

The Influence of Participation in Structured Data Analysis on Teachers' Instructional Practice

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Boston College
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Program in Educational Leadership

THE INFLUENCE OF PARTICIPATION IN STRUCTURED DATA ANALYSIS ON
TEACHERS' INSTRUCTIONAL PRACTICE

Dissertation

by

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The Influence of Participation in Structured Data Analysis on Teachers' Instructional
Practice

by

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ABSTRACT

The current high stakes testing environment has resulted in intense pressure on schools to become more data-driven. As a result, an increasing number of schools are implementing systems where teachers and school leaders collaboratively analyze assessment data and use the results to inform instructional practice. This study examined how teacher participation in the analysis of assessment data influences instructional outcomes. It also examined how levels of capacity in the areas of data use, professional learning, and leadership interact to influence the ability to respond to data. The method is a qualitative case study of an elementary school in the southeastern United States that has implemented formal structures for analyzing and collaborating around assessment data. Data collection occurred through teacher and administrator interviews, data analysis meeting observations, and through the examination of school and district documents.

The school in this study responded to data analysis results through three major actions: large-scale initiatives designed to improve instruction in various content areas, remediation, and individual teacher variations in instructional practices. Findings show that while teachers express support for data analysis and suggest positive benefits for the school, they also indicate that participation in data analysis and the resultant improvement efforts have had minimal to modest impact on their teaching practices.

Possibly contributing to this outcome was the finding that the school had uneven capacity in the areas of data use, professional learning, and leadership. The school has a well-developed system for data access and reporting. However, it has been less successful in providing the professional learning experiences that will enable more substantial changes in teacher beliefs and practices. Furthermore, a lack of clarity regarding the instructional purpose of data analysis from multiple levels of district and school leadership and the procedural nature of the data analysis process has reduced the ability of school leaders to effectively leverage data analysis for the purpose of substantive and sustained instructional improvement.

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CHAPTER ONE: INTRODUCTION

Statement of the Problem

The enactment of the No Child Left Behind Act (NCLB) heralded a new era in educational reform. Never before has a piece of legislation placed such stringent requirements on states and school districts for the academic improvement of all students, and never before has failure to meet federally mandated standards had such drastic consequences for schools. The act requires annual state testing of all students in grades three through eight and at least once in grades ten through twelve. Moreover, disseminated test results must be disaggregated by factors such as race, gender, English proficiency, and socioeconomic status with the school demonstrating a predetermined measure of adequate yearly progress toward a goal of universal proficiency by 2014 for each subgroup. A school's failure to meet targets in any category can result in the eventual initiation of increasingly severe sanctions including state takeover or reopening as a charter school (U.S. Department of Education, 2002).

The consequences for inadequate progress place schools in an increasingly perilous position, especially when the results of the 2007 National Assessment of Educational Progress (NAEP) are considered. Although the results demonstrate a statistically significant increase in performance at or above the basic level across virtually all racial subgroups in reading, a substantial achievement gap persists between Whites and Asians and their Black and Hispanic counterparts. Even lower levels of achievement occur among English language learners and students with disabilities (National Center for Education Statistics, 2007). While the NAEP is not the measure by which adequate yearly progress for individual states is determined, its nationally representative sample

indicates that without substantial intervention, schools across the country will increasingly fail to meet performance targets set by NCLB.

One of the principal means by which policymakers and education reform advocates contend that educators should respond to the challenges imposed by NCLB is to become data-driven. In recent years, this term has become a ubiquitous addition in the educational lexicon. It is often stated that schools should engage in data-driven decision making or that data should inform instruction. The intense focus on data has come as a result of the severe consequences associated with failing to make adequate yearly progress toward universal achievement targets. Schools ignore data at their own peril. Halverson, Grigg, Pritchett, and Thomas (2005) define data-driven instruction as a process that “helps translate the results of summative testing into formative information teachers can use to improve instruction” (p. 8). This definition reflects an intuitive logic in the data-driven mantra: When schools engage in data analysis, they have a more in-depth understanding of specific student strengths and weakness. As a result, they can target teaching and instructional improvement efforts to directly address those weaknesses. However, although logical, the premise rests on a massive assumption. It assumes that teaching will change as a result of participation in data analysis, and, herein lies the heart of the problem. There is growing consensus among educational researchers that the problem of school improvement is primarily a problem of practice. The most powerful and effective way to effectuate meaningful change in schools is to implement high quality instructional delivery systems. However, teaching beliefs and practices are notoriously difficult to change (Elmore, 2000, 2003; Fullan, 2001). Cohen’s (1990) case study of Ms. Oublier demonstrates the complexity of reconciling traditional pedagogical

beliefs with new instructional approaches for even the most motivated teachers. The author states:

Teachers and students who try to carry out such change are historical beings. They cannot simply shed their old ideas and practices like a shabby coat and slip on something new. Their inherited ideas and practices are what teachers and students know, even as they begin to know something else. Indeed, taken together those ideas and practices summarize them as practitioners. As they reach out to embrace or invent a new instruction, they reach with their old professional selves, including all the ideas and practices comprised therein. The past is their path to the future. Some sorts of mixed practice, and much confusion, therefore seem inevitable (p. 323).

Therefore, one must ask the question, “Does participation in data analysis change the way teachers teach?” America is by no means suffering from a lack of innovations intended to transform the process of teaching and learning. The past century of educational reform is replete with numerous examples of educational innovations that were intended to revolutionize the process of teaching and learning that ultimately ended up on the trash heap of history (Kliebard, 1995; Tyack & Tobin 1994). One possible reason for these unsuccessful outcomes may be that policy-driven reforms that characterize shifts in education often focus on structural elements such as scheduling, incentive pay, certification requirements, and technology but only affect the periphery of the technical core of schools, which encompasses the essential features of teaching and learning such as instruction and assessment practices (Elmore, 2000). As the case of Ms. Oublier demonstrates, old practices die hard. The regularities of schooling persist

despite even the most sincere intentions of policymakers to alter them because they do not adequately address the technical core. Contrastingly, innovative practices developed by researchers and practitioners often are substantiated by empirical research but are often small-scale, context-specific, and, when they are adopted on a large scale, are often altered and watered down so severely, they bear little resemblance to the original (Elmore, 1997). Policy and research on strong instructional practices and the leadership characteristics that promote them are comparable to the proverbial two ships passing in the night. Both have the same destination, but they travel in vastly different directions with each seemingly unaware of the other.

Data-driven decision-making appears to be a very commonsense, logical approach to school improvement. On its face, the concept seems to have great potential for improving instructional and student achievement outcomes. However, when one examines it more closely, numerous potential caveats emerge that complicate the fairly straightforward process usually presented by policymakers. If data-driven decision making does not have a strong influence on the technical core of schools, it is very likely to join the long procession of promising school improvement initiatives that eventually faded into obscurity. Central to these concerns is the issue of capacity. Within schools, the conditions must be present for data analysis to substantively influence instructional practice. Specifically, different strands of research indicate schools should have the capacity to use data well, to develop their instructional practice through professional learning, and leadership that fosters a culture that promotes development in the two aforementioned areas (Datnow, Park, & Wohlstetter, 2007; Fullan, 2001; Lachat & Smith, 2005; Putnam & Borko, 2000; Rosenholtz, 1989). However, there is very little

research that seeks to examine how data analysis influences instructional outcomes and how issues of capacity affect this process. As a result, there is very little understanding of how the push for schools to become data-driven actually impacts instruction and how various levels and types of capacities interact to influence this process.

Purpose

The purpose of this study was to explore how the analysis of assessment data influences instructional practices in a school that has implemented formal structures for data examination. Formal structures include regularly scheduled meetings where teachers discuss assessment data and student work or special groups of teachers and administrators known as data teams that meet to discuss, organize, and interpret student achievement data. This study also took the position that student learning can be assessed through a variety of methods beyond traditional tests. Therefore, in this study, assessment data refers to any assignment or test that provides insight into student learning. Thus, traditional summative and formative assessments are included in this conceptualization as well as regular classroom assignments such as writing samples or student projects. Furthermore, this study sought to ascertain the school's relative levels of capacity in the areas of data use, professional learning, and leadership for the purpose of determining how these areas influence the school's ability to respond to data. The study is guided by the following research questions.

1. How does participation in formal data analysis processes influence instructional beliefs and practices?
2. How does a school's capacity in the areas of data use, professional learning, and leadership affect its ability to respond to assessment data?

Significance of the Study

The current educational policy environment will necessitate that the examination of student achievement data become an increasingly entrenched element of educators' professional practice. As the adequate yearly progress targets of No Child Left Behind increase each year, a burgeoning number of schools will find themselves in danger of being sanctioned for not meeting progress objectives. However, even if the U.S. Congress acts to alter progress benchmarks or reduce the severity of consequences in a future reauthorization of the Act, it will not ameliorate the need to respond effectively to assessment data, for numerous states have developed accountability systems with consequences similar to NCLB. Furthermore, international tests such as the Programme for International Student Assessment (PISA) continuously rank the U.S. relatively poorly when compared to its international peers (Baldi, Jin, Skemer, Green, & Herget, 2007) leading to a steady stream of criticism by politicians and business leaders regarding the inability of schools to provide an education that will allow the U.S. to maintain its economic dominance. These criticisms are usually accompanied by calls to increase the amount and rigor of testing. Therefore, it appears the push to become data-driven will not diminish at any point in the near term.

In response, many districts are implementing measures to improve their capacity to analyze and respond to data (Datnow, Park, & Wohlstetter, 2007; Sanchez, Kline, & Laird, 2009). However, the attainment of substantive and sustainable achievement gains will ultimately depend upon whether or not the data analysis process leads to instructional improvement. The significance of this dissertation study lies in its goal to extend beyond the analysis phase that is the emphasis of most studies to develop an

understanding of whether and how data influence instructional processes. By exploring the effect of data use on instruction, researchers can develop an understanding of the efficacy of current data analysis approaches. As a result, one can begin to answer the question: Are data driving instruction? The findings of this study not only have the potential to answer this question, but it may also provide insight into how schools may more effectively link data analysis to instructional improvement objectives, an outcome that addresses a major gap in currently published research.

Another significant contribution of this study derives from its conceptual approach. Not only does this study seek to determine whether and how data influence instruction, it also seeks to determine how relative levels of capacity in three key areas function as intervening elements that affect the degree and nature of instructional change. Very little literature attempts to synthesize scholarly research on effective data use, professional learning, and effective leadership to create an analytical framework for examining the level of influence data use has on instructional processes. This conceptualization is intended to allow for a holistic analysis of the impact of data use on instruction. The insights gained from these findings have the potential to lead to new paradigms for data analysis that place an explicit emphasis on developing schools' levels of capacity in the identified areas.

Beyond the policy, leadership, and organizational implications associated with this study, there is also a strong moral imperative related to a school's ability to recognize student weaknesses highlighted by student achievement data and the school's ability to develop an effective instructional response. Achievement gaps persist between most minorities and their White counterparts and low-income students and their wealthier

peers (McKinsey & Company, 2009). While educators have no control of the external factors that may influence disparities in student achievement, they can control the context of schooling. Educators do have the ability to set high expectations for student achievement and instructional quality. Schools can also do much to develop cultures of collective accountability for student outcomes and a no excuses philosophy when students do not learn well. Thus, even though legitimate arguments can be made regarding the multiplicity of factors that perpetuate achievement gaps, schools still have substantial control over what this study considers to be their most potent weapon – the quality of the teaching and learning experience. Educators have a moral obligation to ensure that the quality of one’s education is not predetermined by geography, social class, or genetics. The use of data for instructional improvement can play a major role in ensuring this imperative is met. Through the insights gained in this study, schools can potentially develop more effective ways to link data analysis to instructional change and improvement through a greater focus on developing their capacity to respond effectively. When schools are able to change the way they teach to better meet the instructional needs of students, there may also be a concurrent increase in achievement for students who historically, have struggled the most, an outcome that can potentially begin to bridge the achievement gap. The results of this study may contribute to this process of understanding how best to go about the process of instructional change.

However, this dissertation study, by design, does not focus on student achievement. The major objective of the research is to determine the extent to which instruction changes as a result of data analysis. These changes may or may not lead to enhanced student achievement. While an analysis of student achievement would provide

additional insight into the efficacy of instructional interventions instituted in response to the examination of data, such an analysis extends beyond the scope of this dissertation. Furthermore, it would be somewhat premature to examine achievement when the nature and extent of instructional change as a result of data analysis is not completely known. Even if it were found that student achievement improves as a result of data analysis, the factors that lead to those gains would inevitably have to be explored if the findings are to have any practical value. This research is intended to be a first step. It seeks to ascertain the impact of data on one of the most intractable issues of educational reform – changing teaching practice. Thus, the results of this dissertation have the potential to inform future studies that seek to explore the impact of data analysis on student achievement.

Theoretical Orientation

To develop an understanding of the nature of the influence of structured data analysis on teachers' instructional practice, there must also be an understanding of the nature of learning that emerges as a result of participation in data analysis. Therefore, this study draws upon the organizational learning theory of Argyris and Schön (1974, 1978, 1996). Argyris (2002) defines learning as “the detection and correction of error” (p. 206). Once an error is detected, the organization engages in a two tiered process of single or double-loop learning. Single loop learning occurs when an error is detected, and the organization seeks to correct the error without altering the governing variables or values that may be the underlying cause of the problem. The outcome of such learning may be alterations in operational processes or routines that may improve efficiency and short-term outcomes. Thus, there is a single feedback loop involving a direct connection between error detection and alteration of organizational actions. However, this type of

learning fails to adequately address deeper issues of organizational values that may cause problems to persist or reemerge (Argyris & Schön, 1996).

Double-loop learning, on the other hand, is a type of organizational learning that involves a change in governing variables which then lead to alterations of organizational action strategies. Thus, there is a double loop process. Argyris (1978) states:

Single loop learning can be compared with a thermostat that learns when it is too hot or too cold and then turns the heat on or off. The thermostat is able to perform this task because it can receive information (the temperature of the room) and therefore take corrective action. If the thermostat could question itself about whether it should be set at 68 degrees, it would be capable not only of detecting error but of questioning the underlying policies and goals as well as its own program. That is a second and more comprehensive inquiry; hence it might be called double loop learning. (p.116)

Double –loop learning is a much more reflective process that compels an organization to interrogate the organizational norms and values that inform its actions. By examining and, when necessary, altering organizational norms and values, the organization is better able to develop action strategies that are more likely to have a more meaningful effect on organizational outcomes.

This study takes the position that the process of instructional change is highly compatible with the single and double-loop learning process. When schools detect errors in the form of student learning problems, they may choose to engage in a single-loop process of remediation or curriculum revision that does not necessarily require any substantive alterations in instructional philosophy. In this instance, the problem is

believed to be the result of ineffective action strategies rather than organizational norms (Argyris & Schön, 1974, 1978). Alternatively, schools may choose to first critically reflect on their instructional philosophy and instructional support structures. When it is determined that there is fundamental incompatibility between those underlying instructional values and their expectations for student achievement, the school may alter those values and, resultantly modify the instructional program. The major distinction between the two approaches is a focus on reflection and inquiry into the underlying norms and values that influence instructional practice (Argyris & Schön, 1996). The school that engages in the latter double-loop process is one that is better able to make the substantive changes in instruction that have the potential to have more substantial and enduring effects on student achievement.

The implications for coupling data analysis with a double-loop learning process are substantial. First, data analysis is primarily a reflective process. Once student achievement issues are discovered, educators should reflect on curricular and instructional approaches to determine the adaptations needed to address learning problems. When this reflective process is double-loop, it may lead to a greater focus on reflection on instructional norms and assumptions, which may yield more comprehensive and in-depth approaches to improving student achievement. Double-loop learning processes may also yield more comprehensive changes in professional learning as schools seek to develop the capacity to make more meaningful changes to practices. These aforementioned adaptations may not be as extensive when organizational learning is a single-loop process. Therefore, single and double-loop learning theory will provide a useful framework for categorizing the types of organizational learning that takes place at

the study site as well as the types of instructional changes that emerge as a result of this learning.

Methodology

The study is a descriptive, analytic qualitative case study of a single elementary school in the southeastern United States that has implemented formal structures for teacher analysis of assessment data. Data collection methods included semi-structured interviews with teachers and administrators regarding the extent to which participation in structured data analysis has influenced their instructional beliefs and practices, school improvement objectives, and relative levels of capacity in the areas of data use, professional learning, and leadership. Observations of data analysis meetings were conducted to corroborate data obtained through interviews. Finally, document analysis also served as an additional means of corroborating interview and observation data.

Data analysis for the study occurred through a process of inductive coding that facilitated the development of central categories or themes. This inductive approach was particularly useful given the emergent nature of the data. A triangulation process was utilized to attend to issues of validity. The varied methods of data collection that were employed in the study allowed for comparison between data sources. As a result, teacher interviews were compared to administrator interviews, observation notes, and archival documents to identify inconsistencies that were further explored through a process of theoretical sampling.

Overview

The subsequent chapters of this dissertation provide an overview of the literature related to data analysis and instructional change as well as a description of the

methodology that will be employed in the study. The review of literature is primarily organized according to three broad areas of research – data use practices, professional learning, and leadership. This study presents the argument that schools’ relative levels of capacity in these three distinct areas influence the nature of their instructional response to assessment data, and, therefore, the review of literature is structured accordingly. The third chapter provides a detailed description of the proposed methodology, including rationale, data collection methods, and analytical methods. The fourth chapter details the findings obtained through data collection organized according to major themes. The final chapter discusses these findings and provides implications for practice, policy, and future scholarly research.

CHAPTER TWO: REVIEW OF LITERATURE

Overview

At the heart of the current push to introduce data-driven decision making and the implementation of formal structures for data analysis is the assumption that providing schools with access to data will lead to improved instruction and, resultantly enhanced student achievement. As previously stated, this premise is quite logical and reasonable. In fact, this study is grounded in the idea that improved instructional outcomes result in enhanced student achievement. However, as the long history of educational reform in this country demonstrates, logical and reasonable assumptions about educational improvement have a tendency to metamorphose into complicated quagmires when introduced to the reality of educational practice. One of the reasons, according to authors such as Fullan (2001) and Sarason (1996) is that such initiatives tend to address programs and structures but fail to substantively influence the beliefs and practices that nourish the technical culture of schools, which refers to “views of students, conceptions of subject content, beliefs about student learning, and understanding of effective pedagogy and assessment” (McLaughlin & Talbert, 2006, p. 18). Currently, it is unclear how or even if formal structures for data analysis actually influence schools’ technical cultures. There is very little empirical research that seeks to provide an in-depth understanding of this specific issue, but there is a substantial amount of literature on topics that have direct bearing on issues related to the implementation of data-driven processes and instructional change.

As a result, this review of literature seeks to examine three specific areas of research to make the following argument: If data-driven decision making is to have a

significant influence on the improvement of the instructional program, which presumably will improve student achievement, schools must have sufficient capacity in three areas. The first is data use capacity. Schools must have the capacity to use data well. Data must be presented in a manner and within a receptive culture that facilitates its effective utilization. Secondly, the school must have sufficient capacity for professional learning. Professional learning must be conceived of broadly, collaboratively, situated in practice, and increase teachers' subject matter and pedagogical content knowledge. Finally, schools must have leadership capacity. Leaders must establish a culture of learning and ensure commitment and coherency to school improvement objectives. It is argued that when these three areas are sufficiently developed, schools will be more able to gain insight from assessment data and be better positioned to alter the instructional program in a manner that has a meaningful and sustainable impact on student achievement.

Theoretical Orientation

A school's capacity to learn from the examination of assessment data in a way that allows it to adapt instruction to better facilitate student achievement is likely the single most important factor in determining the efficaciousness of a data-driven approach to school improvement. Thus, to understand the impact of assessment data on instruction, it is necessary to understand the type of learning that emerges from data analysis and how this learning influences the instructional behaviors of teachers. As a result, this dissertation study utilizes organizational learning theory as lens for examining the instructional response to assessment data. Specifically, the concepts of single and double-loop learning (Argyris & Schön, 1974, 1978, 1996) are used to analyze the

outcomes of the data analysis process. However, before explaining the concept of single and double-loop learning, it is first necessary to explore some essential related topics.

Argyris (2002, p. 206) defines learning as “the detection and correction of error.” However, the means by which an individual or organization goes about the process of correcting a perceived error is determined by a theory of action. Theories are explanatory mechanisms that are used to explain and predict behavior. The concept of a theory of action is a model that explains deliberate human behavior (Argyris & Schön, 1974). Essentially, theories of action are behavioral frameworks that determine how one responds in a given situation, and they are informed by norms, assumptions, and beliefs that are shaped through the individual’s interaction with the world. When placed in a specific situation in a particular context, one’s response is determined by a theory of action that determines how to achieve a desired outcome for that specific situation and context. For example, a teacher’s theory of action for improving the behavior of a very difficult first grade class may be to implement structured routines, provide praise for desirable behavior, and incorporating student interests into the curriculum. As this example demonstrates, theories of action inform professional practice (Argyris & Schön, 1978).

Theories of action can be divided into two types – espoused theories and theories-in-use (Argyris & Schön, 1974). Espoused theories explain how to behave in particular circumstances. They are those theories of action communicated by an individual or an organization as those representing values and beliefs. The theory-in-use, however, directs actions. It is the theory that is actually practiced. Argyris and Schön (1974) state, “Theories-in-use are means for getting what we want. They specify strategies for

resolving conflicts, making a living, closing a deal, organizing a neighborhood – indeed, for every kind of intended consequences” (p. 15). However, very often, there may be an incongruity between an organization’s espoused theory and its theory-in-use, and, the organization may not be aware of this difference because theories-in-use are often tacit and implemented without the deliberate consideration of the actor. Thus, the only reliable way to determine a theory-in-use is through behavioral observation. As members of an organization carry out the actions associated with their organization’s work, they are manifesting the organization's theory-in-use. By examining these practices, one begins to see the organization's theory-in-use. Understanding theory-in-use is essential to organizational learning. If an organization that is performing ineffectively is not aware of its underlying theory-in-use, it cannot evaluate and critique the theory for the purpose of improving effectiveness. Thus, awareness facilitates the improvement process and helps the organization to change its behavior and operational procedures.

To understand how theories-in-use function, it is first necessary to explain the role of governing variables. Governing variables are values and beliefs that influence behavior. Theories-in-use are mechanisms by which one attempts to manage these variables to keep them within an acceptable range (Argyris & Schön, 1974). In essence, the theory-in-use allows one to maintain a sense of constancy through the implementation of action strategies that allow one to preserve the integrity of governing variables by keeping them within an acceptable range. For example, if the governing variable is to maintain instructional autonomy, one’s action strategies will be designed to preserve this variable to the fullest extent possible. Therefore, one would expect to see action strategies that resist collaboration with colleagues and efforts to modify instructional

practice. The intended consequence of these actions is to maintain constancy for the governing variable of professional autonomy. When an individual is successful in maintaining the governing variable within an acceptable range, the theory-in-use is validated. It is only when one perceives the theory-in-use to be ineffective that one considers altering it. It is this perception of incompatibility or error between the theory-in-use and the preservation of governing variables that prompts learning (Argyris & Schön, 1974).

The alteration of a theory-in-use is a learning process that can occur in two forms – single or double-loop. In single-loop learning, errors are detected and corrected without altering governing variables. It is a process of learning that involves the resolution of a situation through the modification of actions and assumptions without addressing any of the intervening contextual variables which may have given rise to the problem (Argyris & Schön, 1996). For example, a principal that observes that students are performing poorly in math may inquire into the problem. As a result of this inquiry, the principal may require additional math instructional time. In this instance, a single feedback loop detects error, which is an incompatibility between organizational expectations and actual outcomes, and resultantly modifies organizational action strategies and assumptions. Contrastingly, double-loop learning entails changes in governing variables as well as action strategies and assumptions. This form of learning involves two feedback loops. Strategies and assumptions are altered as a result of a change in values or governing variables. In the previous example of school math achievement, double loop learning would have occurred if the principal, along with the teachers, explored their values and assumptions regarding math instruction and, as result

of this inquiry, the school realizes their current instructional approach is incompatible with the demands of the curriculum. Therefore, the school develops a new instructional philosophy and implements new instructional techniques that will improve student achievement. In this instance, a problem with existing organizational norms was detected, which resulted in modification of those norms in addition to action strategies (Argyris & Schön, 1996).

The distinction made between single and double-loop learning does not imply that one should be avoided at the expense of the other. Rather, they are two different types of learning that require different forms of capacity to engage in fully. Single-loop learning is adequate for increasing efficiency and when the overarching focus is on maintaining existing norms for organizational performance. Members engage in collaborative inquiry to detect error and develop strategies to resolve the error so as to preserve the current theory-in-use (Argyris & Schön, 1978). However, situations will inevitably arise where the source of problems lies not only in existing action strategies but are also inextricably linked to organizational values and beliefs. If an organization is not able to engage in the deeper levels of inquiry required in double-loop learning processes, it will find such problems will persist or will be only partially resolved.

Double-loop learning is substantially inhibited by four common governing variables that characterize individual and organizational learning that Argyris and Schön (1974) term Model I. These include defining goals in a manner that confers unilateral control of the environment, maximizing the likelihood of winning and minimizing loss by controlling the task, suppressing negative emotion through protection of oneself and the avoidance of conflict, and a strong focus on rationality through a focus on objectivity.

The purpose of these governing variables is primarily defensive in nature. They are intended to avoid feelings of vulnerability, embarrassment, and risk as well as negative judgments regarding competence. Thus, issues of great importance are not discussed so as to minimize discomfort. However, these governing variables substantially reduce the likelihood of learning because they prevent one from reflecting on the outcomes of behavior (Argyris & Schön, 1978).

Argyris and Schön (1978) term one particular manifestation of organizational Model I behavior organizational defensive routines. Argyris (1994, p. 81) states, “These consist of all the policies, practices, and actions that prevent human beings from having to experience embarrassment or threat and, at the same time, prevent them from examining the nature and causes of that embarrassment or threat.” As a result of such practices, the reasoning behind decisions is often tacit, and the lack of transparency makes them invulnerable to potentially embarrassing scrutiny. Thus, decisions are only evaluated by those who make them, which means they are unlikely to be subject to highly critical analysis. These conditions ultimately reduce the likelihood that organizations will deeply inquire into the sources of detected error, and, as a result make double-loop learning all but impossible. According to Argyris and Schön (1974), Model I behavior tends to be the rule rather than exception in organizations. This assessment leads one to ask why such behavior is so prevalent, and why do these behaviors persist? Argyris and Schön posit Model I behaviors are a product of societal values that emphasize competition, conformity, avoidance of uncomfortable feedback, and the suppression of anger and hurt. Adults model these behaviors to their children who eventually begin to adopt them, which allows for their eventual persistence when these individuals become

members of various organizations. As a result, Model I behavior becomes entrenched in organizational structures and norms.

A much rarer form of organizational learning is Model II. Unlike Model I, Model II is characterized by governing variables that favor the generation of valid sources of information, free and informed choice, and internal commitment (Argyris & Schön, 1974). These governing variables result in dispositions that encourage seeking the insight of individuals with expertise to help produce well-informed decisions. Thus, transparency and verifiable data are valued over personal defensiveness. Argyris and Schön (1978) state, “every significant Model II action is evaluated in terms of the degree to which it helps the individual involved generate valid and useful information (including relevant feelings), solve the problem in such a way that it remains solved, and so without reducing the present level of problem-solving effectiveness” (p.238). The Model II paradigm values the contribution of those who possess the greatest competence for the purpose of producing the most informed decision possible, even if this insight results in the diminishment of one’s own contribution. The same is true for the process of evaluating the effectiveness of prior decisions, which is characterized by a greater degree of transparency, openness to critique, and a focus on directly observable data rather than the tacit reasoning that accompanies Model I behavior.

Model II reduces the prevalence of organizational defensive routines in favor of a broader, competence-driven approach to organizational management. The sharing of power and joint task control is valued to encourage personal commitment and ownership of decision-making. The result is increased levels of internal commitment and a dramatically increased willingness to confront the assumptions and norms that undergird

organizational decisions. When Model II values characterize organizational learning processes, the implications for organizational learning are substantial. Because the level of defensiveness between groups and across the organization will be reduced, there is more honest discussion about operational processes, increased willingness to provide assistance to others, and increased motivation to experiment and take risks. There is also a greater sense of collective responsibility, which is the result of the sharing of power. Consequently, the organization is better able to engage in the type of reflective inquiry that allows it to more closely evaluate and question operational norms. This often leads to the deeper levels of learning that characterize double-loop learning (Argyris & Schön, 1978).

As the aforementioned discussion indicates, inquiry and reflection play critical roles in an organization's ability to engage in double-loop-learning. And, as shall be demonstrated in the upcoming discussions of the literatures regarding data use practices, professional learning, and leadership, the development of collaborative cultures in schools that inquire and reflect on student achievement data and instructional practices is a central theme. Thus, the theoretical stance assumed in this study is one that views the development of collaborative cultures that support inquiry into students' achievement and instruction as catalyzing agents for double-loop learning. The data use literature encourages collaboration and inquiry into students' achievement data (Datnow, Park, & Wolhstetter, 2007; Lachat & Smith, 2005) while the professional learning literature promotes situated learning, deprivatized practice, and shared responsibility (Lave & Wenger, 1991; Louis & Marks, 1998; Fullan, 2001). Finally, the leadership literature indicates practices that support the development of the above mentioned outcomes

(Leithwood, Jantzi, & Steinbach 1999; Rosenholtz, 1989). As a result, there is a strong linkage between the theory of double-loop learning and the literatures discussed in this review. Therefore, this theory will provide a useful integrating framework to analyze data related to these distinct, yet closely related bodies of literature.

Data Use Practices

There is substantial disagreement regarding the role of assessments in improving the instructional practice of teachers. Firestone, Mayrowetz, and Fairman (1998) posit that there are three major positions regarding the influence of assessment. The first argument is that testing and the moderate-to- high stakes that may be attached to it dilute the curriculum and compel teachers to focus on areas that will appear on the test to the exclusion of other important topics and subjects (Corbett & Wilson, 1991). On the other hand, there are those who argue that testing is a catalyst for more productivity and more skillful instruction. This position contends higher levels of rigor will compel educators to innovate and find more effective means for enhancing the learning process (Baron & Wolf, 1996; Rothman, 1995). The final position questions whether assessments have any meaningful influence on instructional practice. It is grounded in the assertion that the incoherent nature of American curricula and a predominance of teaching practices that focus on lower-order skills make it extremely difficult to effectuate anything other than superficial change (Cohen, 1995).

In concurrence with the latter view, Firestone and colleagues (1998), in their study of the effects of performance-based testing with moderate and high stakes on math teaching practices in Maine and Maryland, found that considerable changes were made to align the school curriculum to state standards. For example, teachers changed the order

of the content presented and some schools rescheduled when certain courses would be offered based on state tests. However, there was little identifiable difference in how teachers actually presented math content. Although the sample size was small, the intensive nature of the qualitative research process employed in this study provided very useful findings. The researchers interviewed the entire organizational hierarchy from central office administrators to principals to teachers. They also utilized several classroom observations accompanied by additional teacher interviews to provide insight into how teachers perceive the connection between their teaching practice and the assessment. Such methods, while not necessarily yielding results that may be broadly generalized because of the small sample size, do provide deeper insight into the nature of the impetus for change testing without a concurrent focus on data analysis has on instructional practice.

According to Murnane, Sharkey, and Boudett (2005), educators use assessment data in at least three major ways. The first is an instrumental approach, which focuses on using data to make decisions such as promotion or retention or placement in a special education program. The second approach is symbolic and is used to justify decisions such as reassigning teachers or implementing a new curricular program. The final approach is conceptual. This type of orientation focuses on using formative and summative assessment information as a starting point for a closer examination of student strengths, weakness, and the effectiveness of instruction. Such methods allow educators to recognize and diagnose the reasons for patterns that emerge in assessment results, which allow for more informed and focused improvement efforts. It is this approach that is at the heart of current proposals for data-driven instruction.

Additional studies provide insight into how data are used in schools. Suppovitz and Klein (2003) found that data provide a means of ensuring that instruction is aligned to content standards. In this instance, data allow schools to determine how well students are performing in relation to standards and allow teachers to adapt their instruction as necessary. Another major use of data identified by the authors is to identify students performing below standards and to track their progress over time as they receive targeted interventions. These interventions may include altered grouping practices where students are grouped by achievement levels and receive differentiated instruction based on their achievement levels in specific content areas. This approach is intended to be more responsive and relevant to student needs and is more representative of prevailing arguments in favor of data use. However, one practice that has the potential to emerge from this approach is the identification of “bubble kids” (Booher-Jennings, 2005, p. 233). These are students whose achievement levels are very close to passing. As a result, they have the potential to make a substantial impact on a school’s passing rate, which in the context of the current high stakes testing environment, can have grave implications for schools that fail to make significant improvement. This group is targeted for enhanced instructional intervention and a disproportionate amount of resources in an effort to improve their passing rates. On the other hand, students whose test performance falls substantially below standards are essentially marginalized, neglected, and often referred to special education, a designation that, at the time, would place them in a category of students whose performance would not have adverse consequences for the school because they are exempt from the state’s accountability measures (Booher-Jennings, 2005). However, current provisions of the No Child Left Behind Act now require

students in special education programs be included in all schools' accountability profile.

Gillborn and Youdell (2000) term such rationing "educational triage." In the Booher-Jennings study, the author found that triage manifested in a variety of practices. These included additional assistance to bubble kids in the form of extra assistance throughout the school day, small group sessions with literacy coaches, after-school or weekend tutoring specifically targeting this group, and the reassignment of music, physical education, and library teachers to work with small groups of students on test preparation activities. While this study was limited to one state, Marsh, Pane, and Hamilton (2006) found in their studies of several schools in three states that more than 75 percent of principals indicated they encourage teachers to focus special attention on this group of students, resulting in many questions regarding the status of students whose achievement is either significantly higher or lower than minimum standards.

Factors Influencing Data Use

Lachat and Smith (2005) conducted a study of the data use practices of five urban high schools undergoing comprehensive reform and found that several practices had a significant positive effect on the effective use of data. The first was data quality and access. Because the school district in the study had never before engaged in rigorous examination of data, there were not systems in place that allowed for the quick and comprehensive dissemination. This resulted in data that schools found to be either irrelevant or arrived so late that it was no longer useful. It took significant effort on the part of the school and district to address these problems by providing data in a timely

manner and which were related to achievement objectives. These actions resulted in an enhanced perception of the relevance of data by teachers and administrators.

Data disaggregation was another very important factor that supported its effective use. Previously, the high schools in the study received information that was minimally disaggregated, if at all. The implementation of a data warehousing database that delineated student information by a variety of factors allowed the schools to address student performance issues more effectively. The means by which these issues were to be addressed occurred through a process of collaborative inquiry. The researchers found that in schools where data inquiry was organized around a mutually developed, focused set of questions related to student achievement, there was an increase in faculty motivation to use data. The teachers were more objective in their analysis and were more willing to question assumptions about students, which led to a greater understanding of how to go about the school improvement process. These understandings were further enhanced when the school instituted leadership structures such as data teams composed of administrators and teachers to organize the data in manner that maximized its communicative potential and ensured that the information was disseminated to teachers in a timely manner. Data teams, because they were constituted by teachers, had the additional effect of helping to overcome the perception that data were not useful.

The findings of Lachat and Smith are confirmed by similar findings from Kerr, Marsh, Ikemoto, Darilek, and Barney (2006) in their study of the data use practices of three urban districts. However, the authors make an additional recommendation for developing the capacity for data use. The researchers found that teachers often did not have the requisite skills to engage in the inquiry process. Thus, it is recommended that

districts provide additional training and support to facilitate the effective use of assessment information. The parallel findings of both of these studies indicate several practices that support the effective use of assessment information. Because they were conducted in urban settings on both a school and district level, it may be possible to generalize best practices for urban schools at the very least.

One of the major findings of the two previous studies was the necessity of data being readily accessible and presented in a form that can be readily analyzed by teachers. A study by Wayman and Stringfield (2006) indicates that data software can play a substantial role in facilitating the effective use of data. Two of the most common types of software are assessment systems that quickly organize and analyze student assessments such as benchmark tests and data warehousing programs that provide access to a variety of student historical data but generally are not designed to provide the quick turnaround of assessment system software. The authors found that the use of these types of software resulted in an enhanced sense of efficiency. Teachers reported better access to data and reduced time spent compiling and organizing information for later analysis. The authors also found these programs resulted in increased ability to develop effective interventions as a result of the more comprehensive breadth and depth of data provided. In addition, teachers reported enhanced reflective capacity. They felt they were better able to gauge the effectiveness of their planning, instruction, and efforts to differentiate instruction to meet student needs. Finally, a major benefit of the implementation of software programs was improved collaboration. Improved access to data resulted in higher levels of interaction and the development of both a shared language for data analysis and metric for student achievement.

Datnow, Park, and Wolhstetter (2007), in their study of how high-performing school systems use data to improve achievement for elementary students, emphasize six strategies that are congruent with the findings of the aforementioned studies. The first is to develop a comprehensive framework for data-driven decision-making. This includes setting challenging student achievement goals that are aligned with a common, system-wide curriculum with clear content standards. The second strategy identified by the researchers is to develop a culture of data use and continuous improvement through the implementation of explicit expectations and accountability at both the school and district level. These efforts are to be supported by substantial investment in information systems and the provision of support to enable schools to make effective use of data. In these districts, there was also a strong emphasis on obtaining and utilizing useful and diverse sources of data that enhanced the districts' abilities to make curricular decisions. This includes the use of system-wide benchmark assessments that are aligned to content standards. Another major strategy employed by high-performing districts were efforts focused on improving the district and schools' capacity for data use through professional development and the scheduling of regular times for school collaboration. Finally, the districts enacted data analysis protocols and action plans to ensure improvements were actually made.

Ingram, Louis, and Schroeder (2004), conducted a study of the data use practices of nine high schools designated exemplars of Continuous Improvement (CI) practices as part of a larger longitudinal study. The Continuous Improvement concept is derived from Deming's (1986) Total Quality Management framework and has been applied to educational settings. This study focused on the Continuous Improvement practice of

rational, data-driven decision making. Ingram et al. found significant barriers that impede the use of data to improve instructional practice. One significant obstacle was teachers' strong mistrust of data. In their interviews, the researchers found that many teachers believed that data was often used as a means of justifying predetermined, politically motivated decisions rather than being used to inform the decision-making process. Furthermore, teachers often believed that data was used punitively as a means to punish teachers or the school. Such actions resulted in a strong aversion to data presented by school administrators and a disinclination of teachers toward collecting data themselves.

Another significant barrier Ingram, Louis, and Schroeder (2004) found that hindered data use was the fact that several teachers developed personal measures such as anecdotes or personal experience for determining the effectiveness of their instruction that often differed from more formal systems. They often relied on anecdotal evidence, experience, and their own professional judgment and did not reach consensus regarding what outcomes were most important. Furthermore, teachers often did not equate student achievement with the effectiveness of their own performance, a finding that has the potential to seriously diminish efforts to enhance the instructional program. Finally, Ingram and colleagues found numerous technical hurdles that impeded the instructional improvement process. Schools often did not make structural changes such as scheduling time for collaborative planning and learning for teachers to effectively analyze and make meaning of the tremendous amounts of information they were presented. As a result of these cultural and structural barriers, the capacity to use assessment information for instructional improvement was greatly reduced.

Perhaps more than any other factor, the presence or lack of a culture of data use has great influence on schools' ability to effectively use data. Marsh, Pane, and Hamilton (2006) found that data use was greatly limited in schools that maintained individualistic notions of teaching and learning and did not employ substantive forms of collaborative inquiry. In this regard, school leadership is essential. Mason (2002) found that school leadership is critical in building support for data analysis and securing the resources to sustain inquiry. When strong, supportive leadership is not present, the commitment and collaboration necessary for effective data use often fails to manifest. However, even when there is a commitment to data inquiry, the author found the lack of analytical capacity is a major hindrance to schools' ability to use data well. Participants in the study reported major difficulty making sense of data and, therefore, were not able to effectively translate their analytical efforts to effective instructional interventions, even after receiving training. To address this issue, Wayman (2005) recommends scaling down professional development experiences to promote interaction between small groups of teachers regarding contextually relevant topics. This process is further facilitated by the appointment of an in-house data expert or coach who is usually a teacher that has undergone advanced training in data analysis. This individual serves as a facilitator and provides training and support for teachers as they attempt to use data to inform their instructional practice.

Data Analysis Processes

While the aforementioned studies provide insight into how schools may institute structures and practices that promote the use of data, they do not describe how schools may actually use that information to tangibly improve instruction. As stated previously,

there is very little scholarly information that deals specifically with this topic. However, research conducted for this review of literature did yield a very prescriptive text by Boudett, City, and Murnane (2005) that was written as practical guide for using assessment to improve instruction. While it is not a formal scholarly study, it does systematically incorporate the insights and proven practices of leading scholars and practitioners in the field of educational leadership, and components of the practices advocated by it are confirmed by studies detailed in this review. Therefore, it was included in this paper with the acknowledgement that significant portions may still need to be confirmed by empirical research.

Boudett and colleagues propose an eight step process termed *Data Wise* by which schools should go about the process of data inquiry. The first step involves organizing for collaborative work, which includes developing a data team whose primary responsibility is to manage and organize the vast amounts of data available. The team is also responsible for formatting information in a manner that will enable it to be readily accessible to teachers. Guided by an explicit improvement process, the teachers will then work together to interpret the information. However, this process will be substantially impeded if the faculty does not have functional assessment literacy. Therefore, it is recommended that the school engage in substantial efforts to improve teachers' knowledge of assessments and the numerous factors that influence student achievement on tests. Once this is accomplished, schools should develop data displays that clearly portray student achievement information.

The next step in the *Data Wise* process involves isolating and analyzing a single data source to develop an understanding of students' thinking. The purpose of such a

practice lies in the fact that even though students may have poor assessment outcomes, they are usually guided by some type of logic that led them to a wrong answer. Through a detailed analysis of student responses, teachers gain powerful insight into students' approaches to school work and will develop a more thorough understanding of student needs, which can lead the educator to challenge assumptions about students' capabilities or the effectiveness of their own teaching strategies. Such insights will inevitably lead teachers to the next step in the improvement process, which is a collaborative examination of instruction. This begins by "reframing the learning problem as a problem of practice" (p. 98), which acknowledges the critical need to focus on instruction in any attempts to enhance student learning. Such recognition inevitably will require the school to develop shared understandings of what constitutes effective practice that will be used to address the learning problem. This process occurs by seeking evidence from an examination of both internal (colleagues) and external (research) resources and comparing it to the current practice. From this information, the faculty can go about the process of creating an action plan that addresses the problem of practice.

The school should then choose an instructional plan based on their shared understanding of effective instruction and develop a common vision for its implementation. It is recommended that the school develop implementation indicators so that all members of the faculty have a clear understanding of how the strategy should be implemented in their classroom so as to ensure the coherency of the improvement effort and maximize its potential for student learning. The final steps in the process involve integrating the plan into the instructional program and developing methods by which to assess the consistency and effectiveness of the initiative.

Boudett et al. present a very detailed framework for using data analysis to improve instructional practice. However, the approach they outline necessitates a strong emphasis on improving teachers' pedagogical and content knowledge and skills. The means by which this objective is accomplished is professional development. For this reason, professional development comprises the focus of the next section of this paper.

The literature indicates there is great diversity in manner in which data is utilized. These include diagnostic purposes, as a means of curriculum alignment, and to identify problems in student achievement for the purpose of targeting students for instructional intervention. How data are used and the extent to which they become a meaningful part of school functioning depends heavily on several factors. These include the extent to which data is received in a timely manner and is presented in a disaggregated form that is readily accessible to teachers for analysis. Another major determiner of data use practices is the extent to which the data analysis process is framed in terms of specific student achievement objectives and occurs within a culture that is supportive of data use. To this end, collaboration is essential. Collaboration increases teacher buy-in and alleviates the sense of mistrust many teachers feel toward data. Therefore, school leaders, must ensure that data analysis becomes an integral part of the school's culture. One specific means by which this can be accomplished is the implementation of formal, collaborative processes for data analysis that provide a structured process of inquiry into student performance results and focuses explicitly on the instructional changes that are to occur as a result of inquiry.

Professional Learning

Professional development is defined as “those processes that improve the job-related knowledge, skills, or attitudes of school employees” (Sparks & Loucks-Horsley, 1989, p. 41). The effectiveness of professional development as a means of facilitating school improvement efforts has a strong correlation to the social learning theory of Alfred Bandura (1993). According to Bandura, there are two major factors influencing one’s learning and behavior. First, there are outcome expectations, which refer to one’s beliefs regarding the relationships between actions and outcomes. The second factor is perceived self-efficacy, which refers to the belief in one’s ability to achieve certain outcomes. Teachers with a high degree of self and instructional efficacy and who believe that their instructional interventions can positively influence student achievement spend more time teaching and provide greater levels of assistance to students who have difficulty learning, and provide more praise for accomplishments. Contrastingly, teachers with lower degrees of perceived self-efficacy are more likely to spend a disproportionate amount of time on nonacademic tasks, provide less assistance, and criticize students when they fail. However, according to the author, perceived efficacy is not confined to an individual teaching in a single classroom. Because the school is a social system, a sense of collective efficacy is present. Schools with a low sense of collective efficacy, that have little confidence in their ability to substantively influence student achievement, propagate a sense of dire inevitability that eventually characterizes the school culture. Bandura found that greater levels of poverty, absenteeism, and student mobility were correlated with a lower collective efficacy.

The aforementioned finding has significant implications for professional development. According to Bandura's theory, learning occurs both enactively and vicariously. Enactive learning involves learning through doing and as a result of specific actions, which provide the individual with a means to assess the likelihood of the outcome of specific actions. Vicarious learning involves modeling and observation of others, which also serves to influence one's thinking regarding the probability of one's success at a particular endeavor. Individuals usually select activities or actions in which they believe they will do well and avoid those that they do not. The conditions of one's environment have great influence in this regard. Individuals are likely to select more challenging experiences when they have an opportunity to observe and assess the success and failures of others serving as models as well as when they are provided specific feedback and support about their individual performance (Smylie, 1995). In professional development contexts, one chooses whether to incorporate particular methods into his or her teaching practices based on expectations of effectiveness and the teacher's belief in his or her ability to implement the new methodology. Ross and Gray (2006) state, "Teachers who perceive themselves to have been successful on a particular task, whether individually or as part of a collective, believe they have the ability to perform that task and anticipate they will be successful in future encounters with it" (p. 183). Thus, this theory implies that to the extent professional development experiences allow teachers to observe, assess, and practice methodologies within supportive social learning environments, relative increases in positive outcome expectations and feelings of self-efficacy occur. This resultantly enhances teachers' ability to successfully implement

new instructional methods. The central tenets of Bandura's social learning theory are reflected throughout the research literature on effective professional development.

Professional Development Models

The manner in which schools organize professional development processes to facilitate educators' learning constitutes a professional development model. Sparks and Loucks-Horsley (1989) present a model of staff development that encompasses five major activities that extend well beyond the traditional model of workshops. While their conception does not totally comprise the full spectrum of staff development models, most models are closely related to these overall frameworks. The Sparks-Louck Horsley (1998) model is described below.

Training. By far, training is the most typical staff development model. This model usually takes place in a workshop type setting where there are specific objectives teachers are to satisfy as a result of attending the workshop. An expert trainer or facilitator usually leads the sessions by providing knowledge about relevant subject matter, modeling instructional strategies, and providing feedback that will enable teachers to master learning objectives. The training model is a cost-effective professional development strategy because it allows for the training of a significant number of teachers in specific methodologies in single or multiple sessions.

Observation and Assessment. The observation and assessment model of professional development is premised on the idea that teachers benefit from the feedback of experienced observers. Administrators, peer coaches, or clinical supervisors usually implement this model. A pre-observation conference in which the objectives for the observation are established ideally precedes the observation. During the observation, the

assessor gathers information regarding the teachers' performance in the pre-established domains, and the observer and teacher reflect on the experience. The teacher and observer discuss strengths and weakness and devise plans for improvement.

Individually-guided staff development. Individually guided staff development is the process that teachers undertake to engage in activities they feel will enhance their learning. Thus, the teacher designs the program's goals and activities. This type of professional development is based on the idea that teachers can best ascertain their needs and competently pursue activities designed to improve their pedagogical knowledge and practice. It also assumes that the most beneficial type of learning is that which is self-discovered. The process of developing an individual staff development plan usually begins with needs identification where teachers highlight areas where they need improvement. They then progress to the development of a plan that is specifically designed to meet those needs. A final assessment comprises the last phase of this model.

Inquiry. Teacher inquiry can manifest in different forms. For example, an elementary school teacher tries a new method of teaching math and compares the results to her previous method, or a principal arranges a middle school faculty into study groups to investigate the feasibility of a proposed reform for their school. As the examples illustrate, inquiry activities can take place individually or in small groups in a formal or informal context. The major tenet of this method is that research is an important aspect of education in which teachers should be fully engaged to enable them to make better informed professional decisions and to improve their practice.

Involvement in a development/improvement process. This model for staff development has as its central focus the acquisition of new knowledge and skills through

participation in an improvement process. Frequently, teachers participate in the development of curriculum or school policies. Such problem-based situations require teachers to develop new knowledge and skills to address the issue effectively. Thus, teacher-learning is facilitated through the problem-solving process.

An effective professional development program does not rely exclusively on a specific model. Rather, the school utilizes several methods to develop a robust professional learning program that improves the knowledge and skills of teachers (Sparks & Loucks-Horsley, 1989). The professional learning community is a conceptual model that may encompass all of the specific types of professional development activities mentioned above organized around collaborative teams that work to achieve clearly specified goals related to instructional improvement and student achievement (DuFour, Dufour, Eaker, & Karhanek, 2004). Thus, professional learning communities provide an organizational framework for professional development opportunities; however, before delving into the research behind this approach, it is first necessary to explore research that illuminates how teacher learning opportunities can be structured to most effectively improve instructional practice and student achievement.

Content Focus

Just as the types of professional development opportunities may vary widely, so too does content. Cohen (2000) conducted a quantitative study that, along with several additional areas, measured the influence of mathematics professional development on teacher practices in California. The author found the content of professional development has a significant influence on practice. Specifically, workshops that provide teachers with the opportunity to learn about the math curriculum and specific pedagogical

practices that directly relate to the state's instructional goals were more likely to influence classroom practices. Contrastingly, workshops that advocated practices that were general in nature and were not linked to specific curriculum areas had a significantly smaller degree of classroom implementation. Furthermore, more time spent in content-focused workshops was associated with a greater degree of implementation of new practices. However, greater amounts of time spent in non-content specific workshops were not associated with changes in practices. These findings suggest that content-specificity is an essential characteristic of effective professional development experiences.

Cohen also examined the relationship between student achievement and the degree to which teachers adapted practices as a result of content-specific workshops. He found that average student achievement was modestly higher in schools where teachers adapted their practices. However, this relationship was not found in schools that did not modify their methods. This finding was sustained even after controlling for various demographic factors present in the schools.

Cohen's findings make a strong case for the efficacy of content-focused professional development. However, a study by Desimone, Smith, and Ueno (2006) published six years later indicates that this form of professional development still may not be the norm for most teachers. The authors compiled data regarding teachers' preparation and professional development experiences from teacher questionnaires from the NAEP Mathematics Assessment. Their findings indicate that teachers with the least amount of formal math preparation, such as those without a college or graduate degree in mathematics, were less likely to engage in sustained content-focused professional

development. On the other hand, the most prepared teachers were most likely to engage in this type of professional development. The results highlight a major problem – teachers who need effective professional development the most are not receiving it. The authors are careful to point out that research has shown that there is not a significant difference in the availability of high quality professional development in high and low poverty schools. Thus, the problem may lie in teachers' levels of comfort and motivation. Those teachers with greater levels of math content knowledge may feel more comfortable with more rigorous types of professional development than those who are prepared to a lesser degree. This would indicate that professional development is not performing the educative function that is essential to school improvement efforts.

The Cohen and Desimone, et. al studies provide much insight into the state of professional development. However, it is necessary to note potential weaknesses in methodology. Both studies were based on the analysis of survey responses. While this method may yield a greater sample size, the results may have been influenced by factors such as a lack of understanding of what constituted content-focused professional development and the fact that many teachers simply may not have put much thought into their responses. The two studies would benefit from additional qualitative data that may provide deeper insight into professional development experiences and the resultant influence on instructional practice.

Content Knowledge

While the content focus of professional development refers to the degree to which teacher learning experiences focus on improving teacher's awareness of and ability to teach the subject matter, content knowledge refers to teachers' actual subject matter

proficiency. Kahan, Cooper, and Bethea (2003) examined the relationship between pre-service math teachers' content knowledge and the quality of their lesson plans. The researchers evaluated the transcripts of 16 pre-service teachers, administered a test of their secondary math content knowledge, and rated their lesson plans. They found that those students with higher scores on the test of math content knowledge and higher grades in their math coursework generally produced stronger lesson plans than those who scored more poorly and had lower grade point averages in their math courses. The researchers state that a potential reason for this relationship could be that teachers with weaker mathematical preparation may not see the relationships between math concepts and, therefore, may not be as able to relate such relationships to students as well as those with stronger math backgrounds. Furthermore, this lack of preparation may result in an inability to select appropriate activities that enable students to make conceptual connections. However, while these findings may be intriguing, it is important to note the very small sample size of students and the study's lack of geographical diversity. As a result, the ability to generalize these findings may be limited.

Stein, Baxter, and Leinhardt (1990) conducted a case study that sought to describe the relationship between math teachers' content knowledge and instructional practice. A fifth grade teacher was videotaped presenting a series of mathematics lessons, and these lessons were analyzed to determine how content knowledge influenced his instruction. The teacher was also interviewed and performed various card sorting tasks designed to ascertain the extent of his knowledge of the mathematical concept being taught. The researchers found that limitations in the teacher's subject matter knowledge had an adverse effect on instruction because of an inability to connect math concepts,

overemphasis on concepts that have limited applicability, and a failure to present content in a manner that facilitates learning of future, more advanced concepts. The findings give credence to another study by Leinhardt and Smith (1985) that compared the instructional practices of expert and novice teachers while teaching fraction concepts. The researchers found that teachers with greater expertise provided more conceptually-based explanations and provided more accurate representations of fraction concepts that led to a more comprehensive, fuller explanation of the topic than that which was presented by teachers with less expertise. The results of the two studies underscore the importance of teacher content knowledge for effective instruction. These conclusions have also been reflected in federal and state education policy as laws such as the No Child Left Behind Act (2001) mandate in its highly qualified teacher definition requirements for teacher content knowledge. However, content knowledge is not the only prerequisite for effective teaching indicated in the professional teaching literature. Pedagogical content knowledge is also recognized as being of critical importance.

Pedagogical Content Knowledge

The concept of pedagogical content knowledge or knowledge *for* teaching originates from the work of Lee Shulman (1986). Shulman argues that teachers need a comparatively different type of knowledge than scientists, lawyers, or engineers. Rather than merely having a deep, thorough understanding of the subject, they must also know how to teach it. The author defines pedagogical content knowledge as “the ways of representing and formulating the subject that makes it comprehensible to others” (p. 9). However, it also includes an understanding of how children learn a particular subject and how their thinking, preconceptions, and misunderstandings may influence their learning.

By understanding how children think about and learn a particular subject, teachers are better able to implement strategies that are more likely to facilitate meaningful understanding of the subject matter.

According to Hill, Rowan, and Ball (2005), there is widespread agreement that teachers' pedagogical content knowledge positively influences student achievement; however, few studies directly assess this construct. Instead, researchers consistently employ proxy measures of mathematical knowledge such as college course work, degrees, and test scores. The problem with such methods, according to the authors, is that it does not allow one to determine exactly which type of knowledge was responsible for changes in student achievement. Therefore, Hill and colleagues sought to directly measure the effect of subject matter pedagogical content knowledge on elementary student mathematics achievement. They collected survey and student achievement information from two cohorts of students over a three year period from 115 elementary schools implementing some form of school improvement initiative, many of which were nationally known comprehensive school reform programs. The sample also consisted of 26 demographically and geographically similar comparison schools, and the sample was deliberately designed to include a greater proportion of high poverty schools. A math assessment was administered in the fall and spring of each year for a total of six administrations over the 3 year course of the study. To measure teacher pedagogical content knowledge, the researchers developed a test measuring "proficiency at providing students with mathematical explanations and representations and working with unusual solution methods" (p. 387). Their results indicate that teacher content knowledge for teaching math was a predictor of student achievement. For every standard deviation

difference on the measure of teacher pedagogical content knowledge, student achievement gains were equivalent to about one half to two-thirds of a month of growth. Furthermore, first grade teachers with the lowest scores on the content knowledge for teaching test had students who scored more poorly. These teachers in the lowest two deciles had students who gained nearly ten points less than teachers at the highest levels. The implications of these findings are substantial. First, they support Cohen's (2000) finding regarding the efficaciousness of content-focused professional development and underscore the need to provide more content-focused professional development for the purpose of improving teachers' content knowledge as well as their pedagogical content knowledge. They also reinforce the findings by Desimone, Smith, and Ueno (2006) indicating the need for teachers with the least subject matter knowledge to receive targeted content-focused professional development. In the Hill et. al (2005) study, teachers who scored in the lowest deciles on the content knowledge for teaching test had students who gained substantially less than teachers who scored higher. The authors recommend that schools make significant investments in providing teachers with the least content teaching proficiency with coursework and professional development that focuses on their weaknesses. However, such actions would first require the development of more effective assessment instruments that can help educational leaders identify those teachers for whom such learning opportunities will be targeted.

In addition, the research on pedagogical content knowledge also has important implications for teachers' instructional responses to assessment data. The purpose of formative assessment is to identify issues with student learning and develop an appropriate instructional intervention. However, Heritage et al. (2008) found that

teachers may be readily able to identify student weaknesses but may have difficulty developing an instructional plan intended to address those learning issues. The origins of this disjuncture may lie in gaps in teachers' content and pedagogical content knowledge. Heritage et al. posit a position similar to Shulman (1986) and Hill, Rowan, and Ball (2005) in that they stress that teachers should have an understanding of how learning progresses within a particular subject domain that includes a clear conception of both proficient and non-proficient performance at each stage of concept acquisition and connect this understanding to a deep knowledge of content. They must then be able to leverage both the knowledge of learning and content to develop appropriate interventions to facilitate student achievement. Without the synthesis of both these factors, the likelihood of developing an effective instructional plan to address learning problems identified by formative assessment data may be greatly diminished.

Time and Context

The length of professional development experiences has also been shown to be a major indicator of effectiveness. In fact, sustained professional development experiences have been mandated under Title II of NCLB (U.S. Department of Education, 2002). Porter, Garet, Desimone, Yoonk, and Birman (2000), in their evaluation of the Eisenhower professional development program, found individual initiatives to be more effective when they were continuous and ongoing such as when they were related to an ongoing reform as opposed to isolated workshops, which is common practice in most schools. Ongoing professional development was found to be even more effective when they are relevant to the identified contextual needs of the schools and utilize teachers' existing knowledge and experiences as points of reference (Tillema & Imants, 1995;

Tyack & Cuban, 2001). By building on current beliefs and practices, these programs are better able to introduce conceptual change that will eventually impact classroom instruction. Such an approach acknowledges the diversity of contexts in which an initiative is implemented and the dynamic nature of the educational field. Therefore, it has the potential to temper resistance from teachers, as they are able to work with a program that is designed to be compatible with the needs of the teachers, community, and students.

The need for contextual relevance is further supported by situated learning theory. The situated perspective posits that learners are a part of a community of practitioners. However, novices, as a result of their inexperience with the practices, traditions, and rituals of a particular community of practice, are unable to completely and competently engage in the work of their profession. Therefore, according to Lave and Wenger (1991), they engage in legitimate peripheral participation. However, peripherality does not imply a lack of meaningful participation, but rather describes the inability of the novice to *fully* participate in the community of practice. It is a concept that describes the multiple and varied ways participation may take place. “Peripheral participation is about being located in the social world. Changing locations and perspectives are part of the actors’ learning trajectories, developing identities, and forms of membership” (Lave & Wenger, 1991, p. 36). Thus, participation is occurring, but it is not full participation. For example, the student teacher begins his teaching experience through observation and small group instruction to develop familiarity with the teaching process prior to teaching the whole class. Through legitimate peripheral participation, the learner gains access to the community and, as a result, it makes possible the ultimate objective of full participation

as the learner develops a deeper understanding of and facility with the sociocultural practices of the community through interactions with experienced practitioners (Lave & Wenger, 1991).

The situated perspective emphasizes the role physical and social contexts play in learning. In fact, the context of learning has a great deal of influence on what is learned and how it is learned. In this view, cognition is a social, rather than an individual process. One's conception of knowledge is indelibly affected by interactions with people, groups, and institutions over time. Teachers are members of a community of practice. Through their mutual interactions, the individual gains the necessary knowledge, skills, and communicative frameworks to allow for full participation. Situated cognitivists also take the perspective that learning is distributed. Take for example the special education teacher or math coach whose specialized expertise informs the work of others. Such distribution of knowledge allows for the accomplishment of objectives beyond the capabilities of the individual and contributes to the successful functioning of the organization (Putnam & Borko, 2000).

The implications of the situated perspective are substantial. First, it implies professional learning needs to be centered on authentic activities that are situated in the context of teachers' daily practice (Putnam & Borko, 2000; Glazer & Hannafin, 2006). Second, the situated learning perspective implies that teachers learn best from each other within the context of their daily work. Finally, there must be a substantial effort to cultivate a community of practice within schools with a strong focus on collaboration (Glazer & Hannafin, 2006). Perhaps the most promising approach to implementing

professional development experiences that incorporate the concepts of situated learning theory is professional learning communities.

Professional Learning Communities

Fullan (2001) describes the benefits of professional learning communities. In these learning enriched schools, teachers and administrators work together to set goals for the school and highlight areas where teachers should work to improve their instructional performance. These collective goals serve to focus professional development efforts and the reallocation of resources necessary to obtain those goals. The group commitment to improvement of student learning outcomes makes professional learning the norm. As a result, these schools were characterized by more sharing of expertise, support, and trust among teachers and administrators, which were found to be essential factors in their commitment to maintaining classroom practice.

Bryk, Camburn, and Louis (1999) find that social trust strongly contributes to professional community. They state, "By far the strongest facilitator of professional community is social trust among faculty members. When teachers trust and respect each other, a powerful social resource is available for supporting the collaboration, reflective dialogue, and deprivatization characteristic of a professional community" (p. 767). Social trust and professional community may be "mutually reinforcing". This means that as teachers engage in the activities of a professional community, the level of social trust increases. However, it also requires that there be a foundational level of trust for a professional community to take root. One means by which trust may be facilitated is through Critical Friends Groups. Dunne and Honts (1998) describe the results of a study on Critical Friends Groups (CFG), which are small groups of teachers and administrators

who commit to create and implement goals for enhanced student learning through structured dialogue. The researchers highlight three phases in the development of CFG's. During the first stage, the groups serve as a support structure, providing a trusting setting where teachers can discuss problems with students or administration that hinder the teaching process. The groups then evolve to focus on more instructional problems and devise approaches to strengthen student learning through peer observation and feedback. This process enabled the teachers to help each other focus on improving specific aspects of their practice. In the final stage, the groups delve more extensively into issues such as educational purpose and begin to connect their practice to larger issues of local culture and community. Through this process, they are able to review the school's mission and purpose in relation to the needs of students. Participants in such groups often described their participation as a powerful professional development experience that had a substantial influence on their classroom practice, the most important outcome of any professional learning initiative.

Louis and Marks (1998) conducted a study of a national sample of eight elementary, eight middle, and eight high schools in the process of mandated restructuring. The researchers examined the influence of the school's professional community on teaching and the social structure of classrooms. Specifically, they sought to determine how the school's professional community influenced teachers' ability to deliver authentic instruction, characterized by a focus on the construction of meaning, relevance, and inquiry. The social supports for authentic learning were identified as the ability of the teachers to create an environment characterized by orderliness, fair discipline, high expectations for student achievement, and support for the attainment of

high standards. The researchers examined the connection of the aforementioned elements with the presence of five core qualities of professional learning communities: “shared values, focus on student learning, collaboration, deprivatized practice, and reflective dialogue” (p.8). Through both quantitative survey analysis, observations, interviews, and National Assessment of Educational progress (NAEP) results, the authors found that to the extent that there is a professional community present in the school, there are higher levels of social support for student achievement, a finding that resulted in 90 percent of the variance in this category among the schools. Furthermore, the presence of a professional community was associated with higher quality instruction, which resulted in 36 percent of the variability in the instructional quality found in the schools.

Strahan (2003) conducted a qualitative study of three schools with a history of improving the achievement of low-income minority schools to ascertain the nature of the professional culture. Although the means by which the schools went about the process of improvement varied, there were some commonalities in terms of the collaborative nature of their professional culture. The author found that these schools, through dialogue, developed common priorities for improvement and initiated conversations about how instruction should take shape in light of these priorities. They also placed a strong emphasis on talking about data and implementing shared instructional strategies that target areas of weakness. The staffs of the schools then created school-based professional development experiences specifically based on the outcomes of discussion and instructional improvement plans. Over the time, the researcher notes, in addition to shared instructional approaches, teachers also internalized collaborative work structures, shared norms and values regarding student achievement, and a common moral purpose to

such a great degree that professional conversations about assessments and practice became standard practice. This approach facilitated coherency in their improvement efforts, and substantial incremental gains in student achievement accompanied this progress. Thus, as the previous study suggests, to the extent that there was a collaborative professional learning community in these schools, there was also greater student achievement.

Additional studies have established a link between strong professional communities and student achievement. Wiley (2001) found that math achievement improved in low-income schools where there was a positive professional community in addition to transformational leadership. Similarly, Lee and Smith (1996) conducted a longitudinal study of a nationally representative sample of 820 high schools regarding the relationship of teachers' professional lives to student achievement. The authors focused on three primary areas: collective responsibility for student learning, faculty collaboration, and control over work conditions. Lee and Smith report higher levels of achievement in overall academic performance in schools with strong professional communities characterized by a strong sense of collective responsibility. In addition, there was a more equitable distribution of achievement gains in schools where these conditions were present.

However, Suppovitz (2002) provides a powerful caveat for those seeking instructional improvement through the creation of more collaborative work structures. His study describes the efforts of the Cincinnati Public Schools to initiate a process termed team-based schooling (similar to professional learning communities) in efforts to develop communities of instructional practice. While the author found that team-based

structures had a significant effect on the improvement of teacher morale, collegiality, and collaboration, the efforts had minimal impact, with only about 25 percent obtaining high levels of group instructional practice. The lack of achievement was primarily attributed to the fact that most of the activities the teams engaged in were administrative rather than instructional and a lack of opportunities to have modeled for them methods for engaging in rigorous evaluation of student work and their own instructional practice. The author recommends three core practices for developing communities of instructional practice. First, the groups must engage in rigorous examination of student work when assessments indicate a learning problem and discuss how those problems can be addressed through instructional improvements. Second, teachers must be willing to model best practices and be observed by colleagues for the purpose of providing constructive feedback. Finally, teachers should group their students in a manner that leverages the relative instructional strengths of their colleagues. Such a process allows for continuous conversation about instruction and provides the foundation for a strong learning community.

The problems highlighted in the Cincinnati study are indicative of what Hargreaves (1994) terms contrived collegiality, which is used to describe mandated, administratively-run interactions that occur according to a fixed schedule and are intended to yield predictable outcomes. The stated objective of such initiatives is the reinvigoration of the improvement process by infusing collaboration and a renewed emphasis on professionalism (Hargreaves, 2009). However, these efforts are not primarily motivated by a desire to create deeply engaged communities of practice. While this outcome may be desirable, it is tangential to the primary concern of furthering

externally imposed achievement objectives. According to Hargreaves (1994), this stance is characteristic of a micropolitical perspective on human relationships, which deals with how power is used to achieve desired educational outcomes. Contrived collegiality is a manifestation of the exercise of such power by administrators. As a result, from the perspective of teachers, it becomes an imposition and a means of accomplishing administrative objectives. The consequence of contrived collegiality is a simulated, inauthentic form of collegiality that results in superficial compliance and inflexible approaches to educational improvement that may be inappropriate for specific contexts.

Hargreaves's concept of contrived collegiality underscores the idea that all forms of collaboration are not created equal. Little's (1990) classic work on teacher collaboration distinguishes four forms of teacher collaboration based on the amount of interdependence they require as a way of examining the relative influence teachers have on each other's practice. The author presents storytelling and scanning for ideas, providing aid and assistance and sharing resources on a continuum of collegial relations with each requiring a progressively greater degree of collective effort. However, they do not substantially challenge traditional notions of independence because they are forms of collaboration that do not require mutual dependence and adaptation of teachers' instructional practice. These forms of collaboration require relatively little increase in teachers' frequency of interaction and collective decision-making. Therefore, these forms of collaboration are more prevalent because they are less menacing to the teacher's sense of autonomy, personal choice, and have the potential to minimize conflict.

Joint work, on the other hand, is distinguished from other forms of collegiality as a result of its focus on collective effort that provides principles or priorities that inform

the individual choices of teachers. Therefore, joint work requires a mutual adaptation of practice that is not required by the aforementioned forms of collaboration. However, this form of collaboration is rare. According to Little, when asked, teachers could only identify one colleague they consider critical to their work. Teacher collaboration that rises to the level of joint work remains largely a voluntary, idiosyncratic venture that is not an integral aspect of the work of the organization. However, collaboration is often presented as a form of joint work in school improvement initiatives, but it often manifests in forms other than joint work that require little interdependence and allow the privacy of teachers' practice to persist.

McLaughlin and Talbert (2001; 2006) identified three types of teacher communities that generally describe the degree of collaboration and interdependency within schools. Weak teacher communities are characterized by a strong tradition of autonomy that inhibits the development of shared instructional values and discussions about teaching and learning. Instruction is mostly traditional and methods endure despite evidence of their ineffectiveness. Strong traditional communities differ from weak professional communities in that they are more likely to collaborate around student assessments and placement decisions. There is a strong emphasis on developing hierarchical course structures, which leads to grouping and tracking decisions based on test results. Very often, high course failure rates are touted as evidence of rigorous standards rather than the consequence of ineffective instruction. Like weak communities, there is virtually no collaboration around instructional practice, a preference for traditional methods, and a passive conception of learning. Strong traditional communities often assign teachers to subjects according to their level of experience and

expertise, which often results in the least prepared teachers being assigned the lowest achieving students. In addition, there is often very little support for novice teachers and a strong sense of instructional autonomy persists.

Learning communities differ greatly from their weak and strong traditional counterparts. Schools that have obtained this level of collaborative function are characterized by a strong focus on instructional collaboration that emphasizes pedagogical coherence and responsiveness to student learning needs as indicated by assessment data. The enforcement of student-centered professional norms is another major characteristic. In learning communities, there is a shared commitment to student learning and a sense of collective responsibility that informs individual and group efforts. Finally, learning communities demonstrate a commitment to professional learning and equity. Teachers have strong voice in their professional development and in instructional improvement initiatives. There is also a significant focus on mentoring, contextualized professional development, and regular opportunities to discuss the impact of their efforts on student learning. As these descriptions indicate, learning communities dissolve the cell-like partitions of traditional school arrangements that perpetuate autonomy and conservatism (Lortie, 1975). It replaces these arrangements with one where meaningful collaboration is guided by a clear sense of professional purpose, accountability, and the needs of students.

The professional development literature indicates that teachers' learning experiences are greatly influenced by a number of very important factors. The first is content focus of professional development experiences. Professional development must be focused specifically on developing teachers' knowledge of content and pedagogical

content knowledge rather than on generic teaching strategies if they are to have any substantive influence on classroom teaching practices. Secondly, professional learning experiences must be sustained and situated in teacher's daily practice. Contextual relevance allows teachers to make connections to their daily work and apply their learning to their teaching. This outcome is greatly facilitated through the establishment of a strong, collaborative professional community, a finding congruent with findings in the previous section on factors that enhance the use of data in schools. However, collaboration, in and of itself is insufficient to bring about meaningful improvements in teacher practice and student achievement. Collaboration must rise to the level of joint work (Little, 1990), which promotes a much larger degree of interdependency and mutual reliance between teachers as it relates to mentoring, instructional improvement initiatives, and assessment of the impact of teaching on student achievement.

Leadership

Suppovitz's (2002) study of the Cincinnati school district's difficulties in implementing a team-based structure for educational improvement highlights the problem of loose-coupling. Elmore (2000) states:

This view, in brief, posits that the 'technical core' of education – detailed decisions about what should be taught at any given time, how it should be taught, what students are expected to learn...how they should be grouped for the purposes of instruction...and, perhaps most importantly, how their learning should be evaluated – resides in individual classrooms, not the organizations that surround them. (pp. 6-7)

This situation may result in practices that while potentially effective, may be highly idiosyncratic, incapable of being reproduced on a large scale, and not subject to external evaluation. The usual result of is a hodgepodge of practices, many of which research has clearly deemed to be ineffective. Elmore proposes a definition of leadership that presents it simply as the “guidance and direction of instructional improvement” (p. 13) for the purpose of focusing leadership on core instructional priorities.

The form in which leadership should manifest has evolved over time from instructional leadership to transformational leadership. Hallinger (2003) states that the focus of the concept of instructional leadership primarily emphasizes the principal’s direction and control of instruction, a top-down approach to school improvement. This relatively narrow focus proves problematic because it does not acknowledge the multidimensional nature of change. According to Fullan (2001), change occurs on three levels. For change to be sustainable, Fullan argues that there must be adaptations in curriculum and materials, teaching practices, and beliefs and values. It is the latter dimension that has been highlighted as the critical weakness of the instructional leadership paradigm. Substantive, sustainable improvement requires second order or what Sarason (1996) terms Type A changes, which refer to changes that are “explicitly intended to alter what people say, do, think, and feel not only as individual actions but in combination” (p. 345). The instructional leadership paradigm’s focus on classroom practice, while beneficial, is not comprehensive enough to substantively alter beliefs, practices, power relationships, and organizational dynamics that influence the change process (Leithwood & Jantzi, 1999). Furthermore, the construct relies heavily on the charisma, personality, and skill of the principal, a potential weakness when one considers

the tremendous challenge of leading large schools and the shortage of administrators prepared to assume such responsibilities. Therefore, another model that has come into favor is transformational leadership.

Transformational Leadership

The central focus of transformational leadership is the “commitments and capacities of organizational members” (Leithwood, Jantzi, & Steinbach 1999, p. 9). In this model, strong commitment to organizational goals and enhanced abilities to achieve those goals are believed to result in enhanced effort and more beneficial outcomes. Therefore, the primary role of leadership is to cultivate commitment and build capacity. However, unlike instructional leadership, the transformational leadership model does not necessarily seat power with those in formal authority. Rather, authority is vested in those who are best able to foster commitment and develop capacity. This results in a diffused, distributed form of leadership that is not as heavily dependent on the principal as the catalyst for change.

Leithwood, Jantzi, and Steinbach (1999) developed seven dimensions of transformational leadership in schools that encompass the breadth of requirements necessary to facilitate meaningful change in schools. The dimensions include: “building school vision and establishing school goals; providing intellectual stimulation; individualized support; modeling best practices and important organizational values; demonstrating high performance expectations; creating a productive school culture; and developing structures to foster participation in school decisions” (p. 9). The authors, through an extensive review of literature on the effects of transformational leadership practices in schools found strong evidence to support the positive effects of the three

dimensions: vision and goals, intellectual stimulation, and individualized support. Evidence for the remaining four dimensions was not definitive, but held promise.

Additional studies also support the effects of transformational leadership practices. Ross and Gray (2006), in a study of transformational leadership on teachers' collective efficacy, found that transformational leadership had direct positive effects on collective teacher efficacy. They also found direct effects on teacher commitment to school mission and professional community. These results may be explained by findings that indicate that transformational leadership practices have strong direct effects on organizational conditions such as school structure, purposes and goals, and culture (Leithwood & Jantzi, 1999).

The transformational leadership dimensions of vision building, intellectual stimulation, and individual consideration were found to have an indirect positive effect on changed teacher practice. Geijsel, Sleegers, and van den Berg (1999) conclude that the more teachers experience these dimensions, the greater the likelihood of their undertaking learning activities. Transformational leadership practices have also been shown to have a significant effect on teacher motivation and capacity as well as a moderately significant effect on teachers' classroom practices (Leithwood & Jantzi, 2006).

While the aforementioned studies provide a strong case for transformational leadership practices, a significant limitation of most is a lack of information regarding the manner which transformational leadership practices were implemented to achieve stated outcomes. A possible reason for this process gap may stem from methodology. Because the studies were quantitative in nature, relying mostly on surveys and questionnaires, the

detailed data regarding processes employed by administrators to achieve such data was not possible. However, the implications of transformational leadership practices for effective instructional responses to assessment data are still quite substantial.

Instructional change is largely an issue of capacity and commitment. The research reviewed in this section indicates that transformational leadership practices have been shown to have great promise in both these areas. Therefore, leaders in schools seeking to improve instruction in light of assessment data would benefit from a transformational leadership orientation. Specifically, they must be able to set an inspiring vision, provide intellectual stimulation, and individual consideration, areas of leadership that have been shown to have a positive effect on teacher's commitment, efficacy, and practice. The subsequent parts of this section on leadership practices seek to provide a more detailed explanation of specific leadership practices that are most likely to lead to improved instructional and organizational outcomes.

Culture

The concept of school culture figures very prominently in the school improvement literature as an essential element of sustainable change. Research has shown that schools with strong, positive cultures are associated with higher achievement than schools with weaker cultures (Macneil, Prater, & Busch, 2009; van der Westhuizen, Mosoge, Swanepoel, & Coetsee, 2005). Schein (1985) defines culture as the "basic assumptions that are shared by members of an organization and that define in a basic taken-for-granted fashion an organization's view of itself and its environment" (p. 6). It has also been defined by Firestone and Wilson (1993) as the "system of publicly defined and accepted meaning for the activities of a group of people" (p. 21). Sergiovanni's

(2006) definition emphasizes the importance of the role symbols and ceremonies play in communicating the beliefs and values of an organization while Deal and Kennedy (1982) define culture simply as how things are done. The underlying thread that runs through each of these conceptions of culture is the idea that organizations have shared values and beliefs that have a powerful influence on the actions of their members. Thus, culture has the potential to catalyze organizational effectiveness and innovation or result in the organization's stagnation and decline. Therefore, effective leaders must understand and acknowledge the nature of the culture in their schools and take tangible steps to develop a culture that is consistent with values of high achievement, collaboration and innovation (Deal, 1993). Schools that reflect these values tend to be tightly structured around these core ideas and often implement symbols, rituals, and routines that maintain, strengthen, and perpetuate these core beliefs (Sergiovanni, 2006).

The question now becomes, How do principals develop strong, positive school cultures? The answer appears to be that they should develop transformational leadership characteristics such as those outlined in the preceding section. According to research by Dumay (2009), transformational leadership is significantly associated with higher levels of cultural homogeneity, which is an indicator of the extent to which "assumptions, norms, values, and cultural artifacts are shared by organizational members" (p. 524). Specifically, schools with transformational leaders are more likely to have higher levels of collective decision-making regarding instructional issues because these leaders institute structures that promote collaboration between teachers. As a result, there is a higher level of common understanding and a more coherent school culture as more teachers adopt a shared sense of purpose and instructional values. Leithwood and Jantzi

(1990) also found that transformational leaders made an explicit effort to develop shared meaning among their teachers, which, in turn, increased teacher commitment. This outcome was accomplished by a strong focus on collaboration and establishing an environment that encouraged innovation and new ideas but also emphasized reflection and the critical evaluation of those ideas in light of organizational values.

Perhaps more than any single factor, the transformational leadership dimension of providing clear and explicit organizational goals is consistently identified as essential for the development of strong school cultures (Campo, 1993; Deal & Peterson, 1990; Dumay, 2009; Leithwood & Jantzi, 1990; Rosenholtz, 1989; Sashkin & Sashkin, 1993). In her classic study of teacher conceptions of school as a workplace, Rosenthal (1989) states:

If there is any center to the mystery of schools' success, mediocrity, or failure, it lies deep within the structure of organizational goals: whether or not they exist, how they are defined and manifested, the extent to which they are mutually shared. Indeed, the hallmark of any successful organization is a shared sense among its members about what they are trying to accomplish. (p. 276)

To the extent that there is shared purpose and understanding of common goals which principals constantly reinforce through their daily actions, teachers will begin to prioritize those goals in their instructional decision making. Rosenholtz's findings indicate that clarity of goals and purpose results in greater degrees of collaboration while goal ambiguity and the absence of shared purpose provide teachers with a great deal of discretion to engage in self-interested practices, which often results in isolation. The factors that are most efficacious in facilitating teacher adoption of shared goals were the

extent to which principals promoted the adoption of shared goals amongst the teaching staff and the level of teacher participation in the development of school goals (Rosenholtz, 1989). In fact, Campo (1993), in her study of collaborative school cultures found shared decision making increased teacher fidelity to organizational objectives and greatly enhanced teacher collegiality and collaboration.

Another leadership practice that has a strong effect on the culture of schools is value-based leadership (Maehr & Buck, 1993). Teachers do not individually decide what is taught in schools. Instead, curriculum and pedagogy are generally derived from a shared understanding of schooling as represented by the various regularities that characterize the educational process (Sarason, 1996). Changing teacher practice requires the deliberate alteration of these shared understandings and regularities to reflect a specified set of values and beliefs. Therefore, this requires curricular and instructional policies, the process of rewarding and recognizing individual effort, evaluation procedures, scheduling and grouping practices, and the allocation of resources to be aligned with core values about effective teaching and learning (Maehr & Buck, 1993). These practices reflect the necessity of leaders' attention to what Firestone and Wilson (1993) term bureaucratic and cultural linkages. Bureaucratic linkages are those structures and arrangements that facilitate the operation of a school. They include rules, schedules, policies, and hierarchies that either restrict or promote opportunities for teachers. Cultural linkages influence teachers' perceptions of their role as well as their commitment to the organization. They include value systems, stories, symbols, and rituals that characterize the organizational ethos. In their characterization of the symbolic frame, Bolman and Deal (2003) emphasize the importance of rituals, symbols, and stories

as manifestations of organizational culture and identity. They cohere an organization by providing a common set of foundational beliefs and values that imbue meaning and purpose to individual and collective action. The commitment that is fostered by cultural linkages has the potential to induce great improvement. However, individually, neither of these linkages is a panacea for school improvement. Rather, the effective leader leverages both in a coordinated fashion to build bureaucratic linkages that promote structures and policies that support the leader's vision for the school and cultural linkages that build the momentum and commitment that will enable meaningful change to manifest and be sustained (Firestone & Wilson, 1993).

Distributed Leadership

Leadership research and policy often tend to focus on the efforts of those with formal positional authority. However, a growing body of research indicates that leadership is often spread beyond those in administrative positions (Leithwood, Mascal, Strauss, Sacks, Memon & Yashkina, 2007; Silins & Mulford, 2002; Harris, 2002). The concept of distributed leadership is based on the idea that leadership is not solely the province of the principal or administrative team. Rather, teacher leaders play an integral role in leading various aspects of the school, including instruction. Therefore, according to distributed leadership theory, an exclusive focus on those in formal leadership positions leads to an inchoate understanding of the nature of school leadership. The distributed perspective replaces the model of the lone charismatic leader with one that seats leadership responsibilities across multiple individuals and groups (Spillane, Halverson, & Diamond, 2004; Harris & Spillane, 2008).

Distributed leadership derives its theoretical underpinnings from both situated and distributed cognition theories. The concept views leadership as the confluence of the interaction and activities of multiple leaders within the context of practice. Spillane et al. (2004) state that leadership is “stretched over the social and situational contexts of the school. Leadership is not simply a function of what a school principal, or indeed another individual or group of leaders knows and does. Rather it is the activities engaged in by leaders in the interaction with others in particular contexts around specific tasks” (p.5). Thus, as Harris (2005, p. 258) notes, distributed leadership is not something that is “done” to others. The distributed perspective recognizes that leading schools is a complex, difficult task, that is likely impossible without accessing the experience and expertise of multiple actors. As a result, the distribution of leadership enables the pooling of expertise toward the attainment of common goals.

The emphasis on interaction and common purpose is essential because it underscores the distinction between distribution and delegation. The distributed leadership approach flattens the organizational structure to reflect a more lateral framework rather than a hierarchical one (Hargreaves & Fink, 2008). The mere delegation of roles and responsibilities may result in an additive form of leadership distribution where many people may execute varied leadership functions in isolation without coordinating those efforts with others, which could potentially stifle the ability of the organization to grow and develop. Contrastingly, distributed leadership theory employs a more holistic orientation that relies upon “synergistic relationships among some, many, or all sources of leadership in the organization” (Harris, Leithwood, Day, & Sammons, 2007, p. 343). This perspective relies upon a greater degree of

interdependency, collaboration, and organizational focus. Thus, distributed leadership is not concerned so much with the actions of leaders as it is with their interactions around a shared purpose (Spillane, Halverson, & Diamond, 2004).

The form of distributed leadership has been a significant focus in the research literature. Leithwood and colleagues (2007) discovered the following four overarching patterns of leadership distribution in schools.

1. Planful Alignment - In this model, prior agreements have been made between various actors regarding the nature and extent of leadership exercised by various individuals. This configuration of distributed leadership is likely to be associated with a commitment to dialogue and reflection, shared organizational goals, a collaborative focus, and an understanding and trust of the relative capacity of colleagues.
2. Spontaneous Alignment - The distribution of leadership roles and functions occurs with no prior planning. However, decisions based on intuition and tacit knowledge result in an distribution of leadership that is compatible with school needs. Thus, the major difference in outcomes between spontaneous and planful alignment is the degree of prior consideration of leadership roles and functions. This form of distributed leadership is likely to be associated with a reliance on intuitive decision-making and an idealistic perception of colleagues' capacities. However, like planful alignment, there is also an emphasis on shared organizational goals and cooperation.
3. Spontaneous Misalignment – This approach is similar to spontaneous alignment except that the outcome is not as fortuitous. This can result in the degradation of

institutional productivity. However, organizational members are not opposed to planful or spontaneous alignment, which leaves open the possibility of future productivity.

4. Anarchic Misalignment - This mode of distribution is characterized by an absolute rejection by many members of the organization of being subject to influence by others regarding their own work. As a result, a highly individualistic and competitive work environment emerges.

Leithwood et al. found that planful alignment was most likely to characterize leadership activities around schools' most important priorities. This pattern of distribution most often closely involved the formal administrator. To the extent that a particular leadership initiative was not associated with schools' priorities, the occurrence of planful alignment decreased significantly.

Research that directly seeks to assess the impact of distributed leadership practices on organizational outcomes is still emerging (Harris, 2005; Harris, Leithwood, Day & Sammons, 2007). However, there are several studies that indicate the effectiveness of distributed leadership practices. Research indicates teachers are more likely to work closely together to develop their collective knowledge when there are multiple sources of leadership to initiate and facilitate organizational learning (Silins & Mulford, 2002). A study by Heck and Hallinger (2009) also indicates that academic capacity is improved when there is a robust structure for distributed leadership. In addition, the study found that distributed leadership had an indirect positive effect on student growth in mathematics. Additional studies have found distributed leadership to be associated with increases in student achievement as well enhanced instructional

practice (Louis, 1996; Wahlstrom & Louis, 2008). Finally, in a study of the leadership practices of school leaders who improved schools with a history of academic and social problems, Harris (2002) concluded that a common characteristic of these leaders was a strong focus on distributed leadership and collaborative decision-making for the purpose of empowering staff to tackle the complex challenges associated with school improvement. Therefore, when considered comprehensively, the emerging evidence appears to indicate distributed leadership practices coupled with transformational leadership approaches may have promising implications for school improvement efforts.

Coherency

A major outcome of effective leadership is the degree of coherency of instructional improvement efforts. Firestone, Mangin, Martinez, and Polovsky (2005) conducted an action research study of the professional development practices of three New Jersey districts deemed underfunded by the state's school finance lawsuits. Of the three districts in the study, the researchers found that professional learning was greater in the district that tied professional development to the stated goals of the district and the state. The district's efforts were characterized by a refined focus on specific subject areas and heavily emphasized content-specific professional development. This focus was also reflected in the supervision and teacher assessment process. In this district, teachers report higher degrees of instructional change and higher expectations of student achievement as a result of professional development experiences the district purposely crafted to emphasize continuity, modeling of best practices, and opportunities to practice and discuss techniques.

Elmore and Burney (1997) conducted a study of New York City's Community School District Two's effort to initiate a comprehensive focus on professional practice. The primary focus in Superintendent Anthony Alvarado's attempt to improve instruction in his district was to create a culture of shared values that focus the work of educators around a specific group of actions and programs. He first emphasized the centrality of instruction and expected his principals as well as central office administrators to demonstrate this value in their efforts to support the work of teachers and implement high quality instructional standards. Recognizing that instructional change is a long process, he developed a system where experienced teachers and those with content expertise worked together to develop strategies that were congruent with the curriculum and implemented processes where teachers were frequently observed, provided feedback, and reflected on their practice. Essential to this process was a pervasive effort to eliminate the isolation that characterizes teaching by establishing frameworks for the sharing of expertise.

The aforementioned actions were undertaken with a strong emphasis on system-wide implementation. All principals and teachers were expected to work toward continuous instructional improvement as part of a larger effort to move the system forward. These were the expectations, and every principal was tasked with achieving those expectations. All principals prepared improvement goals based on district objectives and were held accountable for developing and implementing a plan to accomplish them. Their efforts were aided by a decentralization policy that bestowed increasing levels of budgetary authority. Over time, the collective efforts resulted in District 2 becoming one the highest-performing urban districts in the country with less

than 12 percent of its students scoring in the lowest quartile on a national standardized reading test. Contrastingly, 40 to 50 percent of urban students typically score in the lowest range (Elmore, 2000).

A central characteristic of the both New Jersey and New York City approaches to school improvement was a strong focus on instructional coherency. Newman, Smith, Allensworth, and Bryk (2001) define instructional coherence as “a set of interrelated programs for students and staff that are guided by a common framework for curriculum, instruction, assessment, and learning climate that are pursued over a sustained period” (p. 299). The authors present the following three conditions necessary for strong instructional coherence.

1. A common instructional framework guides curriculum, teaching, assessment and learning climate. The framework combines specific expectations for student learning with specific strategies and materials to guide teaching and assessment (p. 299).
2. Staff working conditions support implementation of the framework. This includes basing teaching evaluation on how well teachers implement the instructional program and providing professional development opportunities focused on the framework (p. 299).
3. The school allocates resources such as funding, materials, times, and staff assignments to advance the school’s common instructional framework and to avoid diffuse, scattered improvement efforts (p. 300).

Newman et al. (2001) conducted a study that sought to determine the relationship between schools’ levels of instructional coherency and student achievement. The

researchers employed robust data collection methods that allowed for a thorough examination of the effect of instructional coherency. They examined test score data, implemented surveys, classroom observations, and interviews. They found that to the extent that schools' levels of instructional coherence improved, there was a significant increase in student achievement as measured by standardized test scores. This gain was nearly twice as much as in schools that showed no improvement in the level of instructional coherency. Furthermore, achievement losses occurred for schools whose levels of instructional coherency declined. The reasons why instructional program coherence may have such significant effect on student achievement are not conclusive. However, it is theorized that a more coherent instructional program provides students with a unified set of experiences they can connect and build upon rather than disjointed learning that is inconsistent and provides few opportunities to connect new knowledge to past experiences. Such a program can increase student understanding as well as their motivation to learn. In addition, a coherent instructional program that is implemented over a sustained period of time may increase teacher buy-in by eliminating the constant procession of new programs that will be abandoned before they are completely implemented. As a result, they are more likely to work together and are more motivated to develop their ability to implement the initiative effectively.

While research suggests that instructional program coherence does have positive implications for student achievement, the manner of implementation is important. Newman and colleagues (2001) found efforts at instructional coherence undermine a school's sense of professional community if they are implemented in an autocratic, inflexible fashion that provides little or no opportunities for teachers to question methods

or utilize their professional judgment. Such practices may lead to demoralization and increased attrition among faculty members. It is recommended that when pursuing instructional coherence, school leaders adhere to democratic values, and develop shared ownership of the initiative.

Leadership Content Knowledge

While instructional coherence is a significant component of efforts to enhance a school's instructional program, it does not constitute the full spectrum of factors necessary for improvement. Another important element is leadership content knowledge. This term, proposed by Stein and Nelson (2001), is defined as "that knowledge of academic subjects that is used by administrators when they function as instructional leaders" (p. 423). In a study of administrator math instructional leadership practices, Nelson and Sassi (2005) found that administrators' knowledge of subject areas and their beliefs about effective teaching and learning in those subjects have a substantial influence on the nature of the instructional leadership they exercise. Their findings indicate that principals with a largely procedural knowledge of mathematics that did not include a more conceptual understanding may not be as capable of helping teachers improve instructional practice that is based on more in-depth processes. Principals who generally lacked subject understanding were more likely to employ a "rulelike orientation toward teaching" (p. 73). Such an approach is characterized by an adherence to general principles such as questioning strategies and wait-time without significant consideration of the context in which they occur, which is common among principals who were trained to implement teacher assessment instruments that rely on the direct observation of observable behaviors. This often results in superficial teacher development efforts that

do not encourage teachers to adequately consider their own math understanding, teaching practices, and their connection to student learning. Contrastingly, the researchers found those principals possessing a greater depth of math conceptual knowledge were more capable of identifying problematic areas of student learning and teacher practice and provide essential support for teachers attempting to improve performance in these areas on both an individual and whole school level. These administrators were also more adept at developing a school culture that supported collaboration and inquiry around critical concepts in mathematics instruction.

The cases of Community District #2 in New York City and San Diego provide illustrative examples of how leadership content knowledge manifests in leaders' professional practice (Darling-Hammond, Hightower, Husbands, LaFors, Young, & Christopher, 2005; Elmore & Burney, 1997; Stein and Nelson, 2001; Stein, Hubbard, & Mehan, 2004). Stein & Nelson (2001) describe how district leaders, guided by a strong understanding of how children best learn in both literacy and math, developed curriculums, created and implemented robust professional development programs for teachers and principals, and focused the efforts of the district to support the initiatives. This case demonstrates a major assertion by the authors regarding administrator content knowledge: "...depth of subject matter knowledge and how students learn those subjects does seem to give administrators a significant advantage as instructional leaders" (Stein & Nelson, 2001, p. 443). If school leaders are to substantially improve the quality of instruction in their schools, they should be able to identify, implement, and develop strong instructional practices that are particular to specific content areas. However, the idea lacks practicality given the large number of subject areas for which administrators

are responsible and the lack of training in multiple subject areas. Moreover, it would be extremely difficult for school systems to recruit individuals with sufficient depth and breadth of knowledge and provide professional learning opportunities that would facilitate the development of deep understandings of multiple content areas. Rather, Stein and Nelson recommend that administrators have expertise in one subject and the content-specific pedagogy associated with it. From this base of knowledge, they begin to explore a representative portion of other content areas, refining and adapting their previous understandings of teaching and learning so that it is compatible with the requirements of the new subject areas. Another option is to distribute leadership. In this approach, multiple individuals within a school or school system contribute their expertise in specific subject areas to enhance instructional improvement efforts. Regardless of how it is developed or implemented, leadership content knowledge is a critical and essential prerequisite for any attempt to meaningfully and substantively improve the quality of instructional programs.

The transformational leadership literature indicates that the primary focus of the school principal should be building commitment and capacities of teachers toward organizational improvement. This is accomplished through a focus on developing a productive school culture through the establishment of a shared purpose and common goals and the leveraging of bureaucratic and cultural linkages in a manner that fosters commitment to organizational objectives. Once objectives are established, it is important to ensure that decisions are coherent and aligned to improvement objectives. To the extent that the instructional plan for improvement is clear and coherent, there is a greater degree of institutional and student achievement outcomes. Finally, leaders must be able

to recognize and promote effective teaching. When administrators have strong, leadership content knowledge, they are better able to leverage that knowledge to facilitate instructional improvement and develop systems that enhance the capacity of teachers to improve student learning.

Conclusion

There is a dearth of scholarly research that attempts to provide a comprehensive understanding of how assessment data influence instructional practice. Therefore, it cannot be conclusively determined that the use of assessment information has a tangible influence on instructional practices or student achievement. This poses a substantial problem because data-driven decision-making is an integral part of current federal and state accountability efforts. If schools are to respond effectively to such demands, there must be a body of research that describes how data affect instructional processes and identifies both effective and ineffective approaches for using data to inform instruction. Moreover, this research should emphasize more than the practice of incorporating data into the instructional process. It should also focus on whether and how leaders develop a culture that situates the centrality of instructional improvement as the school's primary focus. In addition, it should examine approaches to professional development. Research in these areas would provide a means of understanding how these factors influence schools' efforts to improve instruction in light of insights provided by data.

This review of literature is an attempt to synthesize relevant literature and provide a conceptualization of how this idea could potentially manifest. Through the examination of three distinct areas of research, it is argued that the nature of the influence of data analysis on instructional practices is determined by a school's relative levels of capacity

in the areas of data use, professional learning, and leadership. The school's capacity to use data effectively determines the quality of the insight educators gain from data. The research indicates that there must be systems in place that facilitate the efficient presentation and analysis of data. Furthermore, data analysis must occur within a culture that is receptive to data use and continuous improvement, and the process must be integrally linked to student achievement goals. However, the impact of data on instructional practices is dependent on the school's capacity for professional learning. When student achievement issues are highlighted by data analysis, the school must be able to adapt instruction to meet identified needs. If schools cannot change the manner in which they teach, the efficacy of the improvement process may be greatly diminished. Therefore, the research indicates that professional learning must be content focused, collaborative, and situated in teachers' practice. In essence, there must be a strong professional community where teachers are able to work together to continuously assess the impact of their instruction and modify those practices to enhance student learning.

Schools' levels of capacity for data use and professional learning are both strongly influenced by the third capacity, leadership. Leaders must build commitment to the process of using data to inform instructional practices. They must cultivate a culture of data use. Moreover, they must work to establish a collaborative, professional community where teachers constantly interact to assess the effectiveness of their teaching practices. This is accomplished through setting clear goals and leveraging bureaucratic and cultural resources to support core values. Leaders must also work to ensure instructional coherency by developing shared instructional standards and providing resources to further improvement objectives. Finally, leaders must have a solid

understanding of good teaching. They must be able to recognize effective practices and guide teachers in their professional development.

The conceptualization of data-driven instruction presented in this literature review has significant implications for the field because it would comprehensively evaluate and provide a deeper understanding of how data influence instruction as opposed to the relevant, yet disparate insights currently available. This could eventually lead to more research and experimentation with models and frameworks for data-driven instruction that focus on more than making data available for analysis but also attempt to link them to the core practices of schooling.

CHAPTER 3: METHODOLOGY

Methodology

The purpose of this dissertation study is to determine how participation in structured data analysis influences teachers' instructional practice. As stated previously, the current policy environment places an increasing emphasis on students' performance on standardized testing, and there are increasingly severe consequences associated with failure to meet achievement benchmarks. As a result, data-driven instructional improvement is becoming a common strategy employed by schools to meet those benchmarks. However, it is not clear how this approach actually influences instructional practice. Furthermore, there is not a clear understanding of how underlying issues of capacity factor into this process. Therefore, this dissertation study poses the following research questions:

1. How does participation in formal data analysis processes influence instructional beliefs and practices?
2. How does a school's capacity in the areas of data use, professional learning, and leadership affect its ability to respond to assessment data?

To answer these questions, this study employed qualitative case study methodology. Data collection methods include observations, analysis of school and district documents, and interviews with teachers and administrators in an elementary school that has implemented structured data analysis. The school is located within a district that has a demonstrated commitment to improving the data use capacity of its schools as part of its overall approach to improving student achievement.

Case Study Methodology

This study is a descriptive, analytic qualitative case study of a single elementary school that has implemented formal structures that allow teachers to analyze student assessment data. The case study approach is particularly suitable because the topic is relatively unexplored. An organizational case study of a single site will allow for in-depth exploration and thick description of the processes that inform teachers' use of data for instructional decision-making. The case study approach allows the research to occur within the context of teachers' actual practice, which has the potential to yield more valid interpretations and conclusions regarding the role data play in the instructional process. Yin (2009) states that the case study method is most appropriate for investigating "a contemporary phenomenon in depth and within its real-life context, especially when the boundaries between the phenomenon and context are not clearly evident" (p.18). Flyvbjerg (2006) also argues that social science research has yet to produce a general predictive theory that is not context-dependent and, as result, cannot produce knowledge that is context-independent. Hence, there is no knowledge in social science research that is not shaped by context. He states, "Predictive theories and universals cannot be found in the study of human affairs. Concrete, context-dependent knowledge is, therefore, more valuable than the vain search for predictive theories and universals" (p. 224). Thus, the case study is well suited to generate this contextual knowledge, which has the potential to provide a fuller understanding of the complex processes and interactions that shape a particular phenomenon.

The case study method is also appropriate when how or why research questions form the basis of the investigation and when the study focuses on contemporary events

that the researcher has no ability to control (Yin, 2009). As the literature review for this study indicates, the influence of data analysis on instructional practice is likely to be a complex phenomenon with a variety of factors commingling to shape the nature and character of the instructional response. Experimental studies by their very nature deliberately separate the phenomenon from its context. Surveys, on the other hand, can begin to address both the phenomenon being studied and its context, but their ability to gain a comprehensive understanding of context is greatly limited by the number of variables that can be investigated and practical considerations such as the length of the survey. The case study, however, is not nearly as constrained by such factors and allows for a much more robust methodological approach that allows the researcher to explore a greater number of variables through multiple sources of evidence that can provide data on both the phenomenon under investigation and its underlying context. These data can then be triangulated to develop more thorough and valid interpretations (Yin, 2009).

Sample

The school and district selected for this study were chosen because together they form a critical case (Miles & Huberman, 1994; Yin, 2009). The critical case represents the “most likely” or “least likely” in that conclusions will likely either confirm or disprove theoretical propositions (Flybvjerg, 2006, p. 231). The critical case exemplifies the problem being studied, and, as such, is of strategic importance. The conclusions drawn from a critical case have potential applicability to other schools seeking to use data to inform instructional processes as well as the potential to inform future research in this area because the contextual circumstances of the critical case encompass a number of diverse, pertinent issues that make it highly representative of schools undergoing similar

initiatives (Yin, 2009). Therefore, conclusions drawn from a critical case are likely to be widely applicable.

The classification of the site as a critical case is partly derived from the extraordinary steps the district has taken recently in the area of data-driven decision making. Over the past eight years, the Riverton School District has made substantial investments in improving its ability to respond to data as part of its efforts to improve achievement in its lowest performing schools. One outgrowth of these efforts has been a large investment in data warehousing technology that greatly improved access to student achievement data. The district has also trained facilitators to guide teachers' discussions around data and to implement a structured protocol for developing standards-based assignments. These conversations occur during regularly scheduled meetings where teachers meet for the explicit purpose of discussing student work. The overarching rationale behind this approach is that data should drive instructional decision making. Therefore, the district has demonstrated a commitment to using data to improve teaching and, resultantly, student performance. These initiatives, which shall be described in greater depth in later sections, extend well-beyond the efforts of most districts. The robust and comprehensive approach the district has taken to use data to improve student achievement makes it an exemplar for data use. Many of the initiatives the district has employed such as structured data meetings, scheduling that promotes collaboration, and technological investment are congruent with best practice research on data use (Datnow, Park, & Wolhstetter, 2007; Lachat & Smith, 2005; Wayman & Stringfield, 2006). Because the district is essentially a model for data use, this study may yield conclusions

applicable to other schools and districts that have undertaken similar measures to improve student achievement through the analysis of assessment data.

The recent history of the school site has also made it suitable as a critical case. As a school that historically has been deemed underperforming, Franklin Elementary has been a primary focus of the district's efforts to substantially enhance and sustain student achievement. While student achievement has fluctuated at times, over several years, Franklin made incremental progress and, in 2009, achieved its highest level of student achievement since the inception of the current state testing program. At this point, the percentage of students reaching proficiency in reading and math represented a two-fold increase over a period of eight years.

However, the school experienced a sharp drop in student achievement on the most recent administration of the state assessment, resulting in the school receiving the state's lowest accountability rating. As a result, Franklin is now being targeted for state intervention in the form of increased monitoring and the provision of additional personnel to facilitate the improvement process. If Franklin does not improve student performance by a sufficient degree, the administration may be replaced and teachers may have to reapply for their positions. Franklin's current context actually enhances rather than diminishes the school's suitability as critical case. Franklin is a high poverty, mostly minority school that struggles to improve and sustain student achievement levels. It is, in many ways, reflective of many schools throughout the country that are currently embracing a more data-driven approach. A great degree of improvement has coincided with the implementation of structured data analysis, but, as recent assessment data indicate, there have been setbacks. Therefore, this case presents an opportunity to

explore how the strong emphasis the district is placing on data is influencing the instructional program. The insights gained from this case study have the potential to inform how teachers, school, and district leaders should approach data-driven instructional improvement.

Site Description

The study was conducted at Franklin Elementary School, a moderately sized school located in the city of Riverton, an economically depressed semi-rural community in the southeastern United States. The school is part of the large, sprawling county-wide Riverton school district that encompasses urban, suburban, and agricultural communities. The community in which Franklin is located is a small city of around 17,000 residents. The economy is primarily agriculturally-based, and job opportunities are scarce, mostly unskilled, and low-paid. Over the past decade, the major agricultural companies have substantially reduced payrolls and closed production centers as a result of what the companies state as a need to stay competitive in light of a major increase in imported products produced with lower labor costs. As a result, there has been an increasing push to automate production and reduce payrolls. However, for a community in which the vast majority of households are dependent on farming, this has been devastating. Compounding this problem is the recent economic downturn, which has limited employment options outside of the city. Recent estimates place the unemployment rate at just over 30 percent, about three times the countywide average (Sorentrue & Schultz, 2009). According to the 2000 Census, about one-third of individuals and about a third of families live below the poverty level, numbers that are approximately three times national averages (U.S. Census Bureau, 2000).

Over the past eight years, the Riverton School District has made large investments in building its data use capacity. These investments include the purchase of a data warehousing program that stores a large variety of the student data to which all teachers have access. Teachers and school leaders are able to use the software to access a wide variety of reports that can be disaggregated based on user preference. This provides teachers and administrators access to the results of past standardized test data, periodic diagnostic tests, school-level common assessments, various reading inventories, attendance, and discipline records. To facilitate analysis of these data for the purpose of informing instructional decision-making, in 2003, the district also implemented weekly 90 minute sessions termed learning team meetings (LTM) where grade level teachers discuss student learning and assessment data. Meetings are led by a facilitator provided by the district as well as school administrators. The facilitator is centrally trained and deployed to guide the data analysis process in schools and usually works at one or two sites. Meetings typically focus on the examination of assessment data and student work, developing assessments, and developing plans to address weaknesses identified by data. As mentioned previously, this study conceptualizes the term “assessments” broadly to extend beyond traditional formative and summative assessments to include regular classroom assignments that can be analyzed for insights into student learning, and the analysis of assignments is a major focus of the district’s improvement efforts. During the data analysis meeting, the facilitator employs the Standards in Practice (SIP) protocol from the Education Trust to guide conversation about student assignments. The overarching purpose of the protocol is to increase the level of rigor in assignments. It is based on the belief that the quality of assignments dictates the quality of learning in

which students engage. Thus, by increasing the rigor of assignments, one must also improve the level of instruction to enable students to meet the demands of the assignment. The Education Trust (2007) states:

Standards in Practice[™] (SIP) is a professional development model that drives to the very heart of instruction—the assignment. Rooted in the belief that students can do no better than the assignments they are given, SIP helps teachers and school leaders inject rigor into assignments and align them with the highest educational standards. . . . *Standards in Practice*[™] is a professional development strategy that identifies the gap between what is being taught and what should be taught for students to attain high standards. This interactive model engages teachers in examining their assignments, instruction, and student work. Through this process, teachers collaborate to ratchet up the rigor of their assignments and devise instructional strategies to match them. (p.9)

The SIP model follows a six step process outlined by McDonald, Mohr, Dichter, and McDonald (2007, p. 85-87).

1. Introduction of the Assignment – A teacher or team of teachers introduce an assignment. This assignment can be developed by the teacher or an outside source. The teachers review the assignment to examine its academic purpose and content.
2. Assessment of Learning Goals – Team members analyze the demands of the assignment by identifying the academic knowledge and skills necessary to complete the assignment successfully.

3. Identify Applicable Standards – Team members match the content of the assignment to related state or district content standards.
4. Development of a draft task-specific rubric – Using a 4 point scale ranging from 1- fails to meet standards to 4- exceeds standards, team members develop descriptions that characterize student work that would be classified under each category in the scoring guide.
5. Assessment of student work – Teachers individually score student work and later discuss and reconcile discrepancies for the purpose of developing common academic expectations.
6. Student work informs improvement planning – Team members examine student work to determine areas of weakness and collaborate to develop a plan to improve instruction. The steps also present an opportunity for teachers to assess their own professional learning needs. If needed, the assignment is also revised so that it is better aligned with state standards.

LTM's are a component of a larger initiative the district terms Single School Culture. The district states that Single School Culture is “not a program but a way of organizing and running a school. It begins with shared norms, beliefs, values, and goals and results in agreed upon processes and procedures that produce consistency in practice” (Riverton School District, 2010a). The model encompasses four broad areas of school functioning. The first is academics, which mainly features the learning team meetings described above. However, the Single School Culture for Academics program also advocates involving students in conversations about their performance for the purpose of developing academic targets and creating a plan for their own learning. Single School

Culture for Behavior is an initiative designed to develop a uniform set of shared expectations, practices, and procedures for behavior to address behavior issues. Single School Culture for Climate seeks to address the context of the school environment by measuring student and faculty perceptions of the extent to which the school culture is characterized by a sense of equity, caring and openness. By identifying problem areas, schools are better able to take positive actions that are intended to nurture positive relationships between all members of the school community, which will indirectly influence the overall success of the school. Finally, Single School Culture for Data is the district's efforts to become more data-driven, to use data to assess the effectiveness of their practices and make adjustments when necessary. Data permeates all aspects of the Single School Culture model identified above. It allows the school to track its progress in each of the areas and enables the school to continuously improve (Riverton School District, 2010a).

One of the major components of Single School Culture for Data is the analysis of student assessment data. Teachers have access to a wide variety of student assessment data, which they analyze during the LTM's. Within the meetings, teachers, coaches, and administrators work collaboratively to identify academic strengths and weaknesses by scrutinizing the items of previously administered assessments. Guided by the learning team facilitator, the group identifies those items where students are particularly strong or weak and then examine the question to determine possible reasons for why students did well or poorly on the assignment. For example, they examine the complexity of the question and the extent to which that particular concept has been previously taught. They also look for any trends that emerge in the types of questions that are determined to be

strengths or weaknesses or in populations of students for whom specific types of questions are problems. For example, if English language learners all missed a particular type of question, it is an indicator that the concept needs to be addressed with this group. Once problematic areas have been identified, all involved should work collaboratively to develop an instructional plan to improve student performance. Teachers, administrators, and coaches should share strategies, identify professional learning opportunities, and work to secure resources that will enable teachers to effectively improve learning outcomes for the concepts and skills identified by assessment data. Thus, the data analysis process utilized by the district is one that is intended promote collegiality, professional learning, and ultimately improve student achievement.

The implementation of the Single School Culture model coincides with increasing federal and state demands for accountability and improved outcomes on the state assessment. As mentioned previously, NCLB provides for increasingly severe sanctions for schools that do not make adequately yearly progress. In addition, the state has also implemented a system that rates schools based on student test performance. A poor rating not only leads to shame for educators since the release of the ratings has become a yearly ritual in which results are published in all of the regional newspapers, but it also leads to district and state intervention. On the district level, teams of specialists consult with the administration and conduct walk-throughs to determine improvements needed to improve the curricular and instructional program. Subject specialists also provide professional development and work with teachers and coaches to model best practices for the purpose of developing the capacity of teachers to improve teaching.

An additional team from the state also works with poor performing schools and offers some support in the form of professional development offerings, but their function is more skewed towards monitoring than support. At the beginning of the year, failing schools are subject to an instructional review in which members of the state team visit every classroom and complete a checklist of best practices, including the extent to which objectives are posted, classroom arrangement, learning environment, content presentation, student engagement and work, teacher preparation, and questioning strategies. They also examine the school's diagnostic assessment data as well other periodic assessments to develop a performance baseline by which progress is assessed. Once the review is complete, they meet with the school's leadership to identify issues to be addressed, and the school is expected to develop an action plan for monitoring and improvement in each subject area. They then return at a later point to measure progress. If it is determined that progress is insufficient, the team does have the authority to recommend teachers and administrators be removed from their position. Because this is the first year that Franklin has been identified as a failing school, the state and district teams were only just beginning their work, and, as a result, these intervention efforts did not factor greatly into the school's improvement efforts at the time this study was conducted as it potentially could have if the study were conducted later in the year. Towards the end of the study, the state did complete the instructional review, but data collection was nearly complete and the results of the audit were only beginning to be disseminated to teachers.

Franklin Elementary School is the oldest school in the agricultural region in which it is located. Originally established in 1916 as a one-room school house that was

destroyed by a historic flood resulting from a catastrophic hurricane, it received its current name in 1922 (Riverton School District, 2010b). The school initially served only White students, but racial demographics shifted substantially when federal desegregation orders led wealthier White families to enroll their children in a newly established private school. As a result, the school came to serve a predominately African American population. However, over time, the number of Hispanic students has increased substantially to the current makeup of about 40 percent ($n \approx 250$) of the student population. Approximately 60 percent ($n \approx 350$) of students are Black, which includes a sizable Haitian population, and a very small number are White. Because of its cultural diversity, about 25 percent ($n \approx 160$) of students are currently classified as English language learners. The school currently enrolls over 600 students, of which about 12 percent ($n \approx 70$) are classified as having some disability. The instructional staff consists of about 60 instructional personnel, including the principal, assistant principal, and three instructional coaches in the areas of literacy, math, and science. Franklin also has a federal Title I designation. Nearly all students are eligible for free or reduced lunch.

The school has a history of low performance on the state standardized test, and it, along with the other elementary schools in the region, has historically been one of the lowest performers in the district. However, the school recently achieved its highest level of proficiency in reading and math with about 60 percent of students achieving grade level standards on the state test. These numbers were the school's highest levels of achievement in about a decade of state assessments and represents achievement that has roughly doubled since the inception of testing. However, scores dropped dramatically on the most recent assessment where the school experienced a nearly 25 percent drop in

reading proficiency and a smaller, six percent decrease in math. Furthermore, the state accountability system has a value-added component that tracks the progress of fourth and fifth graders scoring in the lowest quartile on the previous year's assessment. The number of these students making a year's worth of progress factors significantly into the school's accountability ranking. Historically, the numbers have enhanced the school's accountability ranking with yearly learning gains numbers generally ranging from 60 to 70 percent in reading and math. However, these numbers fell by approximately 20 percent in both subjects. Combined with the sharp decrease in reading, the school's accountability ranking fell, which triggered the increased state scrutiny described previously. As a result, the school is in a position where it must improve, and the analysis of assessment data plays a major role in determining the means by which this improvement will occur.

Sampling

Participants for this study were recruited using the snowball sampling method. Participant selection began with a small initial group of two to three teachers who chose to participate in the study. This group was then asked to recommend additional faculty members who may be interested in participating in the study. The recommended teachers were then asked to recommend even more teachers (Auerbach & Silverstein, 2003). Therefore, the sample size gradually increased until a sufficient number of respondents were identified to satisfy the objectives of the research, which was 10 interviews. Also included in the sample were school administrators, the reading coach, and the science coach. The initial sample of respondents were selected according to the following criteria: Employed as a full-time classroom teacher, administrator or coach at the school

for at least one school year, regularly participates in learning team meetings, and analyzes assessment data as part of his or her work.

Data Collection

A particular benefit of the case study strategy is the flexibility to employ multiple methods of data collection. As mentioned earlier, multiple sources of evidence allow the researcher to investigate a wider range of issues related to specific research questions. While these sources may be distinct and limited in isolation, the converging conclusions that may emerge from these data have the potential to address issues of construct validity (Yin, 2009). To address potential validity concerns, this study employed multiple data collection techniques. These included:

1. Semi-structured interviews with teachers and coaches regarding how data analysis influences their instruction, their assessments of professional learning experiences, and leadership practices at their school.
2. Semi-structured interviews with school administrators regarding data use practices implemented by the school, school improvement objectives, beliefs regarding instructional change, and the manner in which they build capacity in the areas of professional learning and data use.
3. Observations of data analysis meetings for the purpose of observing the data analysis and instructional decision making in context and to corroborate data from teacher and administrator interviews. Data were recorded in observation field notes.

4. Analysis of archival documents such as meeting minutes, data printouts, and district documents for the purpose of corroborating data from teacher and administrator interviews.

The varied methods of data collection made possible through the case study approach have the potential to yield greater validity because they allow for triangulation of data sources. Each of the data sources can be compared to each other for the purpose of determining consistency, conflict, and thematic categories. Thus, the case study method is a rich strategy for generating the greatest insight into the research questions posed by this study.

Table 1

Summary of Methods

Method	Source	Purpose
Interviews	Teachers, Administrators, and Academic Coaches	<ul style="list-style-type: none"> o Determine teacher and administrator perceptions of instructional change o Determine levels of capacity in data use, professional learning, and leadership
Observations	Learning team meetings and professional development sessions	<ul style="list-style-type: none"> o Provide a source for comparison with teacher and administrator interviews o Provide an understanding of data analysis in practice
Document Analysis	Data analysis meeting minutes, data printouts, school district documents	<ul style="list-style-type: none"> o Corroborate interview and observation data o Provide an understanding of district protocol for data analysis o Analyze the results of data analysis meetings

Interviews

A total of ten interviews were conducted for this study. Six teachers and two academic coaches comprised the teaching staff in the study (see Table 2). This group was chosen because instructional change is the major topic of this study, and teachers are the individuals that deliver the instruction, and academic coaches work closely with teachers around instructional issues. As a result, their perceptions are essential. The teachers and academic coaches were interviewed regarding their perceptions of how data analysis influences their instructional beliefs and practices in a 45 to 60 minute interview (see Appendix A). For the purpose of this study, academic coaches were considered teachers and were interviewed using the teacher protocol. Interviews also focused on obtaining assessments of the type and quality of professional learning experiences, their characterization of the school's professional learning community, the school's culture, and teachers' involvement in decision-making. Four upper grades (3-5) teachers and two primary grades (K-2) teachers were selected for interviews. Upper elementary grade teachers were chosen for emphasis because test results in grades three to five form the basis of state accountability efforts. Therefore, most of the resources of the school in terms of data analysis are usually skewed toward these grades. It is recognized that primary grade teachers do participate in data analysis and contribute invaluablely to the success of the school, and interviews with these teachers yielded valuable insight. However, because the bulk of data analysis training and emphasis are targeted toward the upper grades, more teachers from these grades were selected. The number of participants targeted in the study and the fact that the teachers come from the same school were sufficient to achieve data saturation (Guest, Bunce, & Johnson, 2006).

The principal and assistant principal were also interviewed for this study. These individuals were chosen because the study also focuses on issues of capacity. Because they are tasked with building the professional learning and data analysis capacity of teachers, interviews provided insight into the level of capacity in these areas. In addition, leadership interviews also allowed the researcher to develop an understanding of the school's leadership capacity. Administrator interviews focused on how the leadership goes about establishing a productive school culture, provides opportunities for professional learning, and sought to gauge the extent of their instructional leadership (see Appendix B). Each interview lasted approximately 90 minutes. All interviews were recorded and transcribed using a speech recognition program. The following table provides descriptions of the interview participants.

Table 2

Interview Participants

Participant	Position	Experience
Carla	Principal	21 Years 4 th Year as Principal
Simone	Assistant Principal	20 Years 4 th Year as Assistant Principal
Vincent	Academic Coach	9 years 5 th year as Academic Coach
David	Academic Coach	38 years 2 nd year as Academic Coach
Audrey	Primary Grades Teacher	More than 30 years 8 th year in current position
Angela	Primary Grades Teacher	8 years 3 rd year in current position
Natasha	Intermediate Grades Teacher	4 years 2 nd year in current position
Joan	Intermediate Grades Teacher	18 years 7 years in current position
Paula	Intermediate Grades Teacher	7 years 1 st year in current position
Steve	Intermediate Grades Teacher	5 years 5 th year in current position

Observations

Observations primarily occurred during data meetings. These are formal meetings led by a facilitator and often included administrators and academic coaches. The purpose of these observations was to develop an understanding of the data analysis and instructional improvement process in practice. These observations provided a picture of how the school uses data to inform instructional practice. As the literature review indicates, collaboration is an integral component of each of the three areas of capacity examined in this study. Observations allowed for an understanding of how collaboration took shape in the school. Through observations, I was able to assess the manner in which teachers look at data, how leaders develop instructional and professional learning priorities, and how teachers develop an instructional plan based on assessment data. These observations also provided an additional source of data against which teacher and administrator interview data were compared. Each grade level meets once every seven days in formal data meetings that last approximately 90 minutes. A total of 17 of these observations were conducted for the study.

Professional development sessions were an additional source of observational data. These meetings allowed for a greater understanding of how the school links professional development to student performance data. They provided insight into the extent to which professional development develops teachers' content and pedagogical content knowledge as well as allow for determination of whether professional development is consistent and job-embedded. Professional development observations also provided an opportunity to compare professional development opportunities to teacher and administrator descriptions of their effectiveness. Four professional development observations were conducted.

Observations were recorded in field notes using Microsoft OneNote. The format of observations followed a pre-established structure in which an event is described with additional commentary by the researcher regarding those events. Field notes were revisited within the shortest time frame possible for the purpose of providing thick descriptions (Geertz, 1973). I was able to elaborate on ideas presented in the notes, further describe the emotions of the actors, note ambiguities, highlight areas for special attention during observations, and expound on ideas presented in commentary.

Document Analysis

According to Yin (2009), documents are most useful for the corroboration and augmentation of other sources of evidence. In this study, documents provided a great deal of insight into how the school used assessment data. There were two major purposes for document analysis in this study. The first was to develop an understanding of the district's data analysis process. Therefore, district and school documents that detail the school and district's rationale and goals for data analysis, the origins of the process, and specific information about how the process should unfold were examined. For example, documents that outline the protocol utilized in data analysis meetings were examined to develop an understanding of how meetings should be run. Through these documents, a fuller picture of how the data analysis process should unfold was developed. This insight was then used to compare the intended process with the actual process.

The second goal of document analysis was to analyze the results of data analysis meetings. After every meeting, the instructional decisions made by each grade group are recorded on a standardized form. These documents illuminated how the school defined problems of practice and sought to address them. In addition, a considerable number of

data reports were generated for the learning team meetings. Analysis of these reports provided data regarding the accessibility of the reports and the variety of content provided to teachers regarding student reports. These robust and differentiated forms of data led to more valid interpretations and conclusions. Therefore, in addition to providing information on the process of data analysis, document analysis served as a form of triangulation by which multiple sources of data can be compared to provide a fuller description of the extent of instructional adaptation.

Pilot Interviews

Pilot interviews were conducted prior to the initiation of this research study. The purpose of the pilot study is to “refine your data collection plans with respect to both the content of the data and the procedures to be followed” (Yin, 2009, p. 92). Thus, one major goal of the pilot interview was to test the interview protocol to determine the extent to which it elicits responses that address the research questions. The pilot interview provided valuable preliminary information regarding the length of the interviews. Given the limited availability of teachers and administrators, it was essential that interviews stay within an acceptable timeframe. The results of the pilot interviews indicated that the protocol could be implemented within the targeted time frame.

The pilot interviews were conducted with one teacher and an administrator. They were not from the school or district in which the study took place since I did not have access to the site prior to the initiation of the study. However, the participants were selected based on the similarities of their experiences with assessment data to the participants that were targeted for the study. The pilot study respondents were a teacher and administrator from the Boston area whose schools have implemented formal

structures for data analysis or have implemented initiatives to improve the instructional response to assessment data. The data for the pilot interviews were analyzed in the same fashion outlined in the data analysis section of this chapter. The insights derived from this analysis informed the final structure of the interview protocol.

Data Analysis

Data generated for this study was analyzed using an inductive coding process (Glaser & Strauss, 1967; Miles & Huberman, 1994). This approach was a particularly useful analytic method because of the emergent nature of the data. Since the topic of this study has not been extensively studied, an inductive approach allows the researcher to develop conclusions that are derived directly from data and largely unencumbered by prior assumptions. Furthermore, codes created through inductive coding may illuminate concepts that may be overlooked by codes derived through more deductive approaches (Miles & Huberman, 1994). As a result, inductive coding has the potential to provide a more accurate explanatory framework for the research questions. These frameworks will be derived from theoretical categories that illuminate the relationships between different concepts that emerge from data (Charmaz, 2000).

The analysis began through a process of microanalysis of transcribed data as part of the open coding process. Microanalysis involves the careful examination of data, including interviews, field notes, and documents, at the level of the line and paragraph. Initially, especially pertinent sections of data are identified and assigned conceptual codes (Strauss & Corbin, 1998). The purpose of microanalysis of data, according to Strauss and Corbin (1998) is to “mine the data” and “compels the analyst to listen to what the interviewee is saying *and* how they are saying it” (p.65). Charmaz (2000) asserts

microanalysis serves as a means of hindering the imposition of “extant theories or our own beliefs on the data” (p. 515). The purpose of the open coding process is to break down data into smaller components and then compare for similarities and differences. This process of disassembly leads to the identification of discrete concepts labeled with codes. Concepts that are found to be similar were grouped into categories. Categories represent a phenomenon, which is a "problem, an issue, or an event, or a happening that is defined as being significant to respondents" (Strauss & Corbin, p.124).

Subsequent to initial coding were the processes of axial and selective coding. Benaquistio (2008) defines axial coding as “the phase where concepts and categories that begin to stand out are refined and relationships among them are pursued systematically” (p. 51). It can also be viewed as the process of explicating the relationship between an identified category and its subcategories. Whereas categories represent a phenomenon, subcategories expound upon and provide a greater degree of insight into a phenomenon. They provide details about the conditions, actions, and consequences (who, when, where, why, how, and what result) associated with a category. Thus, subcategories, through the axial coding process, provide an explanatory framework for each category that is derived directly from the data. Axial coding, in effect, reassembles the discrete units of data created during open coding and makes connections between different types of categories (Strauss & Corbin, 1998).

The final phase of the analysis process was selective or focused coding. This process involves the identification of central categories or themes, which represent the major themes of the research and that serve as a basis for theory development. It is, in a sense, a summation of all analytical processes employed thus far. Central categories

were constructed through a synthesis of all data sources. The development of central categories will follow criteria outlined by Strauss and Corbin (1998, p. 147). These include:

1. Centrality to all major categories
2. Frequency with which central category appears in data.
3. Extent to which central category yields a logical explanation for the data
4. Sufficiently abstract and applicable to other areas of research.
5. Explanatory power
6. Validity of explanation under changing conditions

Finally, a major component of the data analysis process was the constant comparative method. The strength of the constant comparative method lies in its ability to ensure there is always a good fit between new data and emerging theory. As new data were obtained, they were compared to previous data to constantly refine interpretations. Therefore, the analysis process began with coding and the construction of conceptual categories for a single interview. These categories were later compared to data from additional sources to determine the degree of coherence or difference that emerged in the coding and categorization process (Boeije, 2002). Based on these comparisons, categories were refined to better accommodate the data.

Throughout the coding process, analytic memos were written to record emergent themes from coding and to facilitate discovery of concepts and categories. Memos reflected the purpose of each phase of the analytical process. Therefore, during open coding, memos reflected on concepts and categories. During axial coding, memos sought to explain the relationships between categories. During selective coding, memos

reflected emergent central categories and themes (Strauss & Corbin, 1998). The coding process was also aided through the use of the qualitative software program NVivo.

Transcribed interview and field note data were entered into the program and assigned codes that were referenced for future use.

Validity

A process of triangulation and theoretical sampling was utilized to attend to issues of validity. For this study, data triangulation addressed issues of construct validity through the use of multiple measures of the same phenomenon (Yin, 2009).

Comparisons between teachers were made to test similarities and differences between their instructional responses to data analysis. Furthermore, the data obtained from the administrator interviews were also compared with information from the teacher interviews to determine the similarities and differences between these two groups.

Observation and archival data were also compared to interview data to further test validity. This process of triangulation was an essential component of the data analysis process because the perspectives of teachers and administrators may vary greatly, which has the potential to result in widely divergent findings. Furthermore, there could be substantial variation between the comments of both these groups and their actual practice, which is why direct observation of data analysis meetings and document analysis was included. By cross-checking these various sources of data, gaps and inconsistencies were identified and explored through the process of theoretical sampling (Strauss & Corbin, 1998).

Another means of ensuring validity is member checks. Ideally, the researcher would meet with all participants to discuss the analysis of their responses. However, due

to time and budget constraints, this was not possible. Therefore, member checking occurred through two major strategies. The first addresses issues of descriptive validity, which concerns the accuracy of the researcher's representation of members' responses. As stated previously, it was not possible to meet individually with each participant. An alternative method is to ask participants to clarify and elaborate on their responses during the interview while also providing periodic summaries during the interview to ensure descriptive accuracy (Sandalowski, 2008). The second strategy addresses interpretive validity, which seeks to ensure that the researcher's final interpretations are correct (Maxwell, 1992). Participants were emailed relevant sections of the draft findings and were allowed to respond via email. They were also given the option of contacting me directly by phone. Based on their feedback, there were no interpretive discrepancies. Not only do member checks enhance validity, they also ensure the study expresses the voice, values, and beliefs of the participants as accurately as possible, which is the major purpose of this study and research in general.

Positionality

I taught fourth grade for three years in the region where this research was conducted, and I participated in the data analysis process utilized by the district. Four years have elapsed since I was a teacher in the region. I was very impressed by the scale and availability of information for analysis. I was also impressed by the concept of teachers working together to talk about data and student work. Therefore, I entered the research with a fairly strong preference for the concepts of formal structures of data analysis the district has implemented. However, as a teacher, I was not impressed by the level of conversation about instruction that occurred during these meetings. I felt as

though there was not an explicit connection between data and practice, and the administration did not provide enough support to bridge this gap. Therefore, I also entered the research process somewhat critical of the data analysis process. However, it has been four years since I have taught in the district, and there have been several significant curricular and organizational changes on the district level intended to build instructional capacity. Furthermore, this is not the school in which I worked. As a result, I enter a context that is substantially different from the one in which I taught. When reading the data, I attempted to locate myself in the data by identifying my emotional response to a participant or concept and examine how this was influencing my interpretation. If I found my background was unduly affecting my interpretation, I was prepared to reanalyze the data with the specific intention of minimizing my own voice and amplifying that of the interviewee. While this could not completely eliminate bias, it did much to ensure a more valid interpretation (Mauthner & Doucet, 1998).

Although I have taught in the region in which this dissertation study took place, I do not have personal relationships with many of the faculty at Franklin with one exception being the principal, who was my assistant principal when I taught in the district. Therefore, employing methods of detached, direct observation may not encourage the development of a level of familiarity that will enable faculty members to become comfortable with my presence within the relatively short period of time in which I was conducting the study. As a result, it was necessary for me to form professional relationships with the faculty to facilitate the research process. Therefore, I served as a volunteer, providing assistance to students and teachers in various curriculum areas. I also ate lunch with the teachers and attended faculty and professional development

meetings. It was my intention to not work directly with teachers and administrators around issues of instructional improvement and the use of assessment data to avoid inappropriately influencing the results of the research. However, since the school was experiencing substantial district and state pressure to improve student performance, I was often asked to provide input regarding improvement efforts. This created a source of conflict because I was being asked to help, and it would have been detrimental to my relationship building efforts to simply deny the requests. As a result, I sought a compromise. Towards the end of the data collection process, when I had interviewed all teachers and administrators who led the school's instructional improvement efforts, I helped the school to develop the framework for an instructional improvement plan. This plan was completed and implemented after the conclusion of data collection. Thus, I believe the timing of my direct participation mitigated any undue influence on the research results.

There were two major benefits of this approach to positionality. First, it familiarized the faculty with my presence, increased their level of comfort with me, and enhanced their willingness to participate in the study. Secondly, it allowed me greater insight into teachers' professional lives, which aided the research process. There was a potential risk of objectivity being compromised with this approach. However, I believe the benefits outweighed the potential risks. I sought to address this issue during the data analysis process through the process described previously where I analyzed the data for the specific purpose of identifying bias.

Human Subjects Protections

The first ethical consideration was that of informed consent. The topic of this study had the potential to generate findings that may be very positive and affirmative for the school, but the findings could also possibly make participants feel uncomfortable and even professionally threatened. Therefore, each participant was required to sign an informed consent form (Appendix E), which outlined possible benefits and negative consequences that may manifest as a result of participation in the study. These consequences were verbally explained during the informed consent process. It was anticipated that consequences were limited to feelings of discomfort that may arise from answering specific questions.

The teachers that participated in this study were especially vulnerable since their responses led to assessments of a longstanding school and district improvement initiative. Therefore, the district, school, and participants were not revealed in this study. All participants were assigned pseudonyms and were described in a manner that sought to minimize any personally identifiable characteristics. Since there were only a few teachers in each grade level, it will be relatively easy for someone familiar with the school to ascertain their identities. Therefore, teachers were not identified by their grade level. Rather, they were identified as either a primary grades (K-2) teacher or an upper grades teacher (3-5). Upper grades teachers are also specialized by subject area. To protect confidentiality, subject specializations were not disclosed. It was also necessary to recruit and interview teachers outside of the purview of administrators. Therefore, my recruitment strategy involved using personal relationships developed with a core group of teachers and having those teachers connect me with additional teachers

who may be interested in participation. Finally, the study reports themes that are common to a number of respondents rather than idiosyncratic issues and perspectives, which should further minimize the risk of individual identification. However, even with these safeguards in place, I cannot guarantee anonymity. The context of a small community of professionals makes discovery a definite possibility regardless of the length to which the researcher goes to ensure anonymity (Malone, 2003). As a result, it was necessary to be very explicit about the informed consent process. I not only required the teachers to sign the consent form, but I emphasized that fact that confidentiality could not be guaranteed.

Another potential ethical concern related to the protection of student information. Although students did not participate in this study, student assessment information was examined, and students were discussed in data meetings. When presenting the research, it was necessary to remove any identifiable student information from documents included in the dissertation and assign pseudonyms to students mentioned during meetings, observations, and interviews. Furthermore, all notes, transcripts, and documents generated or obtained during the course of the research were secured in a locked file cabinet maintained by the investigator or in a password protected computer to maintain the confidentiality for those materials. As stated above, these efforts cannot guarantee confidentiality, but they do much to ensure respondents are protected.

CHAPTER 4: RESULTS

This chapter presents findings regarding how teachers' participation in structured data analysis influences instructional practice. The findings are organized into two major sections that are based on the two research questions that form the basis for this study. The first section is titled Instructional Outcomes and attempts to describe the impact participation in data analysis has had on the school's instructional program and teachers' beliefs about effective instruction. This section is organized according to four major themes that emerged from the analysis of data. The second section titled Levels of Capacity presents findings related to the second research question. These findings seek to present an assessment of the school's relative level of capacity in the areas of data use, professional learning, and leadership and describes how the school's capacity in these areas interact to influence its response to assessment data. This section is divided into subsections that correspond to the areas of capacity mentioned above. Within each subsection, findings that relate to each subsection are detailed.

Instructional Outcomes

Four dominant themes emerged from the analysis of data on instructional outcomes: large-scale initiatives; remediation; varied instructional strategies; and espoused beliefs and practice. The theme of large-scale initiatives refers to instructional modifications implemented on a school-wide or grade level basis as a result of an analysis of assessment data. Remediation is a theme that refers to teachers' and the schools' effort to provide supplemental instruction for students whose assessment data indicate they have not mastered particular concepts or skills. The theme of varied instructional strategies details the efforts made by teachers to alter their presentation of

content in light of assessment information. Finally, espoused beliefs and practice refers to findings regarding the extent to which participation in data analysis has influenced beliefs about effective instruction.

Large-Scale Initiatives

By far, the most prevalent response to questions regarding how the school and teachers have responded to insights about student achievement obtained from an analysis of assessment data were large-scale instructional improvement initiatives implemented by the school to address deficiencies identified by data. The term large-scale refers to initiatives that span beyond a single classroom and minimally encompass an entire grade level or, at a maximum, the entire school. One major initiative was the implementation of differentiated instructional strategies in reading and math. After analyzing assessment data, it became clear that the lowest performing students were not progressing at an acceptable rate. The principal states,

I think that the data analysis shows us our weaknesses. It shows us our strengths, but it shows us our weaknesses, and we shouldn't be embarrassed about our weaknesses. We should want to become better through the data analysis. For instance, we need to know how to teach the lowest 25 percent. And, because of the data analysis on the lowest 25 percent, we know we need help.... We are not doing a good job with the really low children. How do we then reach the really low children? What strategies are we missing?

One outgrowth of these questions about how to better meet the needs of struggling students was an initiative to implement differentiated instructional strategies. The differentiated process follows a conceptually similar approach in both reading and math.

Interview data indicate the process generally unfolds in these subjects in the following manner. First, the teacher delivers a lesson to the whole group, usually in the form of a mini lesson. While the students are engaged with an assignment related to that lesson, the teacher then meets with small groups of students based on their identified needs. In addition, the students often, in both math and reading, engage in various differentiated center activities. For example, in reading, if assessment data show that a group of students needs assistance with vocabulary, they are assigned to work at a center where they can practice that particular skill independently or within the context of that small group. Meanwhile, the teacher works with a group of students that have been grouped based on identified learning needs. The composition of these groups should be flexible and not static, with groups changing regularly to reflect needs identified by assessments. The teacher also alters the instructional focus and methods to better meet the needs of the students. As a result, there can be several groups of students working on several different concepts within the context of a single classroom. The interviewees indicate that the implementation of a differentiated instructional approach represented a major change in instructional philosophy for the school as a whole. Prior to the differentiated instruction initiative, instruction was mostly whole group and did not necessarily take into account the needs of individual students. It was driven more by intuition and teacher discretion. Angela states,

Teachers were mainly drill and practice. Worksheets, worksheets, worksheets. Mainly whole group instruction. Practice these spelling words or practice these vocabulary. Drill and practice. You have to practice high-frequency words. It was mainly whole group instruction. The students were not able to collaborate

with each other before. Also, small groups were not being completed as well. It was not being implemented within the instruction either. But, when we took a look at it, we found out that the whole group was not benefiting the students. Maybe it was easier for the teacher, but it wasn't beneficial for the students.

Similarly, the principal states,

The instruction has to change because so often as we used to teach so much whole group. I mean reading was the first to differentiate the instruction a lot better than some of the other subject areas. Now, you have a block of math.... In that hour block, you may be teaching only 15 minutes to everyone as a whole group, but then the teacher has to differentiate the instruction from there. If she had students who may have a weakness in one area, she could have something set up for those children to go work together. Those three or four children can be working on one area together. You can have a cooperative learning group working together where you have somebody who is, who has understood it, and is now explaining it to the other children. And, the teacher works with a group. We found out that reading worked very well like that. So, we felt like math should have the exact kind of differentiated instruction, you know and having a block of time, and it's a designated block of time.

Several interviewees now indicate that teachers, for the most part, are differentiating instruction to meet the needs of students. This represents a major change in instructional practice that is directly attributable to needs identified by assessment data. However, something that was not evident in the interviews is how the teachers should go about the process of differentiating instruction. As a result, it seems that the process of

differentiating is left largely to the discretion of the teacher, which may or may not be advantageous depending on the skill level of the teacher. In only one example did a teacher clearly express how her grade group of teachers collaboratively develops shared strategies that will be utilized across the grade level to address the weakness identified by assessment data. Audrey states,

So, we are going to decide that we are going to change what we are doing. We're going to make sure we are going to see these lowest performing. We're going to see them every single day. We're going to find different things. ... It's going to be hands-on. It's going to be pictures. It's going to be stories. It's going to be songs. It's going to be games, but we are going to be using different strategies.

Making sure that we are not using the same strategies with them. We are changing our strategies each time. We are making our lessons as interesting as possible. We are really seeking out their background, their experience, what they have as previous knowledge, so we can go from there.

In both interviews and observations, this grade level consistently demonstrated a predisposition toward developing a common understanding for how instruction should be differentiated for concepts identified as weaknesses by assessment data. For example, during learning team meetings (LTM's), the grade group, through their examination of student assessments, determined that students were having difficulty understanding the concepts of fewer and greater. As a result, they spent their meeting developing several instructional strategies that addressed different learning modalities. For example, one strategy was tactile while the second strategy was visual. Thus, the strategies developed during these meetings were based on a clear instructional philosophy that was shared by

the teachers. The teachers then implemented those strategies in their individual classrooms and discussed the outcomes during the next LTM. While other teachers indicated that differentiated instruction was a major focus of their own teaching and that of their grade group, no other teacher was able to describe in detail how teachers in their grade group developed common instructional strategies to be used to differentiate instruction nor was such a process observed during the LTM times.

Furthermore, the extent to which teachers are prepared to differentiate instruction for specific content areas is also questionable. Administrator interviews indicate that while teachers have received training on the major tenets of differentiated instruction, this training has been broad and not specific to content areas. As a result, while data analysis determines the focus of the differentiated instructional strategies that will be implemented in the classroom for specific groups of students, it is still not clear that the instruction that students receive in those differentiated groups will be particularly more effective than the original instruction beyond the benefits that may result from teachers spending more time on a concept with a small group of students. The administration, however, does recognize the need for a greater emphasis on the acquisition of additional content-specific instructional strategies to better address the needs of low-achieving students. Simone describes the problem below:

But, we have not gotten down to differentiating based on the content. Now, we know that's going to be the next step, and that's where the CRISS¹ training comes

¹ Creating Independence Through Student-Owned Strategies (Project CRISS) is a professional development program for teachers that focuses on facilitating the development of metacognitive strategies that enable students to monitor their learning, integrate new and prior knowledge, and become active participants in their own learning through writing and discussion. The program seeks to help students to become more

in. It's going to deal specifically with reading, math, writing strategies. So, we know we need to, in terms of planning our professional development. We realized that globally. We need folks to understand what it [differentiated instruction] is and what it looks like. But, then again I need to be able to have a math teacher see what that means, and see what that looks like. So, we plan that global training, and we planned training on specifics with their content levels.

However, these content-specific differentiated instructional trainings will not be available until after the winter break. Therefore, while teachers may have an understanding of the conceptual framework and theoretical underpinnings of the differentiated philosophy, they have not, as a faculty, had exposure to learning activities that provide alternative, content-specific strategies to address weaknesses identified by data. As a result, the range of instructional options teachers have available to draw upon to address problematic concepts may be limited to those generated by individual teachers or to the collective knowledge of teachers in those grade groups with more effective collaborative frameworks. For many learning issues, internally derived strategies may be sufficient; however, there are a number of skills that perennially emerge as weaknesses. For those areas, it is clear that the school's approach to teaching those areas have not achieved the desired level of effectiveness, and the lack of externally derived, content-specific differentiated instructional strategies may continue to limit the school's options in addressing those areas. Thus, while instruction may be differentiated, it may not necessarily be the most effective instruction.

thoughtful and independent learners. The program primarily focuses on reading strategies that are integrated across content areas.

Another example of a large-scale initiative implemented by the school was an effort to improve the oral language abilities of student in the primary grades. After analyzing kindergarten assessment results, the administration and teachers realized that students' oral language abilities were significantly below established benchmarks for kindergarten and first grade. Previously, oral language was not a major focus of the school's instructional improvement efforts in the primary grades and was often not specifically addressed in classroom instruction. Recognizing that students' limited verbal proficiency and vocabularies would limit their ability to learn to read, teachers attended professional development that provided training on improving oral language skills. They were then required to emphasize oral language development in their instruction, which was monitored by administrators who also attended similar oral language strategies. The inclusion of the administration in the oral language skills training helped them to develop a baseline for instruction, which they used to evaluate the quality of instruction once it was implemented in the classroom. The principal states,

The data were showing that our children were doing very poorly at oral language. It just showed up when we were doing the oral language tests, the inventories. ... We had everybody trained on what oral language looks like. We had the administration trained on what it [oral language instruction] looks like when we go in the classroom, and then you had to test oral language. ... Through the trainings, through the different conversations with the teachers, the oral language has improved, but if you don't keep doing it every single year, the exact same way, it would take a quick backslide. It's something that you don't just get to quit in kindergarten. You have to be teaching it in first grade and second grade.

Similar to the school's efforts to implement differentiated instructional strategies, the oral language initiative emerged as a direct response to learning issues revealed by an analysis of assessment data. However, unlike the school's differentiated instructional efforts, there was a much more focused effort to ensure that teachers and administrators had the skills to implement the initiative effectively. Primary grades teachers visited the district's literacy center, which is a school that is selected to be a demonstration site where teachers can see literacy best practices modeled within the context of an actual classroom. Furthermore, the teachers had the opportunity to practice teaching strategies they just learned with students at the literacy center site. This type of professional development provided a common methodological foundation based on best practices in oral language instruction. As a result, interview data indicate there was a greater shared understanding of effective oral language instructional practice, which the administration monitored to ensure was being implemented well in the classroom. This differs significantly from the school's work in differentiating instruction, which had no common understanding of how to go about the process of improving instruction in various content areas. As the principal indicates, the oral language initiative did result in improved assessment outcomes.

A final large-scale initiative addressed the area of science. Every year, fifth grade students consistently perform very poorly on the annual science assessment. After examining the test, student responses, and teacher observations, it was determined that students' lack of vocabulary and reading ability were detrimental to their mastery of science concepts. The school believed that if students cannot read well, they cannot perform well on the science test, which requires students to read and understand the

questions and scenarios presented before they address the science concept being assessed. In essence, the science assessment becomes more of an assessment of their reading skills. Therefore, students often do not perform well on the science assessment regardless of their understanding of science content. As a result, the fifth grade teachers, decided to integrate a balanced literacy approach to science instruction, which is very similar to the model used in reading where students are presented a mini-lesson and are divided into small groups where they work on activities with the teacher that are designed to increase their understanding of science vocabulary and their ability to read science content. This is in addition to traditional science lab activities. At the time of this study, it was not possible to determine the outcome of these efforts since the initiative was implemented during the current school year and only baseline assessment results were available at the time this research was conducted.

Remediation

A major focus of the school's data analysis efforts is the identification of individual students whose performance in certain subject areas falls below established benchmarks. Once these students are identified, teachers and administrators provide supplementary instruction to increase student mastery of content. Remediation efforts often work in conjunction with the school's differentiated instruction initiative. Teachers group those students with similar achievement issues and provide additional instruction on content that was previously taught but not mastered within differentiated groups. Below, Natasha describes how her grade level addressed students' difficulty with text-to-world connections, which is a reading comprehension strategy that seeks to activate

students' prior knowledge by connecting the text to an event or issue in the real world.

She explains the following:

I pulled students back, the students that I basically observed having difficulty with it were pulled back into small groups, and we worked on text- to-world connections, and we talked about the different ways to get text to world connections like from TV, newspapers, that type of thing. And, students were read a novel, and each one of the students were then able after a couple days of instruction, small group instruction, they were able to make text-to -world connections.

However, remediation during the school day has become somewhat of a contentious issue among some teachers, especially those teaching math. The school is departmentalized in grades three to five with specific teachers teaching reading and writing, math, and science. Those teachers teaching reading and writing have a two hour block of time to provide instruction while the math and science teachers have one. Furthermore, within a specific grade level, literacy teachers have two classes to teach while the math and science teachers are responsible for four. As a result, the literacy teachers have significantly more flexibility to provide supplementary instruction for skills students have not mastered because of their extended block. However, the schedule makes it very difficult for math and science teachers to provide additional instruction since there is no additional time available to allocate toward this purpose. Compounding this problem is a pacing calendar the district requires the teachers to follow, which makes it very difficult to alter the instructional focus to address the needs of struggling students. One math teacher expresses her frustration below:

When you are working on the data, and you see that your kid has a specific need, then you go to that need and you tackle that need. ... The biggest problem right now is that you have got to keep moving. They are telling you to keep moving, and you are moving, and you know your kids have a need. Like my very first test on place value. There was a huge need. I had no business going on, but I have to go on. Now, there are a lot of things, a lot of plans that I have that are like how can I do this and keep going on? I mean I don't even sleep well at night because I am trying to think of things. I am starting to set up areas in my room just for different subjects [math concepts]. And, although I am going to keep moving because that's my instruction to keep moving, there are going to be little areas where the kids can go to study specific things. So, that's the way I'm thinking that I'm going to tackle this.

These frustrations were echoed by another math teacher as well as some of the literacy teachers. As a result, while the school may readily be able to identify students who are in need of remediation, finding the time to actually provide additional instruction during the school day has become a challenge.

One way the school has attempted to address the problem is through the pull-out services for the lowest 25 percent of students in reading. One teacher is assigned to work with small groups of students in grades three to five several times a week to address weaknesses identified by data. Furthermore, a recently enacted state law requires the school to provide 30 minutes of intensive reading intervention every day to students whose assessment data indicate are lagging significantly in the development of critical reading skills. The school has responded by assigning every teacher, regardless of

subject matter, a reading group for whom they are responsible for providing this assistance. These supplementary services combine to form a robust system of intervention for reading. Unfortunately, this results in a situation where the increased emphasis on reading leaves little additional time for math. As a result, the school also seeks to utilize extracurricular services by identifying students for school-run after school tutoring and also coordinating services with Supplementary Education Services (SES) providers and after school programs to ensure students receive additional instruction in identified areas outside of the regular school day.

Varied Instructional Strategies

The theme of varied instructional strategies refers to changes teachers make to their instructional approach after analyzing data that indicates that students have not demonstrated proficiency for certain concepts and skills. Varied instructional strategies specifically refer to changes in actual teaching practice rather than an enhanced focus on a particular concept, skill, or group of students that often characterized the school's large-scale or remediation initiatives. As previously noted, while these initiatives may have been coordinated on school-wide or grade level basis, their implementation at the classroom level may vary significantly with different teachers choosing to present instruction in a way they deem appropriate since there was very little development or coordination of instructional strategies on a grade level or school-wide basis except for the primary examples described earlier. Therefore, this section seeks to describe themes that emerged when individual teachers provided examples of how they changed their instructional approach when data indicated that students had not grasped a particular skill. Three major instructional modifications emerged from these data.

The first instructional change was an increased focus on explicit modeling of problem solving processes. During modeling, the teacher demonstrates how to achieve a solution while also verbalizing their thoughts in a process called a think-aloud. For example, a reading teacher may model the process of identifying the main idea in a reading selection by explaining her thinking as she reads the passage. She would then demonstrate strategies for underlining and self-questioning to ensure students are able to adequately process the information. The students would then be provided an opportunity for guided practice and then be gradually released to do more independent work as their proficiency increased. During interviews, teachers indicated they often provided more intensive modeling in small groups for struggling students. They also stated they would occasionally consult an academic coach for new modeling strategies for struggling students. Steve states, “What I do is I go to my resource, and try to get ideas from my resource about what I can and maybe should be doing differently.” When requested, the coach will come into the classroom and model instructional strategies with the class and provide feedback after the teacher models the strategy for students. Therefore, teachers alter their instruction in two ways. They model more intensively or learn different methods of modeling to better meet the needs of struggling students.

The second major instructional modification that emerged from the data was the integration of more hands-on and collaborative activities. Teachers who listed hands-on and collaborative activities as an instructional modification also expressed a belief that re-teaching a concept was insufficient. It was also necessary to alter one’s instructional approach to meet the learning needs of each child. As a result, these teachers expressed a strong preference for more tactile and interactive activities. All of the respondents who

expressed this preference for instructional modification also indicated that later assessments indicated meaningful gains. Audrey states, “You know, I’m using songs and games. They don’t even realize that they are learning the letters. They just think they are playing a game.... They are picking up letters, singing about it. They’re putting it down. They are moving.” Paula, an upper grade teacher, uses a similar approach and explains how she used a more hands-on approach last year when she was a reading teacher and her students were not grasping comparison and contrasting. She states,

Of course everyone did the Venn diagram, but I brought in a lot of fruit, a lot of vegetables, a lot of different things, and I hadn’t categorized each one. Then, we did some things by color. Which fruit have the same color? Which was a different color? You know, all types of things that are hands-on because they love that and just something different. I brought kids in front of the classroom. Okay, tell what is the same and what is different about them? You know, the first thing they say is that they are both boys or if they are both the girls. Then they did hair color. They did clothes color. They did shoes. So, that was one thing that really helped them with compare and contrast. And, then we talked about key words, which we had done already, but once you say it and use those key words, it’s like oh okay I get it. So, that really helped my class a lot.

The final modification that emerged from the data was a focus on building students’ background knowledge. Because Franklin Elementary is located in a relatively rural, high poverty region, students do not have as many opportunities to be exposed to rich, stimulating experiences that spur the development of diverse mental schema that they can later draw upon to facilitate the acquisition of academic content. Vincent states,

“We have children that have never been on the beach before, and that lack of background knowledge hurts in writing, hurts in writing stories, and it also hurts understanding on a reading comprehension test.” As a result, some teachers expressed a need to fill in these experiential gaps so that students can build mental references to compare new ideas and content. In science, Vincent focuses a great deal of his instructional time providing resources for teachers to build background knowledge for science concepts. This includes the provision of video clips or reading material that pertain to a particular science content focus.

However, these teachers also recognize that, despite their impoverished circumstances, their students also come with a wealth of experiences that can facilitate learning in the classroom. As a result, they also focus on developing knowledge of the ideas and understandings that students already possess. Vincent, states, “I think it's best for the teacher to know who they're teaching, and teach to the learning styles of their students. Before I teach a class, I'd like to know the background, the background knowledge, interests, and capabilities before teaching.” Similarly, Audrey states, “We are making our lessons as interesting as possible. We are really seeking out their background, their experience, what they have as previous knowledge, so we can go from there.” By developing a thorough understanding of their students' interest, abilities, and needs, which is a form of assessment, these teachers are attempting to adapt instruction so that it has the greatest possible impact on academic achievement.

Espoused Beliefs and Practice

Understanding how participation in data analysis has influenced teachers' instructional practices requires one to also develop an understanding of how this process

has impacted the school's instructional program as well as teachers' beliefs about effective instruction. As a result, teachers and administrators were asked to rate the impact that the school's focus on data analysis has had on the school as well as their own beliefs about effective teaching. All but one respondent, a teacher, rated the impact of data analysis on teaching in their school as moderate to profound. The most often cited reason given for these strong assessments has been a data culture that has emerged that places heavy emphasis on improving student performance by identifying low-performing students and the school's recent efforts to meet the needs of these students through its differentiated instruction initiative. Simone's statement about student growth aptly summarizes the emphasis on improvement. She says, "No matter who comes into your classroom, they must demonstrate a year's growth. . . . It doesn't matter if I come to you and I am a zero, and I'm in the fourth grade, then I need to gain 163 points because we expect a year's growth for any child who sits in a desk in your class." She states that the emphasis on learning gains "strips away excuses" about pre-existing deficiencies the student had prior to entering a particular teacher's class and focuses attention squarely on the effectiveness of the efforts that the teacher makes to ensure that the child learns at an acceptable rate even if a year's growth doesn't translate to a passing score on the state assessment. By focusing on a year's growth rather than passing rates, it is believed that one is better able to hold teachers accountable for the work they do with students.

The impact of data analysis and the resulting focus on student growth is readily apparent in the interviews. Several teachers reflected on the magnitude of the paradigm shift to differentiated instruction. They describe the instructional program prior to the implementation of differentiated instruction as mainly whole group and teacher-centered,

and the analysis of assessment data was mostly dependent on the skill and interest level of the teacher. Now, however, there is a great deal more collaborative conversation about student progress and use of data to form differentiated groups. One teacher indicated that data analysis “has made this particular school more of a community” where teachers are no longer concerned only about their own students but also help their colleagues develop strategies to address learning problems. The data also indicate that data analysis and the school’s emphasis on learning gains has made teachers more cognizant of student progress. Teachers place a much greater focus on growth and are now more likely to intervene when data show that students are not learning well.

Responses to questions that sought to assess the extent to which data analysis has influenced teachers’ beliefs about effective teaching were also largely affirmative. The teachers indicated that data analysis provides valuable feedback regarding the effectiveness of their instruction. The vast majority of teachers and administrators indicated students’ levels of growth shaped their beliefs about the efficacy of their instructional efforts. With few exceptions, the teachers indicated that when data show that students are not learning, it is a signal to reevaluate their approach. However, the extent to which this approach is reevaluated is questionable because although teachers largely indicated that data has had a substantial impact on the school’s instructional program and has influenced their own beliefs about effective instruction, their responses also indicated that the teachers only make minor to moderate changes to their instruction when data show that students have not learned a particular concept or skill.

During the interviews, every teacher was asked to provide descriptions of actual situations where they changed their instruction when data showed that students were not

learning a particular concept or skill. They were then asked to rate those changes in instruction as minor, moderate, or major changes. The vast majority of teachers described their changes as minor or moderate. This finding stands in contrast to teachers' previous assessments of data analysis as having a strong influence on their school and on their own instructional beliefs. Thus, data indicate there may be a gap between espoused beliefs and actual practice. The degree of change in their own instructional practices does not match the descriptions of changes in teaching attributed to the school as a whole and to their personal beliefs about effective pedagogy. When asked to explain their assessment of the degree of change in instructional practice, teachers typically indicated that the change was a "tweak" or not a significant departure from the type of instruction they initially delivered. As a result, although teachers state that data analysis greatly influences their beliefs about effective teaching, the impact on actual practice appears to be much less substantial. These contradictory findings are not unusual and may be explained by Argyris and Schön's (1974) notion of the incongruity between an organization's espoused theory and theory-in-use. While teachers may espouse a strong belief in data's impact on the school and their individual beliefs, their descriptions of changes in instruction belie those espoused beliefs in favor of another theory of action, one that does not result in major data-driven changes to instructional practice. This would not be an unusual finding, for research indicates that teachers often adapt instructional change initiatives so that they present the least amount of conflict with their current instructional paradigm (Fullan, 2001). This is often accomplished through partial implementation and modifications that dilute the effects of the improvement efforts.

Levels of Capacity

The following section presents findings related to the school's levels of capacity in the areas of data use, professional learning, and leadership. Similar to the preceding section, this section draws on findings from interview, observation, and archival data sources. The objective of the previous section was to describe the school's instructional response to assessment data. This section seeks to provide possible explanations for the nature and character of those instructional responses by examining how the school's capacity in the three aforementioned areas may have coalesced to shape the nature of the instructional response. The findings are organized according to the three major areas of capacity with subsequent subsections that describe major themes in each area.

Data Use

Data use capacity refers the school's ability to obtain, analyze, disseminate, and act upon data. The findings presented in this section seek to describe the degree to which the school is able to effectively leverage data for the purpose of instructional improvement. This section is organized according to four major areas: data reporting and access; the data process; data-driven decision-making; and data culture.

Data Reporting and Access. The school district, through its investment in the Educational Data Warehouse (EDW), has significant capacity in the area of data reporting and access. The database generates a wide variety of reports that allow disaggregation of data by a number of factors. For example, one of the reports provided is an item analysis that lists student performance for each question of an assessment. The school has access to these data on the classroom, grade level, or district level. The school also has the option of comparing its performance to those of other schools with similar

demographics. The EDW also generates reports that provide a historical overview of student performance. Since the state assessment is vertically scaled², it is possible to compare student growth from year to year. On a single report, teachers can view scaled scores from all state assessments administered to students. They can also access several locally administered reading assessments and inventories, several years of district-wide diagnostic test results, and performance predictions for the state assessment based on the diagnostic data. The latter data are especially important since performance predictions often form the basis for the school's intervention efforts. The district diagnostic test is administered twice before the state assessment and, thus, performance predictions provide valuable insight into student progress. The school district has invested in color laser printers so the reports can be generated in full color. Each performance level is color coded and can be sorted. As a result, both teachers and administrators can get a quick overview of student performance examining the relative amounts of red, yellow, green, or blue for each class or grade level.

To facilitate student progress monitoring, the district recently released two new reports that facilitate the comparison of student progress on various assessments. One of these reports is the performance matrix, which is a color coded set of boxes that allows teachers to compare student performance on the state assessment with their performance on the most recent diagnostic (Appendix C). For example, by viewing the report, one can see the number of students who passed the state assessment at a level 3, the minimum

² All state assessments in grade three to twelve are based on a single scale. The minimum and maximum score range increases with every grade level as well as the minimum score a student must achieve to pass the test. The single scale allows for tracking of individual student growth from year to year as a student's score should increase by a predetermined amount each year to indicate a year's worth of growth.

passing level, who are now predicted to fall below or above that mark according the diagnostic assessment. However, this report only list numbers. A second report unveiled during LTM's was a report that grouped and color-coded individual student performance on the state assessment (Appendix C). Next to those performance levels were each student's predicted performance on the diagnostic assessment. As a result, teachers can see which students are predicted to progress, maintain, or decrease in performance. And, because of the color codes, the magnitude of change for a class or grade level can be quickly determined. In one grade level, teachers who had the same data in another form, were very surprised by the number of students who were predicted to decrease in performance when presented with these two reports. These reports provided a very stark and sobering display of student performance and, at this particular meeting, invigorated conversation about how best to improve student performance.

Another form of data reporting observed during the data collection process were data walls (Appendix D). In the LTM room, every grade level has a dedicated section of the classroom wall where the performance level of each child for various assessments is displayed on a card that also lists the remediation services the child receives. Each class also is assigned a color. On the card, the assessment results for each child are listed and are placed on a tier ranging from 1 to 5 that corresponds with the state assessment. When new diagnostic assessments are given, the cards are rearranged on different tiers based on how they performed on the previous diagnostic. Also, depending on where a card is placed within a tier, an observer can visually determine if a child has recently moved to that tier. For example, after the second diagnostic, scores are placed in the middle of each tier. As a result, if a child is placed in the middle of tier 3, one can ascertain that is a

new grouping and the child either moved up to that tier or down from another tier. In primary grades, the tiers are based on the Fountas and Pinnell system, which uses letters from A to Z to represent increasing levels of reading skill. The wall primary wall allows teachers to track student progress in reading as they move along the continuum. The major purpose of the data wall is to provide an explicit view of how students are progressing. The colors also allow the administrators to see the rate at which each class is progressing. As a result, if there is an overrepresentation of a particular color in a low tier, the administrator can quickly determine the teacher those students are assigned to and seek to address any problems that may be present.

Data indicate that the time it takes for teachers to get assessment results, for the most part, is quick enough for them to make effective use of the data. For computer based assessments, the data is very often returned instantaneously after all students have completed the assessments. The most common delays occur with teachers who have not input data from classroom administered assessments. There is also about a two to three week turnaround for the diagnostic assessment results, which have to administered during a weeklong period, boxed, returned to a central location where they are scored and uploaded to EDW. There were mixed reactions as to whether this timeframe was quick enough for teachers to make use of the data with the administrators agreeing turnaround was sufficient and the teachers generally stating that it took too long. One major area of consensus around data turnaround concerned the state assessment results. Most interviewees indicated that the state assessment results, which this year arrived well into the summer, came too late, especially when teachers have to make promotion, retention, summer school, and placement decisions based on these data. As a result, some of those

decisions had to be deferred and made by administrators during the summer months. However, based on observation data that included several assessment cycles, including the diagnostic, data turnaround appears to be very fast for most assessments and reasonably quick for the diagnostic data given the size and complexity of the district and the types of data the district provides in its reports.

Teachers also enjoy a significant amount of access to data. In previous years, access to EDW was limited to administrators, and teachers were provided with reports for their class, grade levels, and schools at the discretion of administrators. However, in the past two to three years, teachers have recently had access to classroom level data in EDW. As a result, they now possess the ability to generate reports on demand, which may be beneficial to teachers who may want to do additional work with data beyond the information provided to them in LTM's. To facilitate this process, the district provides EDW training for every teacher on how to access, input, and interpret reports. In addition, the district provides the school with regular updates and trainings through the LTM's about new reports available in EDW that allow data to be viewed in a different form. Furthermore, coaches enjoy greater access to school level data, which may provide additional insight into their work with teachers. As a result, the evidence indicates that access to data is widespread throughout the school, and teachers indicate in interviews that feel they are sufficiently trained to access the data to meet their individual needs.

The Data Process. Data analysis is a centralized process developed by the school district. Data analysis at Franklin occurs within the context of the learning team meeting with teachers meeting on a weekly basis to analyze assessment results, develop assignments, or discuss student work. Depending on the purpose of the meeting, there is

a specific protocol developed, which is implemented by the learning team facilitator. There were two major protocols observed during the observations. The Standards in Practice (SIP) process, which was described in the previous chapter, was used the least and involves developing a consensus around the creation and grading of rigorous standards-based assignments. Because data collection occurred during a time when the school was receiving a great deal of data from various assessments at all grade levels, the Data Feedback Strategy (DFS) model was used most often (Appendix E). The process involved three major steps. The first was getting the data. After the prior meeting, the LTF developed an agenda, which instructed teachers to bring completed item analysis forms for a given assessment. Based on pre-established cut-offs determined by the number of students in the class, the teachers indicated whether each item on the assessment was a strength or a weakness. For example if 11 out of 12 students answered a question correctly, it was considered a strength. Each teacher provides this information until a picture of the performance of an entire grade level emerges.

The next step in the process is feedback. As a grade level, the teachers look for underlying patterns in students' areas of success and difficulty. In the meeting, the process mostly occurred by examining the complexity level of the assignment. The LTF instructed the teachers to identify several areas that were strong strengths or weaknesses and categorized those questions as either being of low, moderate, or high complexity. The teachers also discussed possible reasons for why the identified questions may have been strengths or weaknesses. For example, one often-cited cause of weaknesses was a lack of mastery of basic math facts. Once the underlying causes of the weaknesses are

determined the teachers then shared strategies for addressing the problems identified by data.

Another key component of the LTM process is the district's efforts to ensure that teachers can read and analyze data. One of the major trainings that teachers receive is on accessing, using, and understanding the various reports generated by EDW. All but one teacher indicated that they had received formal training on how to access and understand EDW reports. In addition, some teachers in the school attend a more advanced training so that they can assist teachers who may have trouble understanding or accessing the data. Furthermore, LTM's are also used to help teachers understand how to effectively analyze and implement data. One of the stated objectives of LTM's is to provide training for teachers to understand various data reports generated by EDW. An example of this training occurred during one of the observed LTM's meetings. In this meeting, the LTF explained two new reports that provided an alternative way to organize and display information. During this time, teachers were shown how to read the data and explained how it can be used to develop a better understanding of student progress.

The interviews indicated that both teachers and administrators have mixed feelings about the LTM process. All teachers indicated that they found the item analysis helpful, not only because it gave them an understanding of how their children are performing, but it also allows them to see how their children are performing in relation to the grade level as a whole. Natasha states, "The item analysis, I find very helpful because especially if you have certain students missing certain questions. It helps you key in on, 'Hey, how can I reteach, or how can I make sure that my students get this?'" The identification of trends was indicated to be a major benefit of the school's data

analysis process. Both teachers and administrators touted the value of being able to focus on those types of questions that were consistently answered incorrectly to try to determine why students were not understanding the assessed concept and then developing a plan to address them. The sharing of ideas and strategies was cited as a major benefit of the LTM process. Because the data for the entire grade level is displayed, differences in achievement between different classes are identifiable, and it is then possible to examine the reasons why some teachers had students who scored significantly higher than their colleagues to gain some understanding of how they may go about the process of addressing those problematic areas. Carla explains,

Maybe there is a possibility that we have four teachers teaching the exact same thing where one teacher was very high in question number two, three, and five. Then what you are doing is trying to get feedback from the teacher to help the other teachers kind of rise to the occasion. Why did you [teacher with lower scores] have so much trouble yet all your [teacher with higher scores] students did so well on that?

Teacher interview responses indicate that this transparency was not a problem, and they often cited the opportunity to discuss strategies with their colleagues as a major benefit of the learning team process.

However, while teachers stated that they believe that the item analysis process is valuable, they also state that the process is often tedious, time-consuming, and many times they feel it is unnecessary. Both interviews and observations show that a great deal of time, up to 80 percent of the meeting, is spent listing and categorizing all of the items and then selecting items to examine in further detail. While strategy sharing and

generation is considered the most valuable part of the LTM process, it was very often the smallest. One of the reasons that may contribute to the small amount of time spent developing instructional strategies is the LTF's requirement to follow the structured protocols outlined by the district. For every type of data work engaged in LTM's, there is also a form that the facilitator must follow and complete as the meeting progresses. Completing the paperwork associated with the protocol consumes a great deal of time, and it was observed that participants often lost interest as the meeting progressed. Carla states,

Sometimes, the learning team facilitator has to push a little harder too and not get tied up in the paperwork or documentation for the learning team meetings. You have to just be able to move instead of thinking I've got to make sure that I get this chart or this data for my documentation of this meeting instead of letting the good things flow. ... I have teachers who feel like identifying the strengths and weaknesses takes too long. In other words, they would like that to be a little more, I don't want to say succinct, but more right on target. They get a little off task on that part.

The very structured nature of the LTM process was cited as a weakness in number of interviews. The SIP process (described in Chapter 3) was characterized as unnecessary and an ineffective use of time since it focuses a great deal of developing an understanding of the academic standards, which many teachers feel they have a sufficient understanding of after years of teaching and various trainings. One teacher described the SIP process as a "waste of time". The teachers indicate that the assignments created in LTM's very often are not meaningful because of the timing of their creation. A great

deal of the data examined occurs after initial instruction, and, depending on the timing of the meeting, can sometimes be more than a week old, and the teachers have transitioned to another instructional focus. As a result, the assignment is not necessarily relevant to what the teachers are doing in the classroom. Therefore, many assignments are created, not because of their ability to help teachers gain insight into student performance but rather as Natasha describes, “It’s just the easiest thing that they come up with at the time or because we have to do something in the LTM, so sometimes it’s not meaningful to the teachers or the students. It’s just an assignment.”

The above findings underscore another important finding – a strong desire for more instructional planning within the LTM’s. Observations and interviews indicate that LTM’s are largely skewed toward analyzing assessment data. Conversations about instructional improvement are then focused on developing interventions to address weaknesses identified by assessment data. However, two problems emerge with this approach. First, the pacing of the district’s curriculum calendar makes it very difficult for teachers to revisit concepts determined to be weaknesses as a result of data analysis. Secondly, very often, data analysis reveals a great number of weaknesses that need to be addressed, which makes it nearly impossible for teachers go back and re-teach concepts in-depth and still keep up with the district’s pacing calendar. Interview responses indicate a desire for the LTM to be more front-loaded. Teachers believe that a greater amount of time should be spent planning the instruction within the meetings rather than analyzing the outcomes of the instruction and then planning remediation. This approach may reduce the large number weaknesses that often result from data analysis. This would make the process of remediation much more manageable since there are a smaller

number of students. The school district, in an apparent acknowledgement of these concerns, has developed a lesson study protocol, which it is currently piloting. However, during the time data was being collected for this study, it had not been implemented at Franklin.

Data-Driven Decision Making. The influence of data on the decision making processes at Franklin is readily apparent in three specific areas. The first is teacher placement. Since Franklin has a history of low performance on the state assessment, there is great external pressure to improve student achievement. One of the means that the administration employs to achieve this objective is data-based teacher placement. The administrators look at student assessment data to determine where to place teachers for the next school year. A primary teacher whose data showed strengths in math may be moved to teach math in the upper grades, while an upper grades teacher may have been moved to teach math exclusively because data showed greater student progress in this area. Simone describes the rationale below:

We want to see. First of all, globally before pointing fingers.... Who was actually teaching in a particular grade and what content did that person teach? Because, if it didn't seem to have been successful, we don't want to keep that person in that grade level or with that grade group. ... We're looking to see, how many gains did that teachers have? Did that teacher make gains with students? Did students remain stagnant? Were there particular groups who were not successful? Boys? African-Americans? ESOL students? How did our subgroups move with this particular teacher? We are looking for strengths and weaknesses and patterns so that we can adjust and plan for the next school year.

By periodically evaluating teacher placement through the examination of assessment results, the school feels that it may be able to place teachers in grades where they can have the most impact on student performance. However, a problem that emerges is that the most capable teachers usually are assigned to the upper grades, which creates capacity issues in the primary grades, a problem the principal acknowledges in her interview. The problem also possibly results in a situation where the lack of capacity in the primary grades diminishes the effectiveness of the upper grades teachers when those students reach grades three through five. Because of the imbalance between the upper and lower grades, students enter grade 3 with greater deficits, which make it much more difficult for the upper grades teachers to help them to perform at grade level.

Another area where data-driven decision making was most apparent was student grouping and progress monitoring. As described in the previous section, the school has significant resources available for the collection and analysis of data. Once student performance levels have been identified, the students are grouped into categories, and the lowest performing groups are targeted for intervention. Data from various assessments often form the basis of the differentiated groups. Those students who fall into the lowest 25 percent of performance are targeted for additional reading instruction through the state's daily intensive intervention mandate. As additional data are collected, these groupings are revisited by both the teachers and administrators in the LTM's. Students are regrouped based on the new assessment information. If a particular group of students have not made significant progress between a series of assessments, the principal states that the school looks to provide additional resources such as pull-out tutoring, after

school tutoring, or consultation with the academic coaches for strategies to meet the needs of struggling students.

The process of progress monitoring is facilitated greatly by the color-coded reports and data walls described in the previous section. The school has an intense focus on student growth, which often results in conversations focused on specific students. Carla states, “You’re really honing in on that one child, and you want to make sure that you don’t miss anybody.... If you have children who are level four who are now a level two or a level one, what happened? You need to have those conversations with the teacher.” These conversations, termed “data chats” occur on multiple levels – between administrator and teacher, teacher and teacher, teacher and child, and administrator and child. In the latter two examples, students discuss their progress with an administrator or teacher and set achievement goals. Interviews indicate that the conversations with students have been very enlightening for teachers and administrators. They have noticed that students are very perceptive when identifying their own strengths and weaknesses and, as a result, provide valuable insight that allows the instructor better meet their needs. Conversations about student progress on multiple levels provide insight that informs the instructional decisions are ultimately intended to enhance student achievement.

Data Culture. The district, through its Single School Culture initiative, has established the framework for the school’s culture of data use. The regularly scheduled LTM’s have ensured that teachers and administrators have time to analyze and discuss student assessment information. The provision of the learning team facilitator ensures that the meetings follow an established protocol the district considers to be most conducive for the effective utilization of data. The district’s investment in EDW and

subsequent training on its use ensures data is widely accessible and presented in forms that are readily interpretable. These factors, combined with the pressure that the school experiences to improve its academic performance, all coalesce to create a context where data play a very prominent role in the school's improvement efforts. Evidence from interviews, observations, and document analyses indicate that a focus on data permeates all aspects of the school's functioning. Data determines student grouping. It also influences the school's instructional focus and improvement efforts. It has even become an entrenched part of the school's academic lexicon as teachers speak increasingly of learning gains, disaggregated subgroups, diagnostic and common assessments, and data-driven decision making. However, despite these prominent indicators that characterize a strong data culture, it is not clear that teachers strongly embrace data use.

There is a strong theme of mandated compliance that occurs throughout interview and observation data. The school's designation as an underperforming school has resulted in increased pressure and additional assistance intended to increase student achievement. This has resulted in a greater number of assessments and progress monitoring mandates. While the school has the infrastructure to comply with these mandates, they are not necessarily embraced or considered essential by many teachers. In several interviews, the rationale for certain school actions was that it was "what the district wants" or "the district requires it." When asked to rate the extent to which teachers embrace the use of data, the most consistent answer was that about half of teachers embrace data and half do not. Carla states,

Do they embrace it? I'm not really sure embrace is the right word. I think my staff understands the data. I think they like to see the data, but I still think many

teachers do not embrace it. Some teachers feel that it is a time-consuming thing, and I don't think we'll ever change those people. I mean some of them are ready to retire. It's like I'm going to continue to do things the way I've always done them. And, even though you show them best practices. They tend to want to go to what they feel comfortable with. And, I don't know if that's human nature or what it is. They tend to want to go to what's comfortable, what's in their comfort zone.

Similarly, Simone states,

I don't think that it's embraced. It's forced upon them. Listen, we have to do it. I don't think we have this cadre of people who say, 'Oh, I looked at the data, and this is what I found.' When it's required, I'll look at it. Compliance. Ritual compliance.

During learning team meetings, several teachers were observed to not participate in discussions, others were unprepared for the meetings, and some appeared to be genuinely disinterested as indicated by doodling, side talk, and body language. These observations were confirmed by interviews that indicated strong resentment about having to attend LTM's. One teacher states, "A lot of times people resent being in the LTM's, so they don't, I guess you can say they don't give out, they don't put out." When asked to explain reasons why teachers may resent the LTM's, this teacher indicated that the meetings are often "a waste of time." This assessment was shared by several other teachers. Upon initial examination, there appears to be somewhat of a contradiction because these same teachers also state that data is an important component of their

instructional planning. However, a statement from David provides some insight. He states,

They resent bringing data because it's like you are planning for one lesson and you are assessing one lesson and then seeing how it went. Who failed or who whatever... And what their weaknesses were... It never seems to inspire or generate better lessons in the future. You know what I mean? It's always we are looking at something and they didn't make it. Okay, how can we make it more rigorous, but we never go into how we should have taught it to begin with.

This statement considered with Natasha's earlier statement about teachers developing assignments exclusively for the purpose of having them to present in LTM's provides some explanation into why there appears to be a somewhat opposing relationship with data. It appears that teachers appreciate the insight that data provides in identifying strengths and weaknesses, which allow them target instruction to meet the needs of students. However, they consider the other aspects of the LTM's to be unproductive. The meetings have been described as form-driven and not yielding anything of benefit in terms of an instructional plan. One teacher states, "I guess what I'm trying to say ... is that when I am in there, it would help me a whole lot if I have something to take away, and I have a plan other than just being in there." The desire for a greater focus on instructional planning within the context of the LTM's was repeated consistently throughout the interviews. Without this type of focus, teachers feel that their time is better spent elsewhere either working with children or planning for instruction.

The findings indicate that while the school appears to have a strong culture of data use, that strength results from its capacity to obtain, organize, and analyze data. It is not

necessarily derived from its ability to act on it. The school can readily identify student strengths and weaknesses and target those students for intervention. However, interview and observation data indicate that the process breaks down when it comes to developing a coordinated instructional response. A number of factors may explain this finding. The first is the heavily structured data analysis process required by the district, which teachers feel is not necessarily conducive to providing anything of practical value in terms of instructional improvement strategies. The second is teacher resistance, which manifests as unwillingness to incorporate data into their instructional program in any significant way. Natasha describes these teachers as being “immune to change.” The confluence of these factors has resulted in a situation where data have become a major component of the school’s operational framework yet still has not become integrated into the school’s data culture to the extent where it results in broad, shared, and transformational changes in the instructional program.

Professional Learning

Professional learning capacity refers to the extent to which the school is able to provide learning experiences that provide teachers with the knowledge and skills to improve instruction and better meet the needs of students. The findings presented in this section explore the types of professional learning experiences provided by the school and seeks to describe the influence the experiences have had on the school’s ability to respond effectively to assessment data. This section is organized into the following areas: professional learning forms; perceptions and assessments; professional learning observations; and collaborative culture.

Professional Learning Forms. Three major forms of professional development emerged through interviews or direct observation. The most commonly stated and observed form of professional development was the workshop. Teachers most commonly associated professional development with workshops, usually provided through the district, but occasionally arranged by the school. Four of these workshops were observed during the data collection period. Another form of professional development cited in the interviews was coaching. The school provides three coaches for reading, math, and science who provide assistance to teachers and model lessons in the classroom. The district also provides some coaching opportunities for teachers attending workshops at its literacy center where teachers have the opportunity to observe and practice new methods with students in classroom settings. Collaboration was the third form of professional development, and this form mostly occurred through the LTM's. Collaboration generally occurred amongst the grade level and usually involved the analysis of grade level assessment data and the sharing of strategies to address needs identified by data.

Perceptions and Assessments. One of the first questions regarding their professional learning experiences asked teachers to describe their idea of effective professional development. The most commonly cited answer was that professional development must be needs-based. Teachers frequently stated that professional development should be something that they actually need rather than an externally imposed mandate that may or may not be related to their own needs or the needs of their school. The second most commonly cited response was that professional learning experiences should provide new knowledge. Both teachers and administrators indicate that teachers' professional development should provide them with concrete strategies

they can implement in the classroom. Finally, respondents largely indicated that professional development should be hands-on, ongoing, and there should be follow-up to ensure the skills and strategies learned are implemented well. All of the above-mentioned factors are consistent with best practice research for professional development (Tillema & Imants, 1995; Tyack & Cuban, 2001; Cohen, 2000; Porter, Garet, Desimone, Yoonk, and Birman, 2000; Putnam & Borko, 2000; Desimone, Smith, and Ueno, 2006).

After providing an assessment, respondents were then asked to describe the quality of their professional learning experiences based on their previously stated descriptions of effective professional development. The vast majority of respondents gave the professional development experiences provided by their schools a positive assessment with a few giving a mixed assessment. When asked to explain the reasoning behind the assessment, the majority of respondents indicated that they feel professional development was highly related to the identified needs of the school and issues identified by data analysis. When asked to provide an example of a professional learning experience that was based on an assessment of needs, both teachers and administrators commonly cited differentiated instruction trainings, and a few teachers cited training on a new discipline program. In addition, eight out of ten respondents indicated that their professional learning experiences were empowering. They indicated that, for the most part, professional development provided teachers with the knowledge and skills to improve their teaching. It must be noted, however, that teachers generally associated professional development with workshops. As result, teachers were specifically asked to comment on the quality of learning that occurs when coaches work collaboratively with the grade level or model lesson in the classroom. The assessments were similarly

positive, with teachers stating that the academic coaches were valuable resources that provided a great deal of insight into the implementation of new instructional strategies. These positive assessments regarding the structure, focus, and outcomes of their professional learning experiences indicate a high degree of satisfaction and confidence in the ability of teachers to make changes to their instruction.

Professional Learning Observations. Four workshops were observed during the data collection period. The first was focused on the new math series the district purchased. The second was on test item specifications related to the newly adopted state curriculum standards. The third was to provide an overview of the continuous improvement model the state has implemented for underperforming schools. Finally, the fourth was a training on using the state's new formative assessment system to differentiate instruction. Of the four workshops, three were intended to provide an overview of the topic. The workshop on the math series provided information on features provided by the new math text. However, it was revealed that the teachers in the math workshop had already attended such training, so it was a duplication of training they had already received, but the district still required the school to participate. The second training was also intended to provide an overview. The purpose was to provide an understanding of the state's continuous improvement model. The training explained the facets of the model, but upon closer examination, it became clear that the district had been using a model that was exactly like the model being presented or very similar. As a result, this training, like the previously mentioned math workshop, was a duplication of information with which teachers were already familiar.

The remaining two workshops provided a great deal more new information. However, their usefulness in facilitating the acquisition of new instructional strategies is questionable. The item specifications training was intended to develop teachers' understanding of the level and depth of questions that the state will use to assess students' understandings of the new math curriculum standards, but a great deal of time was spent on helping teachers to identify the complexity levels of the questions, an activity which teachers engage in on a regular basis in learning team meetings. There was very little discussion of the actual content revisions, and no discussion of the adaptations in instructional strategies that will be necessary for teachers to help students meet the new standards.

The differentiated instruction training was the most hands-on and practical of the observed workshops. Teachers were asked to bring their classroom results from the administration of the state's formative assessment. In the workshop, teachers were shown how to use a fairly complex matrix called a decision tree that showed them how to group students based on the needs identified by the assessment. The teachers went over their data and used the decision tree to group their students based on needs identified by the formative assessment. The value of this training is apparent. Teachers will now be able to use the assessment to target discrete sub-skills. However, a potential problem may arise when one considers that the school has a great deal of experience grouping students according to instructional needs. One of the most problematic elements of this and the other trainings observed is that they do not provide tangible, practical instructional strategies that will allow teachers to address areas of weaknesses. As research by Heritage et al. (2008) finds, teachers are often able to identify academic areas

where students are struggling but have a much more difficult time adapting their instruction so that intervention efforts are successful. Research indicates that teachers must be able to apply both content and pedagogical content knowledge to effectively address learning issues (Cohen, 2000; Hill, Rowan, & Ball, 2005; Heritage et al., 2008). There were no examples of such a focus in the workshops observed during the data collection process. The professional development workshop observations appear to conflict with the assessment of professional development provided by both teachers and administration. However, there were only four workshops observed during data collection. As a result, these workshops may not be representative of the numerous trainings that teachers attend throughout the year.

Collaborative Culture. All respondents indicated that they consider collaboration with colleagues an important aspect of professional learning. They indicated that they consider the opportunity to share strategies within LTM's a very important tool for instructional improvement because it provides an opportunity for teachers to view an instructional issue from a different perspective as they share their instructional approaches with colleagues. Referring to collaboration in LTM's, Angela states,

We can actually sit there and see this is what happened in ... Mr. So and So's class as a whole. It helps me to see that if his students are getting question number three and mine are not, I want to find out what he's doing, to see why his students are grasping question number three and mine aren't.... What in my instruction needs to go a little bit different so that the kids can really grasp what it is that I'm teaching? When we are in learning team meetings, we can easily share those strategies.

However, while all respondents indicate the utility of collaboration, there was a mixed assessment of the strength of the school's collaborative culture. While some teachers cite the strength of their grade level collaboration, others state that the level of collaboration is generally weak. This includes administrators and two of the academic coaches, individuals who are able to assess the level of collaboration on a school-wide basis.

Observation data indicate while some grade levels are significantly more collaborative than others, collaboration on a school-wide basis is generally lacking. One of the most often cited strengths of LTM's are the opportunities provided for teachers to share strategies to address learning problems highlighted by assessment data. However, as mentioned previously, the time devoted to sharing instructional strategies was usually the smallest component of the LTM's. In addition, these strategies were often solicited on-the-spot as soon as a learning issue was cited, which may be appropriate when there are teachers present whose classes did particularly well on a particular assessment item. However, it was often the case that the entire grade level performed poorly on an assessment item. Without sufficient time to consider how to address the problematic skill, it becomes very difficult to develop an effective instructional response.

Furthermore, there were numerous occasions where teachers shared strategies for instructional improvement. However, there were few occasions where those strategies were developed into a coordinated instructional response. Rather, a problem was identified and strategy development consisted of a mere listing of ideas with no substantive discussion of how those strategies will be implemented. Support for this conclusion is derived from observation data where teachers shared strategies without explaining their implementation in detail, the manner in which teachers quickly share

their own strategy immediately after another teacher without much or any thought or deliberation about the previous response, and the absence of evidence of coordinated planning in the form of demonstrations, documents describing how the strategy will unfold, or discussion on the implementation of the strategy during future learning team meetings. As a result, while teachers may tout the benefits of sharing strategies in LTM meetings, there is very little tangible evidence that proves that this strategy sharing led to any large scale adoption of changes in instructional practice. While sharing strategies is a form of collaboration, according to Little (1990), it is considered a lower-level form that does not require teachers to jointly work towards an instructional solution. Instead, because there is no consensus regarding how to approach instructional improvement, teacher autonomy is preserved with teachers either making no change, modifying strategies, or fully implementing them. Therefore, there may be no consistency in improvement efforts. Joint work, on the other hand, requires a greater degree of collaborative effort and interdependence that was not observed during data collection. The result of these findings is a school where teachers share and engage in a lot data-driven professional development, but these activities do not penetrate deeply into the everyday instructional work of teachers.

Leadership

The following section details observation and interview data regarding the school's leadership capacity. The findings seek to describe how school leadership influences the nature and extent of the school's ability to respond effectively to assessment data. Initially, the focus of data collection was centered on school-level leadership. However, once data collection began, it became apparent that the school

district and state had a substantial influence on school leadership. As a result, the findings include a discussion of the influences of these multiple levels of leadership. This section is organized according to the following subsections: goal development and buy-in; support; and culture building.

Goal Development and Buy-In. One of the most unexpected findings from the data collection phase was the extent to which school improvement goals were externally imposed. Because of the school's designation as an underperforming school, there is a significant amount of district and state intervention intended to improve academic performance. When both teachers and administrators were asked to describe the process by which goals were developed, they consistently stated that the school improvement goals were determined by the district and state for the school improvement plan. Simone states, "It's all mandated. Seventy-nine percent have to demonstrate proficiency in reading and 80 percent in math, and that's our goal. We look at how close we came to the goal and set our school improvement objective to that." As a result, there is no discretion when developing school improvement objectives. However, teachers often feel that the goals are too high, especially considering the recent drop in the school's performance on the state assessment. Therefore, while many teachers acknowledge the school's improvement objectives, Carla states that the school gives greater emphasis to their own personal improvement goals. She explains,

You're saying 80 percent of your children will be proficient when the highest we've had has been 59 percent and that was the highest since the beginning of the state test. So, we're saying for your individual professional development, we set a goal for each person. What are you going to do as your individual professional

development goal to make you a better teacher to help you gain this knowledge?
... Whether their children meet the goal, they have to meet their goal of becoming a better teacher... and I tried to explain to them that they may not meet the goal of 80 percent of the children, but did you do all the things you said on your individual professional development plan to help you get there?

The outcome is a situation where school-wide goals are known, but not necessarily embraced by teachers who instead focus on their individual goals. However, because there are no specific goals that are commonly embraced throughout the school, there is no binding focus that serves to inform the instructional work of teachers. As Rosenholtz (1989) indicates, without a shared purpose, collaboration becomes less likely and teachers are left with broad discretion to engage in self-guided practices that serve to increase their isolation.

Teachers and administrators were also asked to describe teacher involvement in school leadership and goal development. These questions arose from research that indicates that teacher involvement in instructional decision-making and goal development increases the likelihood of wide-spread adoption of improvement initiatives and facilitates the development of shared purpose, increased organization learning, and academic achievement (Campo, 1993; Rosenholtz, 1989; Silins & Mulford, 2002; Heck & Hallinger, 2009). The most common response was that teachers are welcome to participate in school leadership, but most choose not to do so. When teachers were asked if they have a voice, respondents indicated that they feel they do, but often chose to abstain from participation. Interview responses indicated that the administration is approachable, will listen to their concerns, and often encourages and supports teachers

with ideas for new initiatives. Yet, despite a general feeling of openness regarding the administration, teacher involvement in school leadership and decision making beyond those designated leaders such as coaches, special education, and ESL coordinators who form the leadership team, teacher involvement and initiative remains relatively minimal. The outcomes of such lack of participation may contribute to teachers embracing school improvement initiatives with less vigor and blunt the school's efforts to improve instruction.

Support. The support school leaders provide to facilitate instructional improvement is a key element of the principle of reciprocal accountability for capacity (Elmore, 2004). Reciprocal accountability is a concept that requires school leaders to provide the support that will build the capacity that will enable teachers to achieve increased expectations for instructional improvement and student performance. As a result, teachers were asked to assess the support the administration provides for professional learning and collaboration. Assessments of support were overwhelmingly positive. Teachers indicated that school leaders provided support through three major strategies. The first is through the provision of various professional development opportunities. Teachers stated that the principal frequently sends teachers to trainings to address issues identified by data. Angela states,

Well, they certainly send us to plenty of professional development. We are highly professionally developed. By providing once a month professional development I would say, and also we have periodic trainings that we have to go to as well. For example, like the literacy action center, which provides us with different

strategies and techniques that can better help us serve our students in the area of reading.

However, training was not limited to externally provided opportunities. During LTM's, the administrators offered to set up trainings to be provided by the coaches or to have various specialists from the district to come to the school. These opportunities were the direct result of teacher feedback regarding problems they were experiencing in certain areas.

The second form of support identified through data analysis was the provision of resources. With current budget constraints, it becomes increasingly difficult to purchase new instructional materials. One of Simone's major responsibilities is the efficient utilization of the materials already available. When teachers indicate they need additional materials, she seeks to find creative methods of meeting those needs by effectively utilizing materials on hand prior to purchasing new items. As a result, the administration is very often able to satisfy teacher needs even with a limited budget.

Another means by which the administration provides support is through the implementation of a scheduling structure that promotes and supports collaboration. Teachers have a daily thirty minute common planning time that they can use to meet for the purpose of instructional planning and collaboration. However, it is up to the discretion of the teachers to set up the time and agenda for meetings, and these meetings, for many grade levels, occur infrequently. In addition to these common planning times, the school has also scheduled LTM's for every each grade level for 90 minutes every seven days. They accomplish this by having the specialist teachers cover the classes

during the last thirty minutes of the school day, and the meetings extend an additional hour after the school day ends.

The final identified method of support is through monitoring, participation, and feedback. Teachers indicate that school leaders regularly visit classrooms and attend professional development sessions with teachers. Referring to the oral language initiative, Carla explains, “My role as an administrator is to learn as much I can about oral language. How am I supposed to know what's best practice and what it looks like unless I go to the training too?” As a result, both administrators attend most professional development sessions and are also present in the LTM meetings, which teachers cited as an example of positive support for professional learning.

Understanding strategies and methodology presented in various professional development sessions allows the administration more effectively monitor implementation. As a result, they are better able to provide feedback to teachers during classroom visits and target those teachers experiencing difficulty with additional support in the form of additional professional development opportunities, peer mentoring, or additional modeling and conferencing with an academic coach. Teachers largely indicate that they look forward to this form of support and feel that it provides valuable insight into how they can improve their teaching.

Culture Building. One of the objectives of the data collection process was to determine the extent to which school leadership has succeeded in making data analysis an enduring element of the school's culture. Interview responses were generally mixed with some teachers indicating that data was a strong part of the school's culture and others stating that it was not. Upon further analysis, common themes were found in each of the

two assessments. Those who gave a positive assessment generally justified their responses by citing the well-developed processes that the district has implemented to facilitate data analysis such as the LTM's, discussion about student progress, data walls, and data access. They also cited the level of transparency data brings to discussions. Respondents indicated that the achievement of every classroom is accessible to everyone, but there is no shame. As Carla often states, "It is what it is." The culture of the school is such that teachers can talk openly about achievement levels without feeling embarrassment. Carla indicates that she has focused on separating emotion from the process and framing the data as an objective means of determining where they need to focus their improvement efforts. As a result, they are better able to identify trends in student achievement that provide insight into skills that need to be targeted.

Contrastingly, those who gave a more negative assessment were more dissatisfied with the outcomes of the data analysis process. These respondents indicate that while data plays a major role in identifying student progress and trends, it very often doesn't result in what they feel are effective strategies that can be used to improve achievement. Paula states,

Basically, the information, the conversations that I hear about data are basically this person went down or this person went up. It's really all about the state test.

That's really the conversation that I hear, who went down and who went up. And, that's basically what they're saying.

She goes on to express dissatisfaction with a lack of useful strategies to address student achievement. David and Steve indicate that a lack of teacher buy-in has diminished the effectiveness of data analysis and reduced its impact on the school's culture. Because

some teachers are not fully invested in the process, its influence on instructional outcomes is reduced.

These findings indicate that the district has been successful in integrating the structural and procedural components of data analysis such as regular meetings, access to EDW, and the provision of a learning team facilitator. Throughout all the interviews, teachers and administrators acknowledge the impact of the district's focus on data analysis and student achievement. As a result, teachers generally recognize the district's data routines as an important part of their work. However, both interview and observation data also indicate that the school's data culture is multi-dimensional. On a surface level, the school has implemented all of the technical and structural requirements necessary for data analysis, but evidence indicates that the school and district's focus on data analysis has not penetrated the school's culture to an extent sufficient to alter instructional beliefs, philosophies, and practices. Interview and observation data show teachers have largely bought into the procedural and structural dimension of data analysis. However, the deeper, more personal, qualitative changes required to change instruction in light of assessment information have not been thoroughly embraced. This has resulted in a situation where evidence of data analysis is prevalent throughout the school and has become thoroughly integrated into teachers' discourse and the school's operational culture. However, the impact of data analysis on the instructional program appears far less substantial.

CHAPTER 5: DISCUSSION AND IMPLICATIONS

This chapter begins with an overview of major findings from this study on the influence of participation in structured data analysis on teachers' instructional practice. The relationship of these findings to the two major research questions is also detailed. The next section presents four major conclusions drawn from the analysis of data. This discussion is organized according to the following themes: clarity of purpose; process vs. product; uneven capacity; and structural vs. instructional change. The discussion then focuses on implications for practice, policy, and future scholarly research. The chapter concludes with a discussion of the limitations of the study as well as some concluding remarks.

Discussion

The primary research question guiding this study asked: How does participation in formal data analysis processes influence instructional beliefs and practices? The findings of this study indicate that the school responded to data analysis through three primary mechanisms. The first was the implementation of large-scale initiatives implemented in response to student achievement issues identified by data. These initiatives were intended to be far-ranging with widespread impact on instructional delivery. Data indicate that there is evidence that teachers have adapted the manner in which they deliver instruction in response to these initiatives. Numerous teachers indicated their instructional approach as well as their colleagues' has been altered to provide more targeted instruction to students based on identified needs. The same can be said for teachers in the primary grades who have begun to focus on the development of

oral language skills in their instruction in light of assessment results that indicated students were lagging far behind in the development of these foundational skills.

The school also has developed a system of interventions to improve the skills of those students whose assessment data indicate are among the lowest performers. During the school day, teachers indicated that they often meet with students in small groups to re-teach skills and concepts with which they are not proficient. However, teachers indicated that this is more feasible in reading than in math since reading teachers have a great deal more flexibility to remediate because of their longer instructional block and a pacing calendar that does not impose as many time constraints as the math calendar. The school has also implemented a pull-out program where an intervention teacher works with selected students as well as scheduled 30 minutes of reading intervention with the lowest 25 percent of students in every classroom.

On a classroom level, several themes emerged when teachers were asked to describe instructional changes as a result of an analysis of assessment data. The first was a greater focus on explicit modeling of instructional strategies. During this process, the teacher emphasizes both the metacognitive as well as the procedural processes necessary for understanding a concept. Teachers also indicated that assessment data led them to integrate more active, collaborative, and hands-on activities to increase student engagement with the concept. The final instructional modification concerned the development of students' background knowledge as a means of facilitating the acquisition and mastery of academic concepts.

When asked to describe the impact of data analysis on the school and their own beliefs and practices, teachers and administrators indicated that the school's focus on

student growth has made them more willing to use data as a means to assess the effectiveness of their instruction and reoriented the school to focus on the needs of struggling students to a greater degree. They indicated that the various improvement initiatives have resulted in a substantial paradigm shift toward more student-centered instruction. Thus, these findings indicate that teachers feel that data has impacted the school and their own personal beliefs about effective teaching significantly. However, when teachers were asked to provide actual examples of how they altered instruction after analyzing assessment data, they mostly described these examples as minor or moderate changes. These findings indicate that while teachers express a great deal support for data-driven instructional improvement efforts on a school-wide level, on a personal, classroom level, the magnitude of the impact of data on instructional modification is significantly diminished. As a result, there appears to be a gap between teachers' espoused beliefs and actual practice.

The second research question examines how issues of capacity in the areas of data use, professional learning, and leadership may have influenced the above findings. The school has a well-developed system for data access and reporting with nearly all teachers being trained in using the EDW program, a large variety of reports for displaying and tracking student performance, and an ability get data back to teachers in a timeframe that preserves its relevancy. However, the process that the district uses to analyze data is considered both a strength and a weakness. Teachers state that they value the opportunity to develop a global picture of student learning and share strategies with their colleagues. However, they state data analysis is oftentimes tedious and time-consuming because of what they consider to be a very rigid protocol used to facilitate the analysis process,

which minimizes the amount of time spent on developing solutions to address learning issues. The process of data analysis often becomes an end in itself with a great deal of time allocated to completing paperwork. Such conditions have fostered resentment toward data analysis because they believe it does not lead to the development of valuable improvement strategies. Therefore, although data analysis has become part of the school's culture, the focus on data has only been integrated to the extent that the more structural elements have been embraced by teachers, while the deeper instructional elements have been influenced to a lesser degree.

Professional learning at Franklin primarily takes the form of workshops, but coaching and collaboration were also reported. While teachers generally gave positive assessments of their professional learning experiences, observations indicated that a great deal of the content covered in professional development was redundant. In addition, none of the professional development observed actually provided teachers with content-specific pedagogical practices, which they could use to address identified student learning needs. Respondents also indicated that collaboration was also an important component of professional learning. Observation data indicated that while some grade-levels were more collaborative than others, collaboration across the school was generally weak. Collaboration in LTM's mostly took the form of impromptu sharing of strategies with little evidence of teachers working to coordinate and implement these shared strategies to improve student achievement.

When assessing the school's leadership capacity, one has to consider the influence of school, district, and state leadership. Because of the school's designation as low-performing, many school improvement goals are externally imposed. Because there is no

input on the school level, many teachers do not embrace these goals and instead focus on their own improvement goals. Teachers do feel that they have a voice in other aspects of school leadership and feel the administration encourages their participation, but their involvement is limited. Teachers also indicate that school leadership supports their efforts in using data and supports their professional development. They also feel they have sufficient support in securing resources they feel are necessary to deliver effective instruction. However, more mixed assessments emerged when teachers were asked to describe the success of the efforts of school leadership to build a data-driven culture of instructional improvement. Responses indicate that while teachers believe that that leadership has effectively established the structural elements of a data-driven culture such as scheduling, access to data, and emphasizing student progress, they are less satisfied with the outcomes of data analysis. Specifically, the lack of useful instructional strategies that emerge from the process are cited as a major detriment.

Clarity of Purpose

One of the major issues that emerged from the analysis of data was a general lack of a binding purpose that serves to orient and inform the school's instructional improvement efforts. Rosenholtz (1989) states, "The hallmark of any successful organization is a shared sense among its members about what they are trying to accomplish" (p. 276). In her study of teacher workplace practices, she found that to the extent that there are shared organizational goals, teachers are more likely to prioritize those goals in their instructional decision making. However, the absence of a collective organizational purpose results in greater autonomy, less collaboration, and increased incoherence in organizational actions. Franklin has a very well developed system for

gathering, presenting, and analyzing student assessment data. However, it does not appear to have established a clearly shared purpose that guides how the school acts on insights gained from assessment data. This results in a situation where teachers and administrators collaboratively meet to talk about student assessment results and progress yet still-remain fairly self-guided in their efforts to improve student achievement.

The process of collaborative data analysis should ideally lead to collaborative efforts to improve instruction centered around shared norms of effective instruction. However, in the vast majority of observations of learning team meetings, this was not the case. Rather, collaboration around instructional improvement was limited to extemporaneous sharing of strategies that led to no real consensus regarding how the school should approach learning issues identified by data analysis. One possible reason that may explain this outcome is that the school lacks a clearly defined theory of action regarding how to improve instructional delivery and student achievement. City et al. (2010) define a theory of action as a set of causal connections that link vision and goals with tangible and specific strategies intended improve teaching and learning. In essence, a theory of action serves as a roadmap for achieving organizational goals and objectives. It delineates those essential actions and activities that will lead to improvements in teaching and learning. Currently, the theory of action in place in the district appears to be that if teachers have access to data, training on its use and interpretation, and meet in regularly scheduled collaborative, facilitated meetings to analyze assessment results, then teaching and learning will improve. While this theory of action is quite specific in defining how teachers will gain proficiency with data analysis, it fails to link concrete actions to improvements in teaching and learning. Rather, the implicit model in place

assumes that data analysis will in and of itself lead to improved teaching and learning. However, when implementing a theory of action, City et al. state, “Increases in student learning occur only as a consequence of improvements in the level of the content, teachers’ knowledge and skill, and student engagement” (p. 24). Therefore, a theory of action that fails to address these three critical elements will likely fall short in improving student achievement.

The evidence gathered in this study indicates that while teachers and administrators value insights gained from data analysis, its connection to large-scale instructional improvement is tenuous. David’s statement that teachers resented LTM’s because they never seem to inspire or generate better lessons for the future illustrates a situation frequently observed in meetings where teachers share strategies for addressing an issue identified by data yet never reach a consensus on which strategies to use and very often did not revisit the issue in future meetings. Because the process of improving instruction based on assessment data is not guided by a clearly defined set of actions intended catalyze and facilitate the process, there is no binding and compelling purpose that informs the work of teachers. As a result, data analysis is not leading to tangible, coherent instructional improvement efforts. As stated, the school is very proficient in determining student learning problems. However, the school is not sufficiently defining problems of practice. For instructional change to occur, the learning problem has to be reframed as a problem of practice. Thus, the emphasis for improvement shifts from the student to the teacher. When teachers define a problem of practice, they link learning to teaching by analyzing the effectiveness of their instruction and using the results of the analysis as a basis for discussion about improvement with the eventual outcome being the

development of a shared understanding of effective teaching (Boudett, City, & Murname, 2005). However, there is currently no shared understanding regarding the purpose of LTM's, which should be to develop and implement such common understandings of effective practice. While teachers may be able to explain that purpose of learning team meetings is to facilitate collective instructional improvement (espoused theory), their actual practice (theory-in-use) conveys an entirely different narrative. As result, although data analysis work is collaborative, the most important work of instructional improvement remains a largely autonomous endeavor.

One problem that may contribute to a lack of clarity of purpose at Franklin is conflicting goals. An inevitable outcome of being designated an underperforming school is increased intervention at the state and district levels. While additional support and resources may contribute invaluablely to improvement efforts, the increased presence of these entities has also been disorienting. Because of Franklin's low performance on the state assessment, the state sets improvement targets that the school is required to meet. However, interview data indicate many teachers feel these goals are unattainable given current levels of achievement. Therefore, many teachers have focused on individual improvement goals for their own professional development and student achievement. As a result, there is no unifying focus that informs the work of the school. Instead, teachers concentrate on their own progress and that of their own students with potentially varying degrees of efficacy. While this focus on personal goals may be beneficial, it also has the potential to foster isolation and obfuscate the focus of instructional improvement efforts by creating a context where teachers pursue multiple individual goals without a clear and comprehensive, shared purpose to guide their work. In essence, the abundance of

individual goals at Franklin has not done much to foster the development of a common purpose around issues of student achievement and instructional improvement.

Goal conflict also can lead to a lack of teacher buy-in and forced compliance. In fact, mandated compliance was a major theme that emerged from the analysis of data. There was not a shared understanding between teachers and the district regarding the purpose of data analysis. This resulted in a situation where teachers understood the data analysis process and participated in the meetings only to the extent that they were required. However, outside of the structured context of the meetings, the influence of data analysis on instructional practice was not as substantial as it potentially could have been if teachers embraced the process more fully. One potential means of addressing this problem is for school level leadership to bridge the gap between school-level objectives and goals and those demanded by the district and the state through the development of intermediate goals which the faculty could adopt. Because these goals would be more achievable, more teachers would likely embrace them. However, the authority of school level leaders was muted by the strong demands of the district and the state. Frequently, administrators referenced state demands for accountability when explaining why certain improvement processes were in place. Very rarely did they state that the school collectively decided that a particular approach was in the best interest of the students. It seems as though the severe consequences associated with continued low-performance has created a culture of compliance that partly stems from fear of the potential sanctions that could result from poor assessment performance. However, the situation at Franklin also illustrates research findings that indicate when improvement efforts are not reinforced by shared purpose and strong values about effective teaching, the outcomes of those efforts

are likely to be greatly diminished (Rosenholtz, 1989; Campo, 1993; Maehr & Buck, 1993; Silins & Mulford, 2002; Heck & Hallinger, 2009).

Process versus Product

The centerpiece of the school district's efforts to improve student achievement through data analysis has been the structured data meetings that are intended to accomplish several important outcomes. First, they are a source of professional development, providing teachers with training that allows them to better understand and analyze data. Secondly, the meetings provide insight into student achievement and allow teachers to identify specific skills and concepts that should be addressed to promote student proficiency. The meetings are also an opportunity for teachers to meet for an extended period of time to collaborate around issues related to student achievement. Collaboration should then lead to an analysis of instructional practice and the development of a cohesive instructional plan to improve student achievement. To achieve these objectives, the school district has implemented a very structured, organized set of procedures that provide the framework of the LTM's and has provided a facilitator whose purpose is to guide teachers through the process. The value of the structured procedures used in the meetings is derived from research that indicates that collaboration among teachers is often highly unfocused, spends too little time addressing the issue at hand, and often does not promote effective organizational learning (McDonald, Mohr, Dichter, & McDonald, 2007). Therefore, the implementation of protocols that frame the focus and conversation of meeting participants is likely to enhance productivity and improve the ability of educators to accomplish the purpose of the meetings.

However, as previously stated, the instructional purpose of the LTM's was not widely shared by teachers and school and district leaders. There was not a common understanding of the instructional outcomes that were to result from the meetings. As a result, a situation has emerged where the meetings have become an end in themselves. Because the eventual outcome or product of the meetings is not widely shared, it appears that meeting participants focus heavily on the process. Thus, a great deal of time is spent following the procedures outlined by the district for data analysis. On numerous occasions, it was not unusual for up to 80 percent of the 90 minutes allocated for the meeting to be spent filling out various forms associated with a particular protocol. During this time, teachers provided information to the facilitator to record on the form, which outlines the protocol. The process requires teachers to look for trends in student achievement, identify problematic concepts, analyze the nature and complexity of identified concepts, and list strategies for improvement. However, the smallest portion of time was devoted to generating improvement strategies, and virtually no time was devoted to coordinating those strategies into an effective instructional plan. Therefore, the portion of the meeting that is intended to help teachers and administrators develop and implement solutions to problems identified through data analysis receives the least amount of attention.

Teacher and administrator interviews express a sense of exasperation with the process. While teachers state that they value meeting with colleagues and analyzing data. They also feel the process is counterproductive. Teachers state that they often develop and administer assessments, not because of their ability to gauge student learning, but rather to satisfy the requirements of the LTM process. They express a great deal of

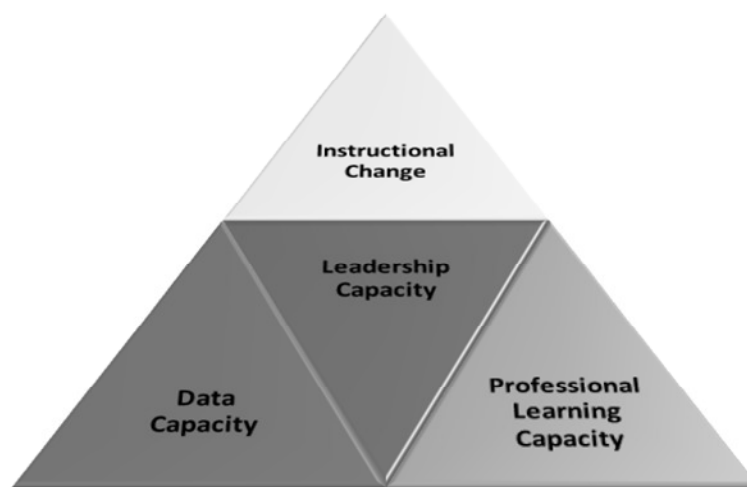
frustration with the amount of time spent discussing student assessment results and completing paperwork and the relatively small amount of time devoted to discussing teaching. There is a strong desire to utilize more of the learning team meeting time to plan instruction, which will help to staunch the flow of the large quantities of red ink necessary to highlight the dozens of students whose achievement fall far below established benchmarks by reorienting the process to focus on improving the initial instruction that leads to poor achievement in the first place. This point becomes especially poignant when one considers the fact that the school has access to historical data that indicate concepts and skills that consistently emerge as weaknesses year after year. Therefore, it becomes a very inefficient use of time to allow an instruction and assessment cycle to proceed when the outcome is essentially a foregone conclusion. By focusing on instruction prior to the assessment, it is likely that fewer students will be identified as needing intervention, which would make the school's remediation efforts much more manageable. However, this will require a greater degree of flexibility in the implementation of the data analysis protocol. It necessitates that the school and district reframe the process to prioritize instructional planning and improvement rather than the current highly procedural emphasis.

Uneven Capacity

The findings of this study underscore the importance of capacity in the areas of data use, professional learning, and leadership. The analysis of data collected for this study indicates that instructional change is greatly dependent on the school's capacity in these three areas. Capacity provides a foundation for instructional improvement, and if instructional improvement efforts are to have a meaningful, deep impact on teachers'

practice, that foundation must be sound. It is not enough to have sufficient capacity in one area and not in others. The findings of this study indicate that each plays a crucial role in supporting instructional improvement. Figure 1 provides a conceptualization of this idea using a pyramid model. In the diagram, the apex of the pyramid represent instructional change, and supporting it are blocks representing capacity in the areas of data use, leadership, and professional learning. Each block plays a critical role in supporting instructional change. And, similar to any construction, deficiencies in any of the foundational elements will compromise the integrity of the entire structure. The findings of this study indicate that while the school has a great degree of capacity in the area of data use, Franklin's lack of capacity of the two remaining areas has greatly diminished its ability to implement instructional change.

Figure 1. Capacity model of instructional change



When one sits in a data meeting at Franklin, it quickly becomes apparent that the school has a great deal of resources to support data-driven decision-making. The walls of the meeting room are covered with information facilitating monitoring of student

progress. The district has invested in a comprehensive system for data storage, disaggregation, and retrieval and has provided teachers access to this database. Teachers can retrieve a wide variety of reports that organize and present data in a myriad of ways that provide multiple representations of student achievement so that teachers have a clear understanding of where students stand in relation to academic benchmarks. There is a facilitator who is specially trained to guide conversation about student progress, assist teachers in digging deeper into the data to develop understandings of learning problems, and facilitate the development of an action plan. In these meetings, administrators and coaches are present as well as various academic support personnel. All of the aforementioned elements are highly consistent with research regarding best practices for data use (Lachat & Smith, 2005; Kerr, Marsh, Ikemoto, Darilek, & Barney, 2006; Wayman & Stringfield, 2006; Datnow, Park, & Wohlstetter, 2007; Sanchez, Kline, & Laird, 2009). The amount of resources available and the advanced organizational structure for data analysis far exceeds the capability of many school districts. However, despite these advantages, deep, meaningful instructional change does not occur regularly at Franklin. This study posits that the reason for the lack of deep instructional change lies in the relative weakness in the remaining areas of capacity.

In interviews, teachers generally indicated relatively high amounts of satisfaction with professional development. The teachers indicate that they feel that the learning experiences the school and district provide are relevant and related to the issues identified by data, and they felt those experiences provided them with the knowledge and skills necessary to improve their teaching. As an example, they often cited the differentiated instruction trainings to illustrate how the school and district are strengthening the ability

to use data to improve instruction. They feel trainings such as these equip them with strategies that will enhance their instructional effectiveness. Furthermore, teachers expressed satisfaction with the support provided by academic coaches that are available to work with the teachers to model best practices in the classroom or provide consultation when teachers are experiencing difficulty with an instructional issue. Finally, teachers' believed that collaboration was a valued component of their professional learning experiences. They stated that opportunities to share strategies with colleagues provided a wealth of new information that allowed them to improve their instructional practice.

However, despite the significant levels of satisfaction expressed by teachers, observations and interview data indicate that their assessments of professional learning were not necessarily consistent with research-based indicators of effective professional learning. The first indicator is time and duration. While teachers indicate they have a lot opportunities to attend various workshops, they also indicated that, for the most part, these workshops only spanned one or two sessions with a follow-up activity they were required to submit to prove they implemented the concept that was the workshop's focus. With the school's oral language initiative, teachers did not indicate that any additional follow-up support was provided to ensure they implemented the content well. The second indicator is content focus. Research indicates that teachers' knowledge of content as well as their pedagogical content knowledge positively influences students' academic achievement (Cohen, 2000; Hill, Rowan, & Ball, 2005). As a result, professional development that focuses on developing teachers' knowledge of content as well as their ability to teach it is considered critical. At Franklin, where large numbers of students are identified as not meeting standards, the need for professional learning experiences

focusing specifically on content and its effective instruction is apparent. However, there was only one instance where teachers described a literacy learning opportunity that provided concrete, tangible teaching strategies for a specific type of content. Most of the professional development opportunities described by teachers were general in nature or were focused on technology integration. Observations of teacher professional development also indicate that learning opportunities provided to teachers did not have a specific content focus. For example, the differentiated instruction training provided by the state taught teachers a new method for identifying students for instructional intervention based on identified skills but did not provide them with any tangible strategies for improving their teaching once students were in those differentiated groups.

Collaboration was cited as a strong source of professional learning by both teachers and administrators. Both groups indicated that collaboration was highly valued as it provided an opportunity to share strategies for instructional improvement. However, observations of teacher collaboration within the context of learning team meetings indicate that teachers may be overstating impact of collaboration on their grade levels. While it was observed that some grade levels were more collaborative than others, collaboration as whole was mainly superficial. Teachers shared ideas, but rarely did this sharing lead to any consensus about how to address instructional improvement. Instead, teachers acknowledged the information provided by their colleagues, but there was no evidence that they made any adaptation to their practice, and frequently, the issue was not revisited in future meetings. Therefore, an inevitable question emerges. Given these findings, what explains the relatively positive assessments of professional learning experiences expressed by teachers at the school? One possible explanation may be that

teachers genuinely value the professional development and collaborative experiences the school and district provide because it is their only frame-of-reference. Teachers may not necessarily be aware of research regarding effective professional development and, as a result, only have the school and district program on which to base their evaluation. The same cannot be said for the district and state. In 1995, the state enacted a law that required the state department of education to align professional development policy with state curriculum standards as well as frameworks for professional development adopted by the National Staff Development Council (NSDC). Thus, in designing professional development activities, state and school district leaders must take standards developed by the NSDC (2001) into consideration, which are composed of context, process, and content standards. The context standards require the implementation of structures that promote the development of professional learning communities that take collective responsibility for student learning, leadership that emphasizes continuous instructional improvement, and the provision of resources that support adult learning and collaboration. Furthermore, the NSDC content standards have an explicit focus on equity and ensuring a supportive learning environment, the development of strong understanding of content, and content-based instructional strategies. Therefore, given this explicit requirement for continuous and content-specific professional learning, it is unclear why these standards were not observed to be reflected in professional development provided by both the state and the district.

What is clear is that the absence of such a framework has hampered the school's ability to make effective use of data. While the school has made significant and admirable changes to influence the quality of the instructional program such as their

differentiated instruction initiative, remediation efforts, and the work of various grade levels to change teaching approaches, the relatively low level of professional learning capacity has diminished its ability to establish a professional learning community that can provide the content-specific professional learning experiences that will allow teacher to make the fine-grained improvements to instructional beliefs and practices that constitute meaningful change. The structures are in place that can facilitate stronger collaboration and professional learning. The learning team meetings and facilitator can do much to promote highly constructive dialogue regarding instructional planning and improvement. However, the school must begin to emphasize the use of these and other resources to serve the purpose of improved professional learning.

Leadership capacity is another key element of the school's ability to respond effectively to assessment data. It may be considered the most important area of capacity because leadership directly influences both the school's professional learning and data use capacity. Therefore, to the extent that school leadership is able to effectively establish a professional learning community and implement the structures and processes necessary for data analysis, instructional change will occur. Figure 2 provides an alternative means of conceptualizing the role leadership capacity plays in guiding instructional improvement through the use of gears. In the illustration, leadership capacity drives both professional learning and data use, which in turn drive instructional change. Thus, in this representation, leadership enables instructional change by providing the impetus for capacity development in the remaining two areas.

Figure 2. Leadership capacity



When conceptualizing leadership capacity at Franklin, it is important to include leadership at both district and state levels since both of these entities factor heavily in the decision-making processes that drive the school. When analyzing the school's leadership, it is apparent there is a great deal of attention focused on developing the school's ability to use data. As mentioned previously, the school has a very well-developed system in place for gathering, organizing, and analyzing data. However, the school's leadership has not been able to effectively develop the school's capacity for professional learning to the extent that it results in substantive changes in teachers' instructional practice. Teachers indicate that administrators support their professional development by encouraging and even requiring them to attend certain professional development opportunities. The administration also encourages collaboration and has implemented structures such as common planning time and the learning team meetings to promote and support collaboration among teachers. Finally, teachers indicated in interviews that the administration ensures they have the resources they need to improve

instruction. However, these efforts do not appear to have been sufficient to bring about widely shared changes in instructional beliefs and practice, and the origin of the problem may lie in the realm of school culture.

Culture is simply the way things are done (Deal & Kennedy, 1982). It involves the shared values and beliefs that inform the work of the school. As previously discussed in an earlier section, there is no real shared understanding for how instruction should change in light of assessment data. There is a great deal of discussion regarding the need for change, but the values regarding how instruction should manifest in the classroom are less clear. Currently, the culture of the school is not one that supports the development of substantially improved instructional outcomes. The expectation and support for deep professional learning has not been sufficient to catalyze change. If teachers are expected to make substantive improvements to instruction, that expectation has to be communicated and internalized across the school. However, expectations are only as valid as the support provided to attain them. Therefore, if school and district leaders expect teachers to change teaching practices, they must provide new sources of knowledge to enable this change to occur. For every increment of increased performance required of teachers, school leadership must provide an equal amount of support to build the capacity to achieve that goal (Elmore, 2004). However, at Franklin, both expectation and support are lacking. That is not to say that school and district leaders do not expect quality instructional improvement. That is not the case. However, this expectation for improvement has not become integrated into the school's operational framework. But, even if this expectation were omnipresent, it is likely that outcomes would not change significantly until the support the school and district provides matches those expectations.

This requires professional and collaborative learning experiences that foster the acquisition of new content and pedagogical content knowledge that provide teachers with tangible methods to truly change the way they teach in light of assessment data. In essence, leadership capacity must develop to a level where it spurs the creation of a culture that supports not only the effective use of data but also enables the school to engage in deep professional learning so that teachers can improve their teaching based of insights those data provide.

Thus, this case demonstrates that disproportionate capacity is insufficient in bringing about large-scale, meaningful, and sustainable instructional change. Instructional improvement is mutually dependent on the school's ability to leverage its collective knowledge and skills in all three areas. Schools must be able to use data well, but they also need to recognize when organizational learning is necessary and be able to implement systems that provide teachers with the necessary knowledge and skills to improve instruction. However, leadership capacity appears to play an even greater role in the process, for leadership determines the nature and extent of capacity development in all three areas. This occurs not only through the provision of resources and structures to support capacity development but also through the establishment of cultural beliefs and norms that enable to instructional change to firmly take root.

Structural versus Instructional Change

It must be noted that a great deal of change occurred at Franklin as a direct response to assessment data. The various large scale initiatives detailed in the previous chapter, remediation efforts, and also the instructional modifications of individual teachers are all examples of how the school has used data to adapt the instructional

program. However, as a whole, the changes described in various interviews could not be characterized as deep and meaningful changes in beliefs and practice. The changes described by respondents were more structural than instructional changes. Structural changes involve alterations to the organizational patterns, resource provisioning, and curricular processes of schools. They entail practices such as grouping, scheduling, and organizational hierarchy. There is an implicit theory of change in structural reform, one that often relies on assumptions of causality to achieve desired outcomes. For example, by providing more time for collaboration or reducing class size, student achievement will increase. In these examples of common structural changes, there is an assumption that changes in teaching will occur, which will lead to greater student achievement. However, school restructuring has a weak relationship to instructional improvement. As a result, it cannot be assumed that structural change will lead to changes in teaching practice or increases in student achievement (Elmore, 1995).

At Franklin, the major instructional improvement initiative was the implementation of differentiated instruction. On its face, the initiative appears to extend beyond mere structural change to incorporate more substantive changes in teaching methods and philosophy. Differentiated instruction, by its very name, implies different methods of teaching for different types of students. Nevertheless, at Franklin, differentiated instruction was still largely a structural change. The interpretation of differentiated instruction that manifested in the school was one that privileged the large-scale structural components such as revised scheduling to facilitate small group instruction, data analysis focused on identifying at-risk students, and flexible grouping of students. The actual process of differentiating instruction for various groups of students

was mostly left to the discretion of the teachers, resulting in a great deal of potential variation in instructional quality depending of the skill and commitment of the teacher. The lack of coordination of instructional efforts may have resulted in teachers not making any substantive changes to their teaching, which may explain why teachers described their changes in instruction as mostly minor.

However, throughout the interviews, teachers expressed great enthusiasm for differentiated instruction and the school's other large scale initiatives. They indicated that it has changed the manner in which they conceptualized teaching toward a focus on the needs of the students instead of the instructional preferences of the teacher. Teachers may genuinely feel enthusiasm for the large-scale initiatives. Structural reforms may infuse new vigor and energy into a school. However, those energies are likely to be directed towards the successful implementation of the structural change, not the instructional improvement efforts that they are intended to bring about (Elmore, 2004). Large-scale structural changes, while considerably less difficult to implement than profound instructional change, are not necessarily easy. They involve alterations to long-standing programmatic regularities. Thus, structural changes may require a great deal of effort to implement and may foster a sincere sense of accomplishment. However, that does not mean that the changes will result in large scale improvements in teacher practice. Instead, teachers may have simply adapted. While new grouping practices and instructional services may have been implemented directly in response to data analysis, evidence indicates that these changes largely repackage the same instructional practices that resulted in poor achievement in the first place.

It is easy to blame teachers for the lack of change in instructional practice. However, this chapter has repeatedly emphasized the role of capacity in instructional change. Therefore, it is not completely the teachers' fault that differentiated instruction was not necessarily different. In fact, it is reasonable to assume, that in the vast majority of cases, teachers teach what they know, and they do so to the best of their ability. As stated several times, there is a clear lack of purpose that seems to guide instructional improvement. The district and state, which provide the impetus and support for differentiated instruction, have not sufficiently communicated the instructional purpose, and they have not, on an adequate scale, provided the content-specific training necessary for implementing a differentiated instruction program where teachers actually teach differently. Therefore, if leaders have not adequately fulfilled their responsibility to develop the school's professional learning capacity, it should be no surprise that the changes that emerge are first-order in nature.

According to Tomlinson (2008), first-order change occurs over time and does not require substantial changes in teacher practice. This type of change often accompanies structural change. It permits teachers to maintain their current instructional practices within the context of a new organizational scheme or program. On the other hand, second-order change requires not only changes in practices but also major changes in beliefs about teaching. The type of learning that occurs in first-order change is classically single-loop. Franklin has not engaged in any critical reflection of its instructional values and, as a result, has for the most part, maintained the instructional approaches that it has always practiced albeit modified to various degrees to accommodate an externally imposed emphasis on data and differentiated instruction. The

school has responded to the problems revealed by data analysis through actions that maintain the status quo to the greatest extent possible while also preserving the organizational values that gave rise to the problem. This has resulted in a situation where evidence of data analysis is prevalent throughout the school, but instructional beliefs, philosophies, and practices remain largely unchanged. Therefore, the impact of data analysis on the school's culture is a superficial one. Franklin presents the outward trappings of a school that values data analysis as a means of improving instruction through its fulfillment of various structural and resource requirements. However, these surface projections serve to mask issues that indicate that data analysis does not necessarily work as efficiently or effectively for the purpose of instructional improvement as the district or school indicates.

Implications for Practice

The findings of this study underscore the need for school districts to have a much broader focus when implementing data-driven instructional practices. A well developed program for data analysis does much to facilitate the development of insights into student performance. One of the clearest outcomes that emerged from this study is the benefit of having a robust system for data analysis that is easily accessible to educators at all levels. In this study, the school district's investment in data analysis, the development of formal structures for analysis, the provision of the learning team facilitator, and subsequent training of teachers did much to develop a school culture where data play a major role in the functioning of the school. This investment along with the concurrent emphasis on using data to track student achievement succeeded in creating a context where teachers

are comfortable using evidence to determine the efficacy of their instructional efforts and are willing to acknowledge when data indicate gaps in student learning.

However, when implementing structured data analysis, it is important to ensure that the process of data analysis does not become an end in itself. The highly structured format for data analysis implemented by the school district resulted in a greater focus on the process rather than the product. That is, the study indicates that the school was so focused on following the procedures for data analysis, the ends the process was supposed to serve were obscured. Practitioners seeking to avoid such outcomes would be well served by ensuring that there is a clear and shared purpose for data analysis. These common understandings should emphasize that data analysis is a tool that promotes reflection on instructional effectiveness and is a catalyst for discussion and planning that results in the development of a coordinated and comprehensive action plan for instructional improvement that is informed by shared understandings of effective practice.

Another consistent finding was the desire to focus on more instructional planning. Very often, the school in this study had an *ex post facto* orientation. The focus of the efforts was largely centered on data obtained after initial instruction occurred. The school did not make use of historical data from the school and district level that indicate trends in achievement that persist year after year that can be used to inform instruction prior to the assessment. Therefore, the process becomes an inefficient use of time and resources. When improvement efforts are implemented in this manner, various complications emerge. First, the sheer number of students who need additional assistance makes it very difficult to manage improvement efforts. Arranging additional staff and

intervention resources has the potential to be a significant problem. The school in this study had to devote a great deal of staff and time for remediation. Secondly, pacing also becomes problematic. Riverton, like many school districts across the country, have pacing calendars that provide a scope and sequence to which classroom teachers are expected to adhere. However, it becomes very difficult to remediate certain concepts and skills for a large number of students while also maintaining an appropriate pace. A more proactive approach is required. By using historical data as a basis for instructional planning before an assessment, teachers and administrators can develop an instructional plan that anticipates student learning needs and uses them to inform initial instruction. This approach has the potential to lead to fewer students being identified as underperforming, which makes the process of remediation for students who still have not demonstrated mastery much more manageable.

Instructional planning, in and of itself, is a major issue. Data indicate that instructional planning was a very superficial process. As a result, the return on the considerable investment the school district has made in using data analysis may be greatly diminished. It makes very little sense for school districts to invest hundreds of thousands or even millions of dollars to improve schools' capacity to analyze and learn from data only to have those efforts result in minimal, if any large-scale improvements in instructional practice. Data analysis is only one step in a multiple step process. Investing in only data analysis is comparable to a cook who purchases all the ingredients for a cake only to leave them sitting on the shelf. Similarly, school districts may have all the ingredients to make effective use of data such as accessible reporting formats, a framework for analyzing data similar to learning team meetings, and insights yielded by

analysis, but if the process does not lead to a focus on meaningful instructional improvement, the purpose of the investment, which is large-scale instructional improvement and higher student achievement, will only be minimally realized, if at all. Data analysis without an explicit focus on changing instructional beliefs and practice in light of insights provided by data is likely to result in an expensive perpetuation of the status quo.

As a result, another major implication of this study is that capacity development must be a balanced process. Franklin had a great deal of capacity in the areas of data use, but its capacity in leadership and professional learning was limited. Data from the study indicate that all three areas of capacity are mutually dependent. Meaningful, large-scale instructional change will likely not manifest if capacity in any of the three areas is underdeveloped. School and district leadership in this study did much to create a normative culture where data use was an accepted component of teachers' daily work. However, the leadership did not clarify to a sufficient extent the instructional, professional, and moral purposes of data use. Data should provide an impetus for professional learning and close examination of organizational norms and values. They are the means by which educators measure their progress in meeting their stated goals of ensuring every child receives a high-quality, rigorous education that will enable them to be productive contributors to the advancement of society, a goal that is deeply rooted in the moral purpose of teaching. However, in the absence of such clarity of focus, traditional norms of autonomy and inflexible approaches to instruction are likely to persist. Leadership capacity, like the diagram shows, drives the other two areas. When leadership efforts are insufficient in developing clarity of focus and building a culture

that encourages meaningful changes in instructional practice, it is likely to be reflected in the type and degree of instructional change.

Professional learning capacity also requires special mention. If schools and teachers knew how to effectively alter instruction in light of assessment data, it is likely that they would do so. The inability of the school in this study to improve instruction on a large-scale may be partly symptomatic of an inability to generate new ideas and instructional strategies. The findings of this study highlight the importance of developing professional learning experiences that enable schools to learn new strategies and skills that will allow them to effectively respond to assessment data. Franklin's efforts to improve students' oral language skills illustrate an effective approach. These professional learning experiences must be based on the identified needs of students and teachers and presented in a meaningful fashion. Teachers in this study and prior research indicate that professional learning experiences that are relevant, sustained, and job-embedded are the most likely to have the most impact on instructional practices. Furthermore, those professional learning experiences should be content-specific and grounded in strong norms of collaboration and collegiality. If schools and districts fail to provide such quality learning experiences for teachers, it is unreasonable for them to expect the types of instructional improvement that would emerge from such a professional learning program.

Therefore, school leaders must work to establish a clear link between the outcomes of the data analysis process and professional learning. At Franklin, the professional learning experiences available to teachers did not provide the content-specific skills to address learning problems. As a result, teachers' modification of their

instructional approach was minimal. If data analysis is to have a substantive influence on teachers' instructional beliefs and practices, the type and quality of professional development must be improved. One possible approach could be for leaders to develop a comprehensive plan for professional development that is based on improving teachers' content and pedagogical content knowledge. School leadership would set professional learning priorities at the beginning of the school year after an analysis of the previous year's data. These priorities would serve as a framework for the professional learning experiences offered by the school. Once these are established, school leaders can then begin to implement opportunities for teachers to develop the content-specific skills necessary to improve their teaching. The learning opportunities should be comprehensive, incorporating a variety of formats such as workshops, coaching, lesson study, and collaborative planning. As this framework is implemented, it can be modified based on needs that emerge as a result of the continuing analysis of data. The value of this approach lies in its emphasis on centering professional learning on improving content area knowledge and its grounding in insights gained from data analysis. It begins to address both issues of uneven capacity and unclear purpose detailed in this study through the provision of a robust system of professional learning and anchoring that learning to data analysis.

However, the implementation of such a systematic program requires school leaders to locate individuals and resources that will facilitate the provision of high quality content-specific professional development. This is a particularly crucial requirement because schools' ability to improve instruction through professional learning will likely depend on their ability to make effective use of resources both within and outside of their

buildings. Therefore, an additional implication of this study for leadership practice would be for schools and school districts to more closely collaborate to share information and resources that enable them to draw upon the strengths of other schools and districts to more effectively address their own areas of needs.

Implications for Policy

The increased emphasis on data-driven decision-making is driven by educational policy that demands higher student achievement and provides increasingly severe sanctions for schools that fail to meet those demands. The findings of this study indicate the need for a shift in focus from an outcome-oriented approach that focuses almost exclusively on assessment results to one that provides greater emphasis on the instructional processes that lead to those outcomes. Currently, school improvement policy emphasizes structural reforms such as closing underperforming schools and increasing school choice. However, for the vast majority of students, these efforts will not result in a substantially better educational experience. To improve learning for all students, state and federal policy must first create conditions that improve the quality of the instruction students receive. Professional development policy is an area that can have immediate impact. The school in this study had considerable difficulty translating the results of data analysis into tangible improvements in instructional practice. There is a great need for state and federal policies that provide assistance to schools in developing coordinated instructional responses based on assessment data. This includes the provision of professional development that increases teachers' content and pedagogical content knowledge and also facilitates collaboration that is both efficient and enables the development of effective improvement strategies. A focus on instructional improvement

is likely to have a much more substantial, sustainable, and widespread effect on student achievement than the current, mostly punitive orientation that characterizes school improvement policy.

Another major policy implication derived from this research relates to the findings regarding school and district leadership capacity. Instructional change is a very difficult process that is highly dependent on the skills and abilities of both school and district leaders. While the need for instructional leadership is widely recognized, it is not clear that school and district leaders have a deep understanding of how to go about the process of using assessment data to improve instruction. Therefore, in addition to a focus on improving teacher knowledge and skills, there is also a need for federal and state policies that seek to improve the abilities of school leaders to create the conditions that enable substantive changes in teachers' instructional beliefs and practices. This can be accomplished through initiatives such as leadership institutes and administrator networks that allow school administrators to learn best practices from each other as well as experts in school leadership. Furthermore, leadership policy should also focus on the development of leadership content knowledge, which centers on school leaders' understanding of effective teaching. A better understanding of effective teaching and leadership practices has the potential to greatly improve both instructional and achievement outcomes.

Implications for Research

As policymakers' demands for improved student achievement intensify, a growing number of schools will begin to invest in and implement increasingly sophisticated systems for using data to inform instructional practice. However, as the

research in this study indicates, getting to practice is not as clear cut as policymakers indicate. During data collection, it became apparent that teachers were implementing the teaching strategies they knew. One possible reason for why there was not much variation in teaching was that teachers may not have known of or were not comfortable implementing alternatives to their current pedagogical paradigm. Data analysis demands innovation. When data show students are not performing well, there should be some modification of instructional frameworks as result. However, this demands that there be a deep enough pool of instructional resources that educators can draw to adapt their instructional approach. In this case, it appears that this pool was relatively shallow, and it is likely that this situation is reflected in schools in similar contexts. In essence, when teachers do not have access to new instructional models which they can use to address achievement problems, their only option is to draw upon the instructional strategies which they possess.

As a result, the findings of this study indicate there needs to be more research into the development of more coordinated systems that link the outcomes of data analysis to content specific professional learning opportunities that are targeted to the identified concepts or skills. Teachers must have access to a comprehensive system of targeted professional development that is directly linked to the content issues identified by data. Therefore, when learning problems emerge from data, teachers can be immediately engaged in learning experiences that will enable them to critically reflect on their practice and facilitate the development of new instructional frameworks and methods. However, the manner in which such a system should be ideally structured and organized requires additional research.

Prior to beginning this research, it was not my intention to provide assistance to the school. However, after data collection was complete, I did assist the school in the development of an instructional improvement plan at the request of the administration. Beyond being a rewarding experience, my work with the school highlights an opportunity for university-school partnerships that seek to more effectively leverage data use for the purpose of instructional improvement. As more schools develop sophisticated systems for data warehousing and analysis, these partnerships provide an opportunity for schools of education to work with schools to increase their capacity to effectively link the result of data analysis to focused, coordinated instructional improvement efforts. They also provide an opportunity for researchers to develop deeper insight into the factors that both hinder and promote instructional improvement and, as a result, may facilitate the development of more effective approaches to both leadership and teacher learning.

Another major implication of this research concerns structural reform. The implementation of data analysis systems is a structural change. One potential avenue of research is to investigate the extent to which the implementation of data analysis influences student achievement. However, as this study makes clear, there are additional factors that may have stronger implications for student achievement than the actual structural change. The impact of structural changes on teaching may very well determine the extent to which student learning improves, and this is true for other types of structural changes such as class size reduction, common planning time, or extended school days. Therefore, future research on structural changes may be more insightful if they focus on the degree the change influences instructional norms, values, beliefs, and practices rather than simply the final academic outcome. Studies of this nature may help to provide fuller

explanations for why proficiency did or did not increase rather than merely state whether it did or not. Such a research orientation may provide an invaluable contribution to the school improvement dialogue by focusing attention on the development and improvement of instructional processes rather than the implementation of structural reforms and the outcomes they are intended to bring about.

Finally, the small scale nature of this study as well as the timeframe in which it was conducted are limitations. Therefore, an area for further research would be to follow a greater number of schools that are implementing structured data analysis over a longer period of time. Such research would allow the researcher to gain a more robust understanding of how schools respond to data analysis over several data cycles and would also provide a better understanding of how schools in varying contexts use data to improve instruction. Furthermore, this study relied on teachers' ex post facto reports of their adaptations in instruction. Additional research that employs direct observation of teacher practice before and after data analysis would provide much richer insight into the nature and extent of instructional adaptation.

Limitations

One of the inherent limitations of a single case study is its relatively small scale and lack of contextual diversity. Yin (2009) states, a common concern about case studies is that they “provide little basis for scientific generalization” (p. 15). This study sought to maximize the transferability of the findings of this study through the selection of a critical case and the implementation of diverse data sources for the purpose of triangulation. However, even these measures may not be sufficient to enhance the transferability of the findings to all contexts. There are a number of factors that may yet limit the ability to

generalize broadly. These include the fairly isolated geographical location of the study site, which may influence the diversity of teachers who choose to work at the school and demographics of the school and community, which are heavily poor and minority and are not reflective of the country as a whole. However, while these may be considered limitations of the study, they may alternatively be considered strengths because the unique circumstances of the school and district may be used as the basis for the building of theory that can be further tested and expanded in the future with similar populations (Strauss & Corbin, 1998).

Another significant limitation of this study is that it relies heavily on teachers' reported perceptions of changes in instruction. Although teachers may report changes in instructional practice, it cannot be verified that these changes take place to the extent that teachers report them, if at all. As a result, it cannot be determined for certain that teachers are actually changing their practice in light of assessment information. This issue was addressed in the interview protocol through questions that asked teachers to provide specific examples of changes in practice as well as observations of data analysis meetings. However, without observing practice before and after data analysis meetings, changes in practice cannot be specifically validated.

Time is also a limitation of the study. This study was conducted over a five week period. Due to budget constraints, it was not possible to extend the duration of the study. As a result, I was only be able to observe a few cycles of data analysis and the resultant instructional response, which may have hindered my ability to gather a fully developed sense of how the process works at the school. Insights gained from additional sources of data helped to address this issue. However, because the research was conducted during

the time the first major round of district diagnostic assessments were administered, the school was in the process of calibrating its instructional approach to address trends identified in assessment data. Therefore, although the research window was fairly brief, it occurred during the time of year where the scrutiny of data is most intense.

Finally, my personal background may have also influenced the outcome of the study. As a lifelong resident of Riverton and a teacher in an adjacent community, I am very familiar with the context of the school, the district, and the community. In fact, the major motivation for my pursuit of studies in educational administration and school improvement stems from experiences in Riverton. Therefore, I enter the research with strong connections to the topic and the community, which may manifest as biases that may affect my interpretation of the research. As I stated in the section on positionality, I included steps to identify potential bias in the data analysis process. However, it may not be possible to identify all potential manifestations of bias, and, thus, this is a limitation of the study.

Concluding Remarks

The findings of this study underscore a need for school leaders and policymakers to ensure the improvement of instructional processes is the primary focus of school reform efforts. Very often, school improvement initiatives center on sweeping structural changes such as curriculum programs, scheduling, or data analysis. However, these programs in and of themselves will not likely result in much improvement in student achievement. Their effectiveness will depend on the extent to which they impact the quality of instructional delivery. Structured data analysis is a valuable tool that has great potential to provide great insight into the depth and quality of student learning. It also

has the potential to provide teachers and administrators with insight into the quality of their teaching, which should lead to efforts to adapt instructional beliefs and practices.

However, it is very tempting and, unfortunately, very common for educators and policymakers to approach reform initiatives as if they were a panacea for school improvement. When implementing such programs, they often adopt a set it and forget it approach. That is, they implement the initiative, neglect to develop the instructional processes that should accompany the program, and check back for results. When student achievement does not increase at a sufficient rate, the program is deemed ineffective. However, it is not possible to gauge if school improvement efforts are actually effective if instructional practices essentially remain the same. The major implication of this research study is that instructional improvement should not be taken for granted, regardless of the size of the investment the district or state has made in implementing other aspects of the program. Quite contrarily, it should be the centerpiece of any school improvement effort. The Riverton School District made considerable investments in improving the ability of schools to obtain, organize, and analyze data. However, despite these efforts, teachers indicated they mostly made minimal changes to their teaching approach. If schools and districts seek to maximize the considerable investments they make in improving the academic achievement of students through data analysis or other reforms, it will likely serve them well to ensure they develop sufficient capacity to substantively improve the quality of the instructional program.

Appendix A

Teacher Interview Protocol

Transition:

1. Greet the teacher and thank him or her for allowing the interview.
2. Inform him or her about confidentiality. They are not required to participate in the interview. They may choose not to answer a certain question or all questions. They may stop the interview at any time.
3. Explain that the purpose of the interview is to discuss how the school uses data to inform instructional practice.
4. Let's begin by discussing your background.

Background

1. Describe your background as an educator. Why did you become a teacher?
Probe: What grade do you teach, and how long have you been teaching it? (If the teacher teaches a specific subject, ask them to state their subject.)
2. How would you describe your approach to teaching?
Probe: How do you believe students learn best?
3. Describe your school and faculty.
Probe: What are its strengths and weaknesses?
Probe: What are the most pressing student learning needs, and how do you address them in your teaching?

Data Analysis Process

4. Do you feel data analysis is necessary for school improvement? Why or why not?
Probe: What types of data do you examine in your data meetings?
Probe: Why do you choose to examine those types of data?
Probe: How long does it typically take for you to get data for analysis? Is this timeframe quick enough for you to make the best use of the information?
5. Do you feel you have sufficiently developed the skills to use data to improve your teaching? Explain why or why not?
Probe: What type of learning activities have you engaged in to help you use data to improve your teaching?
Probe: Do you feel teachers are supported in their use of data? Can you provide some examples?
6. Describe the data analysis process.
Probe: What is the protocol for looking at assessment information?
Probe: What are the strengths and weaknesses of this protocol?
Probe: How do you determine student learning problems?

Instructional Change

7. What do you do when data show students aren't learning a particular skill or concept?
 Probe: How does instruction change, and how do you decide exactly how it should change?
 Probe: Can you provide some specific examples of how you and other teachers in your school have changed the way they taught when data showed that students were not learning well? What did teaching look like before and after the change?
 Probe: In those examples, would you describe the changes in teaching as minor changes, moderate changes, or major changes? Why would you characterize the changes this way?
 Probe: In your examples, did learning improve? What criteria did you use to judge this?
8. Has analyzing data caused you to change your thinking about what constitutes good instruction? Why or why not?
9. Overall, if you were to rate the influence data analysis has on teaching in your school on scale of one to ten, how would you rate it if 1 means no change, 5 means moderate change, and 10 equals profound change?
 Probe: Explain why you chose this rating.

Leadership and Professional Learning

Transition: The next set of questions is about school leadership and your professional learning experiences.

10. What are your school's goals for school improvement, and how are they linked to data analysis?
 Probe: How does the administration communicate those goals?
 Probe: Do you feel all teachers are aware of and embrace those goals? Why or why not?
 Probe: How does the administration involve teachers in developing goals and leading instructional improvement efforts?
11. How does school leadership support teachers as they try to improve their teaching?
 Probe: How successful do you think the administration has been at establishing a culture where data use drives instructional improvement? Can you explain your assessment?
12. What is your idea of an effective professional development program?
 Probe: How would you characterize the quality of professional learning experiences your school provides? Why do you characterize them this way?
 Probe: What are some examples of professional development offerings your school provides?

Probe: Do you feel empowered by your professional learning experiences? In other words, do you feel the professional development you participate in provides you with the skills to improve your teaching? Can you provide some examples?

13. Is the professional development you participate in linked to achievement issues identified by data analysis? Please explain.
14. What role does collaboration play in teachers' professional learning?
Probe: How does your school promote and support collaboration?
Probe: Is your school a professional learning community? Can you provide some examples of why it is or why it is not? Or, if it is progressing, what are indicators of progress?
15. Is there anything thing else that that you think I should know that is important to understanding how your school uses data to improve teaching?

Thank you for your time.

Appendix B

Administrator Interview Protocol

Transition:

1. Greet the principal and thank him or her for allowing the interview.
2. Inform him or her about confidentiality. They are not required to participate in the interview. They may choose not to answer a certain question or all questions. They may stop the interview at any time.
3. Explain that the purpose of the interview is to discuss how the school uses data to inform instructional practice.
4. Let's begin by discussing your background.

Background

1. Describe your background as an educator and administrator.
 - Probe: What did you teach?
 - Probe: How long have you been an administrator?
 - Probe: How long have you been in your current position?
2. Why did you become an educator?
 - Probe: Why did you choose to become an administrator?
3. Describe your school and faculty.
 - Probe: What are its strengths and weaknesses?
 - Probe: What are the most pressing student learning needs, and how have you approached addressing them?

Data Analysis Process and Instructional Change

Transition: Let's talk about the data analysis process.

4. Do you feel data analysis is necessary for school improvement? Why or why not?
 - Probe: What types of data do you examine in your data meetings?
 - Probe: Why do you choose to examine those types of data?
 - Probe: How long does it typically take for you to get data for analysis? Is this timeframe quick enough for you to make the best use of the information?
5. Describe the data analysis process.
 - Probe: What is the protocol for looking at assessment information?
 - Probe: What are the strengths and weaknesses of this protocol?
 - Probe: How you determine student learning problems?
6. How do you ensure teachers know how to analyze data and use it to improve their teaching?
 - Probe: Can you provide some specific examples?

7. What do you do when data show students aren't learning a particular skill or concept?
 Probe: How does instruction change, and how do you decide exactly how it should change?
 Probe: Can you provide some specific examples of how teachers in your school have changed the way they teach when data showed that students were not learning well?
 Probe: In the example you described, what was your role in helping teachers change their practice? What did teaching look like before and after the change?
 Probe: In those examples, would you describe the changes in teaching as minor changes, moderate changes, or major changes? Why would you characterize the changes this way?
 Probe: In your examples, did learning improve? What criteria did you use to judge this?
 Probe: Do you think that participation in data analysis has changed you teachers' thinking about effective instruction?

Leadership and Professional Learning Capacity

Transition: The next set of questions relates specifically to your leadership of instructional improvement efforts.

8. Is your school culture receptive to data use? In other words, how would you describe the extent to which your staff embraces the use of assessment data as a way of deciding how to adapt their instruction?
 Probe: Can you provide some demonstrative examples?
 Probe: How do you establish a culture that views data as a valuable means of informing instruction?
 Probe: Generally, how do you go about the process of establishing a healthy school culture? By healthy, I am mean a culture that is focused on student learning, instructional improvement, and is characterized by collegial staff relations.
9. Although you may have alluded to this in earlier questions, can you state your school's overall approach to improving student achievement and improving teaching?
 Probe: How does this approach reflect your leadership style?
 Probe: What role do teachers play in goal setting and leading school improvement?
10. How do you link data analysis to school improvement objectives?
 Probe: Can you provide some specific examples?
 Probe: How do you know teachers at your school embrace school improvement objectives?
 Probe: How are these objectives established, and how do you communicate them?
11. . What is your idea of an effective professional development program?

- Probe: How would you characterize the quality of professional learning experiences your school provides? Why do you characterize them this way?
- Probe: What are some examples of professional development offerings your school provides?
- Probe: How do you link data analysis to professional development?
- Probe: Do teachers at your school feel empowered by their professional learning experiences? In other words, do they feel it provides them with the skills they need to competently improve instruction? How do you know?
12. What role does collaboration play in teachers' professional learning?
- Probe: How does your school promote and support collaboration?
- Probe: Is your school a professional learning community? Can you provide some examples of why it is or why it is not? Or, if it is progressing, what are indicators of progress?
13. How do you use your understanding of effective teaching to ensure that instruction changes in light of assessment data? In essence, how do you help teachers develop the skills and abilities to improve instruction?
- Probe: How do you support teachers who may be struggling to improve their teaching?
14. Is there anything else that that you think I should know that is important to understanding how your school uses data to improve teaching?

Thank you for your time.

Appendix C

Data Reporting Forms

Figure C1. Reading test matrix in tabular form (Redacted)

Reading Test Matrix - RTTFR0250

Current School Year: 2011
 School: _____
 Grade: _____

Lowest: Ethnicity:	Gender: Retained:	FRL Lunch: Std Curr:	A+ ESE: A+ ELL:	AYP SWD: AYP ELL:
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State Test	DIAG Fall	Student Number (Low 25)	Student Name	Cur Grd	Ret Nbr (P/R)	R/E (M/F)	FRL	A+ ESE	A+ ELL	AYP SWD	AYP ELL	Std Curr
1	1			1	H	Y	Y	Y	Y	Y	Y	N
				0	B	Y	N	N	N	N	N	Y
				0	B	Y	N	Y	N	Y	N	N
				1	W	Y	Y	N	Y	N	N	N
				1	B	Y	Y	N	Y	N	N	N
				1	B	Y	N	N	N	N	N	Y
				0	B	Y	N	Y	N	Y	N	N
				0	B	Y	N	N	N	N	N	Y
				0	B	Y	N	Y	N	Y	N	Y
				0	H	Y	N	Y	N	Y	N	Y
				0	H	Y	N	Y	N	Y	N	Y
				1	H	Y	N	Y	N	Y	N	Y
				0	B	Y	N	N	N	N	N	Y
				0	B	Y	N	N	N	N	N	Y
				2	B	Y	Y	Y	Y	Y	Y	N
2	2			1	B	Y	Y	Y	Y	Y	Y	N
				0	B	Y	N	N	N	N	N	Y
				0	B	Y	N	Y	N	Y	N	Y
				1	B	Y	Y	N	Y	N	N	N
				0	B	Y	N	N	N	N	N	Y
				1	B	Y	N	N	N	N	N	Y
				1	B	Y	N	N	N	N	N	Y
				2	B	Y	Y	N	Y	N	Y	N
				0	B	Y	N	Y	N	Y	N	Y
				0	H	Y	N	N	N	N	N	Y
				0	H	Y	N	Y	N	Y	N	Y
				2	H	Y	Y	Y	Y	Y	Y	N
				1	B	Y	Y	Y	Y	Y	Y	N
				0	H	Y	N	Y	N	Y	N	N
				0	B	Y	N	N	N	N	N	Y
3	3			1	H	Y	N	N	N	N	N	Y
				0	M	Y	Y	Y	Y	Y	Y	N
				1	B	Y	Y	N	Y	N	Y	N
				0	B	Y	N	N	N	N	N	Y
				1	H	Y	N	Y	N	Y	N	Y
				2	B	Y	N	N	N	N	N	Y
				0	B	Y	N	Y	N	Y	N	Y
				2	B	Y	N	N	N	N	N	Y
				1	B	Y	N	N	N	N	N	Y
				2	H	Y	N	N	N	N	Y	Y
				1	B	Y	Y	N	Y	N	Y	N
				1	H	Y	N	Y	N	Y	N	Y
				3	B	Y	N	N	N	N	N	Y
				0	H	Y	N	N	N	N	N	Y

Low 25: B R W	1 2 3 4 5	PIR Last Yr: R P P Ret Nbr: R # 0	Male Female
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Reading Test Matrix - RTTFR0250 Page 2 10/20/10

Reading Test Matrix - RTTFR0250

Current School Year: 2011
 School
 Grade: 04

Lowest:	Gender:	F/R Lunch:	A+ ESE:	AYP SWD:
Ethnicity:	Retained:	Std Curr :	A+ ELL:	AYP ELL:

State Test	DIAG Fall	Student Number (Low 25)	Student Name	Cur Grd	Ret Nbr (P/R)	R/E (M/F)	FRL	A+ ESE	A+ ELL	AYP SWD	AYP ELL	Std Curr
2	3			04	0	H	Y	N	N	N	N	Y
				04	0	B	Y	N	N	Y	N	Y
				04	0	H	Y	N	Y	N	Y	Y
				04	1	B	Y	N	N	N	N	Y
	1			04	0	H		N	N	N	N	Y
				04	1	B	Y	N	N	N	N	Y
				04	1	B	Y	Y	N	Y	N	N
	2			04	0	B	Y	N	N	N	N	Y
				04	0	B	Y	N	N	N	N	Y
				04	1	H	Y	N	N	N	N	Y
				04	0	B	Y	N	N	N	N	Y
				04	0	B	Y	N	N	N	N	Y
				04	2	H	Y	N	Y	N	Y	Y
				04	1	H	Y	N	N	N	N	Y
				04	0	H	Y	N	N	N	N	Y
				04	1	H	Y	Y	N	Y	N	N
				04	1	H	Y	N	N	N	N	Y
				04	0	B	Y	N	N	N	Y	Y
				04	0	H	Y	Y	Y	Y	Y	N
				04	0	H	Y	N	N	N	N	Y
				04	0	H	Y	N	N	N	N	Y
				04	2	B	Y	N	N	Y	N	Y
				04	2	H	Y	N	N	N	N	Y
				04	0	H	Y	N	N	N	Y	Y
				04	1	B	Y	N	N	N	N	Y
				04	0	B	Y	N	N	N	N	Y
				04	1	B	Y	N	N	N	N	Y
				04	0	B		N	N	N	N	Y
				04	0	B	Y	N	N	N	N	Y
				04	1	B	Y	N	N	N	Y	Y
				04	0	B	Y	N	N	N	N	Y
5	5			04	0	B	Y	N	N	N	N	Y

Figure C2. Reading test matrix with numerical representations (Redacted)

Reading Test Matrix - RTTFR0250

Current School Year: 2011
 School:
 Grade: 04

Lowest:	Gender:	F/R Lunch:	A+ ESE:	AYP SWD:
Ethnicity:	Retained:	Std Curr :	A+ ELL:	AYP ELL:

	1	2	3	4	5	
5					1	
4			5	4		1
3	3	4	10			
2	9	4	7			
1	29	5				1

DIAG Fall

Appendix D

Data Walls

Figure D1. Primary data wall form (Redacted)

Name: _____				Teacher: _____					
Date	F&P Inst Level	Retell	Date	PBW	Date	Oral Lang	Date	SRI	Notes:
									Services
									iii
									SBT
									RTI Tier 2
									RTI Tier 3
									Tutorial
									SES Tutorial
									Push-in
									PMP

Figure D2. Intermediate grades data wall form

Name: _____			
Teacher: _____			
	Reading	Services	Subgroups
State Test		iii	Economically Dis.
		SBT	Limited English Prof.
Winter		RTI Tier 2	Stu w/ Disabilities
Diag.		RTI Tier 3	Black
Fall		BGE Tutorial	Hispanic
Diag.		SES Tutorial	Asian
LY FCAT/		Push-in	American Indian
Diag.		PMP	White

Figure D3. Primary data wall

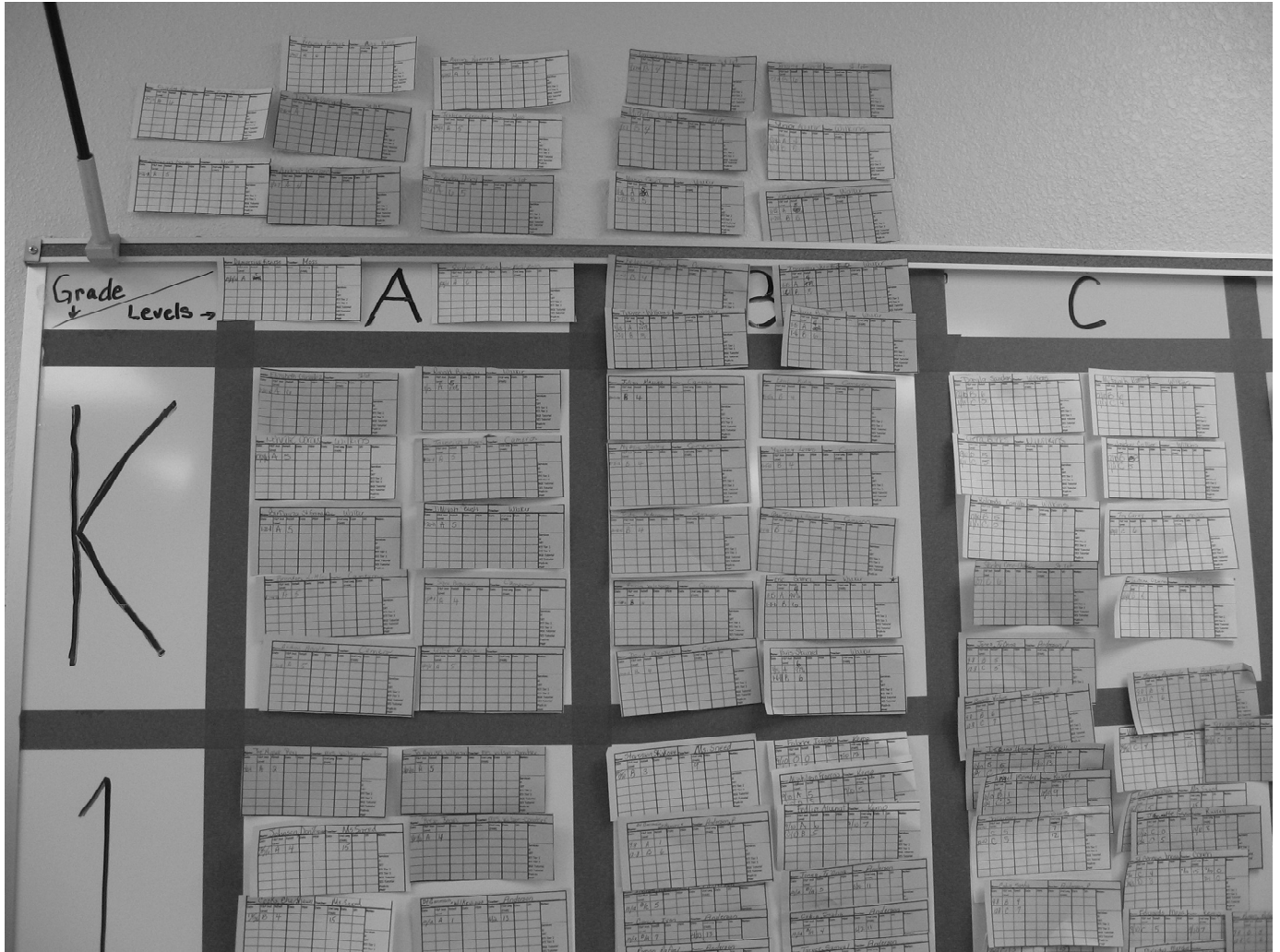


Figure D4: Intermediate data wall



Appendix E

Data Feedback Strategy Form

Figure E1. Recording form for Data Feedback Strategy (Redacted)

MATHEMATICS Diagnostic 1 : D-F-S Form (for 1 Grades 3-8)

School _____ Date: 10-12-10 Learning Team Facilitator: _____ Team/Grade Group: 5th

Reporting Categories	Algebra	Geometry and Measurement	Number and Operations	Data Analysis	Probability
Test Breakdown	3rd 4th 5th 6th 7th 8th 10% 15% 10% 40% 40% 40%	3rd 4th 5th 6th 7th 8th 30% 30% 30% 20% 30% 35%	3rd 4th 5th 6th 7th 8th 50% 55% 50% 30% 10% 10%	3rd 4th 5th 6th 7th 8th 10% X 10% 10% 10% 15%	3rd 4th 5th 6th 7th 8th X X X X 10% X
Total # of Questions	2	12	22	4	N/A
Total # for Each Teacher = OR > THAN 5%	0/0	5/2 <small>Dist Sch</small>	5/1 <small>Dist Sch</small>	2/1 <small>Dist Sch</small>	0/0 <small>Dist Sch</small>

District _____ School _____ Diagnostic # 5914 Reporting Category Number + Operations

<p>Questions at 51% or higher (Look for patterns of strength)</p> <p>20. MC L 59% (4% more than district)</p>	<p>Questions at 50% or lower (Look for CRITICAL patterns of weakness)</p> <p>School percent 20% and less</p> <table style="width: 100%;"> <tr> <td>8. GR M 1%</td> <td>23. GR M 15%</td> </tr> <tr> <td>15. GR M 0%</td> <td>24. GR M 20%</td> </tr> <tr> <td>16. GR M 5%</td> <td>30. MC M 18%</td> </tr> <tr> <td>17. MC M 20%</td> <td>31. GR M 11%</td> </tr> <tr> <td>19. MC M 11%</td> <td>37. MC M 15%</td> </tr> <tr> <td></td> <td>39. GR M 8%</td> </tr> </table>	8. GR M 1%	23. GR M 15%	15. GR M 0%	24. GR M 20%	16. GR M 5%	30. MC M 18%	17. MC M 20%	31. GR M 11%	19. MC M 11%	37. MC M 15%		39. GR M 8%
8. GR M 1%	23. GR M 15%												
15. GR M 0%	24. GR M 20%												
16. GR M 5%	30. MC M 18%												
17. MC M 20%	31. GR M 11%												
19. MC M 11%	37. MC M 15%												
	39. GR M 8%												

Strategies for corrective instruction/action plans:

Date and Agreed Upon Actions For Next Meeting: _____

Single School Culture © for ACADEMICS
Data-Feedback-Strategy Method

Appendix F

Informed Consent Form

Boston College Lynch School of Education
Informed Consent for Participation as a Subject in:
The Influence of Participation in Structured Data Analysis on Teachers' Instructional Practice
Investigator: Percy Napier
Adult Consent Form
Date Created: April 23, 2010

You are being asked to participate in a research study conducted by Percy Napier, a doctoral candidate in Educational Administration in the Lynch School of Education at Boston College. The research conducted for this study will be used in my dissertation. The purpose of the study is to understand how participation in structured data analysis influences teachers' instructional practices. In your district, structured data analysis takes the form of Learning Team meetings. You have been chosen to participate in this study because you work in a school that has a well-developed model for teachers to analyze data, and your experience with this model may provide a valuable contribution to this study. Approximately 10 educators from your school will participate in this study. I ask that you read this form and ask any questions that you may have before agreeing to be in the study.

If you agree to this participate in this study, it is asked that you participate in one interview and a possible follow-up interview. We will meet at a time and place that is convenient for you. During the interview, I will ask you about how your participation in structured data analysis has influenced your instructional practices. I anticipate that the interview will last 45 to 60 minutes. During the interview, I will take notes and record the conversation, with your permission. Potential benefits of participation in this study include the ability to contribute to research that seeks to improve how schools approach using data to improve instruction, and the opportunity to reflect on your practice. Feelings of discomfort that may arise from some of the questions are a potential risk. **The study may include risks that are unknown at this time.**

Your participation is voluntary and free of cost. There is no compensation for participation in this study. You are free to withdraw at any time for any reason. If you choose not to participate, it will not affect your current or future relations with the university or your employer. You may choose not to answer any or all questions, and you may choose to stop the interview at any time. There is no penalty or loss of benefits for not taking part or stopping your participation. You will be provided with any significant findings that may make you decide that you may want to stop participating. You will also have the opportunity to respond to sections of the draft research report that pertain to you via email or by phone.

The records of this study will be kept private. I will not use your name in the study, and I will not include any information that will make it possible to identify you or

the school in any published report. Research records will be kept in a locked file. All electronic information will be coded and secured in a password protected file, and all records will be destroyed at the conclusion of the study. However, although every effort will be made to ensure your identity is not revealed, confidentiality cannot be guaranteed. Access to study information will be limited to myself; however, please note that regulatory agencies, the Institutional Review Board, and internal Boston College auditors may review the research records. In addition, the results of this study may be presented in meetings or in published articles.

For further questions or more information concerning this research, you may contact me at napierpe@bc.edu or call me at (561) 985-4899. If you have any questions about your rights as a research subject, you may contact: Director, Office for Human Research Participant Protection at Boston College at (617) 552-4778, or irb@bc.edu. You will be given a copy of this form to keep for your records and for future reference.

Statement of Consent:

I have read (or have had read to me) the contents of this consent form and have been encouraged to ask questions. I give my consent to participate in this study. I have received (or will receive) a copy of this form.

Name (Print) _____

Signature: _____ Date _____

Email: _____

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