016). Data teams for school improvement. *School Effectiveness & School Improvement, 27*(2), 228–254. doi-org.ezp.waldenulibrary.org/10.1080/09243453.2015.1056192

Senge, P. M. (2006). *The fifth discipline: The art and practice of the learning organization*. New York, NY: Currency Doubleday.

Wells, C. M., & Feun, L. (2013). Educational change and professional learning communities: A study of two districts. *Journal of Educational Change, 14*(2), 233-257. doi:10.1007/s10833-012-9202-5

Yan, Z. & Cheng, E. C. K. (2015). Primary teachers' attitudes, intentions and practices regarding formative assessment. *Teaching & Teacher Education, 45*, 128–136. doi:10.1016/j.tate.2014.10.002

Zhang, X., & Wong, J. N. (2018). How Do Teachers Learn Together? A Study of School-Based Teacher Learning in China from the Perspective of Organisational Learning. *Teachers and Teaching: Theory and Practice, 24*(2), 119-134. doi:10.1080/13540602.2017.1388227

Zhang, J., Yuan, R., & Yu S. (2016). What impedes the development of professional learning in China? Perceptions from leaders and frontline teacher in three schools

in Shanghai. *Education Management Administration & Leadership*, *45*(2), 219-237. doi:10.1177/1741143215617945

Appendix B: Professional Learning Communities Observation Protocol

PLC Team Observation Protocol

Team #_____

Date _____

Field Note #- Time start: Time Stop:	Type of data used	Interactions and Dialogue	Data Discoveries	Team Response to Data	Additional Notes
Phase One- Accessing Data					
Phase Two- Analyzing the Data to Turn It into Information					
Phase Three- Combining the Data with Understanding and Expertise (Forming Actionable knowledge)					
Phase Four-Using That Knowledge to Act					

Examples of:

Phase One-teachers bring data to share, it may be student work, summarized results or in other forms.

Phase Two-Teachers say what the data tells them about student learning-what students have and haven't learned.

Phase Three-Teachers identify a gap in practice-combine knowledge with data, such as identifying a gap in curriculum, or realizing a missing component in instruction. (The dialogue shifts to instruction) This phase entails teachers discussing lessons and what may or may not have contributed to student success.

Phase Four-Teachers make decisions about actions they will take instructionally. Teachers may produce a new instructional practice, changing lesson plans or pacing, decision to research additional ideas (Dialogue shifts to actions to be taken)

Appendix C: Teacher Interview Questions

Teacher Interview Questions

1. What common beliefs and values do you and your teammates share about data use to alter instruction?
2. How do you build collective efficacy, or the belief that your influence extends to ALL students? (Describe as actions)
3. How do you decide which data to use to gain the most access to student thinking?
4. How do you hold each other accountable in your PLCs? (For data gathering, attendance, participation)
5. What type of training do you need to use data more effectively to change instruction?
6. How did you learn to integrate curriculum, instruction, assessment and data?
7. How have you learned to interact with your colleagues and ask the right questions about the data?
8. Explain your perception of your ability to access and compile data.
9. How do you and your team decide what questions to ask about your data so that it can inform instruction?
10. What PD have you received on data use and data to alter instruction?
11. What are some barriers to using data to make instructional changes?
12. How do you feel your leader and the central office have supported your efforts to effectively use data in your PLC?

13. How do you bring new teachers on board and what support are they given for the PLC/Data process?
14. What do you do when you and your partners do not know any new or different ways to teach something?
15. Who do you seek help from if you need content, instructional or data support?
16. How do you and your colleagues reach consensus or challenge each other's assumptions?
17. Please expound on as many possible ways as you can about what your team does, or decisions it makes, because of analyzing data.
18. How aware are you of the goals of your action plan? If so, how do you support your goals through PLC work?
19. What informational data systems do you have access to?
20. How do you hold on to new learning from your PLC meetings from one year to the next?

Appendix D : Principal Interview Questions

Principal Interview Questions

1. Please describe your shared values, norms and goals, how they were established, and how they are communicated?
2. What is the district vision for data use and how do you translate it into expectations for your teachers?
3. Please describe your leadership style and how it contributes to the work of your school PLC teams? (For follow up: how you share decision making, level of teacher autonomy, and how you encourage problem solving)
4. What expectations do you set related to data use and how and when do you communicate those expectations?
5. What actions do you take to support data use and the inquiry process in PLC work? How do you know which teachers and teams need additional support?
6. How do you build collaboration skills and the teachers' ability to use critically reflective dialogue? (I.E.-challenge each other with questions, respectfully contradict and to elaborate.)
7. How do you build trust between teachers so that they feel free to share data and practices among themselves?
8. What professional development opportunities have you provided for teachers to use PLCs as a tool to use, analyze and interpret data to make instructional decisions?
9. How do you respond when a PLC is not meeting your expectations?

10. What has been your personal training on PLCs and data use and how do you use that training to support data use in PLCs? (Follow up: Please mention who if support)-hidden
11. How do you support teachers who are reluctant to change?
12. Please describe if your focus on data tends to be more on achievement for accountability purposes or growth? Explain.
13. How do you model data use with teachers? Please describe as many ways as you can.
14. How do teachers in your school share new knowledge about content and instruction gained during PLC time?
15. Teachers have many mental models of the purpose of data and how it should be used. How do you develop a common understanding about the expected goals and purposes of school-wide data use?

Appendix E: Professional Development Director Interview Questions

Professional Development Director Interview Questions

1. How are PLC expectations and strategies communicated to leaders?
2. Do you believe our district has more of a proving stance or improving stance about data? What might be some reasons you believe that?
3. How does the district create and communicate a shared purpose, mission and vision?
4. In what ways has the district attempted to be systematic in training teachers to perform in PLCs and to use data for instruction?
5. What efforts have been made to sustain understanding of how to use data? (Such as new teachers, and teachers new to the district)
6. What resources can teachers access to learn about assessments, data analysis, and altering instruction based on data?
7. What is the district's expectation for teachers meeting in a PLC, such as agenda items and how many times and the duration of those meetings?
8. Do you believe our district is richly coordinating a PD effort around PLC work and data use? Please explain.
9. How does the district focus on system coherence? How do you communicate a consistent vision and expectations for data use?
10. When knowledge is gained in a grade level PLC, how might it be communicated to the district curriculum coordinators?
11. In what ways does the district support teachers in gaining access to data?

12. How do you make professional development on PLCs timely and contextual?

13. How does the district make use of internal expertise on data and PLCs?