

Distributed leadership for equity and excellence in mathematics: An elementary school case study

by

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ABSTRACT

The need for schools to develop and implement actions that will clearly improve the academic performance of all children is of great importance. Schools face pressure to improve K-12 mathematics instruction to reach *all* students, regardless of economic, linguistic, or cultural background (NCSM, 2008, 2016). Supporting academic excellence and equity in school mathematics requires strong leadership (Blankstein & Noguera, 2015). Recognizing that leadership in a school does not fall on the shoulders of just one person (Spillane & Healey, 2010, p. 256), the purpose of this case study was to explore the “how” of leadership, specifically the leadership practices that get us to the “why” (e.g., equity) and “what” (e.g., leadership for excellence) of mathematics education. The overarching question driving this research was: “What are the leadership practices that are intended to promote equity and excellence in mathematics education?” Using Spillane, Halverson, & Diamond’s Distributed Leadership Perspective (2004), the goal was to understand the respective distributed roles teachers and other individuals took in the process of achieving equity and excellence in mathematics at one elementary school. Formal (e.g., Head of School, Central Office Administrator) and Informal (e.g., teachers and parents) leaders were interviewed and observed. Data analysis focused on identifying the macro-functions (e.g., overall leadership practices) and micro-tasks (e.g., day-to-day, short-term tasks) that leaders engaged in to promote equity and excellence. Leadership practices were focused in three areas: Supporting the Teaching/Learning of all Students; Supporting the Teaching of Diverse Students; and Parent/Family Connection. Five primary categories of leadership practices were identified: Relationship, Instruction Support, School Climate, and Parent Involvement.

Despite the importance of family engagement, teachers faced challenges communicating to parents, getting them to help with homework, etc. Efforts should be made to support and involve parents in school more broadly, beyond just helping with homework. Second, there needs to be a shift in the view of a top-down approach and reliance only on formal leaders to lead the work of mathematics teaching and learning. Rather, leadership needs to be widely distributed and incorporate the input of multiple individuals who alternately lead and follow depending on the situation. Finally, leaders need to continue to take into account the situation and background of their students as they build relationships and differentiate instruction to best meet the needs of their students. These, along with other practices, will get us to the *how* of leadership (actions, interactions, etc.) to enhance students' mathematics learning for equity and excellence.

CHAPTER 1. INTRODUCTION

“Excellence in mathematics education requires equity—high expectations and strong support for all students” (National Council of Teachers of Mathematics [NCTM], 2000, p. 12).

Equity and excellence in mathematics should go hand-in-hand, “...to *truly honor excellence, we need to embrace equity*” (Brown, Benkovitz, Muttillio, & Urban, 2011, p. 58). However, these concepts are often conflicting in both policy and practice.

There are broad calls for equity and excellence related reforms (National Council of Supervisors of Mathematics [NCSM], 2008; Association of Mathematics Teacher Educators [AMTE], 2015; National Council of Supervisors of Mathematics & TODOS: Mathematics For All [NCSM –TODOS], National Council of Teachers of Mathematics [NCTM], 2016). Many policies do not result in effective learning practices for each and every student for a variety of reasons. Different abstract definitions abound for equity and excellence. Reviewing these terms for this study involved bringing the abstract and concrete definitions and their meanings together.

Defining Excellence and Equity in Mathematics Education

Excellence

To achieve excellence a definition of the term requires consensus and agreement. Several models of excellence exist in schools today. For example, Sternberg (2008) presents four models commonly operating in schools. These include schools that were using the No Child Left Behind (NCLB) definition of excellence, and focusing their

resources on reading and mathematics to ensure students performing in the bottom half of their class at least satisfy the required minimum level of competency standards. The second model looks only at students in the top half. The third model reviews students in the middle, while the fourth model only looks at the statistical average scores with detailed newspaper analysis to compare local schools and districts with one another.

Unlike the NCLB definitions, excellence can be defined in terms of access to and quality of the instruction available to all students. In their book “Achieving Excellence Through Equity for Every Student” Blainstein and Noguera (2016) define equity as “a commitment to ensure that every student receives what he or she needs to succeed” (p. 3). Similarly, provisions in the new federal education law, the *Every Student Succeed Act* (ESSA)’s define accountability, data reporting, consolidated state plans that include and reflect equity and excellence to help ensure success for students and schools. More specifically, it “gives states and districts the opportunity to move beyond No Child Left Behind’s reliance on a limited range of metrics and punitive “pass/fail” labels for schools, and use their planning and accountability processes to re-imagine and redefine what a high-quality education should mean for their students.” (ESSA, 2015).

Excellence in mathematics focuses on the quality or rigor of the content, pedagogy, and the effects of equitable teaching and learning. Excellence in this study refers to the intersection between the practices that allow for students understanding and continuing factors that afford opportunities for all students to achieve individual success or new levels of achievement (e.g., expectations, standards, etc.).

Equity

Equity can be a loaded term for many people, abstract for others, misunderstood by many and even perceived as not content-specific by some. Discussions of “equity” can be difficult because it is operationalized, utilized and understood in a variety of ways, based on different people, situations and environments. It would be naïve to think equity is a simple, self-evident, or straightforward matter addressed without reflection and interpretation or robust dialogue and debate. Due consideration is needed of history and theory, narrative, expository knowledge and an understanding of the disciplinary bases and assumptions of different educational sciences (Luke, Green, & Kelly, 2010). The goal in mathematics education is to promote equitable opportunities and outcomes for students. According to Gutierrez (2007), this assumes neither equal approaches nor equal outcomes. Rather, the outcomes are impartial, given “the natural variation between students in terms of strengths and interests, between females, males, those in poverty, middle class, rich, first Nations, Anglos, Blacks, Chinese, and so on” (p. 41).

The distinction between equality and equity is necessary to understand how I dealt with equity in mathematics in the current study. For the purpose of this study, equity will be defined based on the following premise:

All students regardless of their personal characteristics, background, or physical challenges, must have opportunities to study—and support to learn—mathematics...equity does not mean that every student should receive identical instruction; instead, it demands that reasonable and appropriate accommodations

be made as needed to promote access and attainment for all students.... equity requires high expectations and worthwhile opportunities for all; accommodating differences to help everyone learn mathematics; resources and support for all classrooms and all students (NCTM, 2000, pp. 12-13).

In the United States, as well as globally, mathematics is a very important aspect of the elementary school curriculum. In chapter one of their recent book, *The Impact of Identity in K–8 Mathematics Learning and Teaching: Rethinking Equity-Based Practices*, Aguirre, Mayfield-Ingram, and Martin (2013) remind readers of the importance of mathematics, stating “school mathematics simultaneously serves as gateway and gatekeeper for various opportunities in and out of school” (p. 5). Other studies confirmed the gatekeeping role mathematics play (e.g., Martin, Gholson, & Leonard, 2011; Moses & Cobb, 2001). Furthermore, mathematics education at the elementary school level provides the foundation and building blocks for future schooling (i.e., middle school and beyond) and participation in society (Gutierrez & Rogoff, 2003; Martin, 2003; Tate & Rousseau, 2002). Keeping equity and excellence at the center of “the increasingly popular *Mathematics for All* rhetoric” (Martin, 2003, p. 7) in mathematics education is an important area for research, since equity is the first and guiding principle of “Principles and Standards for School Mathematics” (NCTM, 2000). This means ensuring that all students are successful in learning mathematics. Ideally, students would have access to the same quality of mathematics education, regardless of their ethnic, cultural, and linguistic backgrounds (Martin, 2012; NCSM, 2008; NCTM, 2000; Tate, 1995a; 1996);

and regardless of their classroom teacher, school, or state in which they reside. In reality, this is not the case.

Leadership for Excellence and Equity

Promoting and supporting both academic excellence and equity for all students in school mathematics, in part, requires strong leadership (Blankstein & Noguera, 2015). In a study entitled, “Leading Schools for Excellence and Equity...,” Benkovitz, Muttillio, and Urban (2011) asserted:

...in schools where principals support, model, and monitor a teamwork approach, a balanced approach, a strong sense of purpose, and an insistent disposition to assure that all students are served well and that all are encouraged to perform at their highest level, the outcomes of interest are better. (p. 3)

Although this quote initially highlights and speaks singularly about leadership and equity, it also reinforces the importance of leadership by multiple individuals (i.e., a team approach) who insist on high expectations for students as espoused by the current research study. Understanding how mathematics leadership for equity and excellence is distributed throughout an elementary school can play a critical role to inform and ensure better mathematics education for all students. Without equity you can’t have excellence and you can’t have excellence without equity. Although the two terms are different they are intertwined. Sternberg (2008) persuasively argued, “we need to educate students not merely prepare them for tests” (p. 19), reflecting both excellence and equity. I argue that equity is a component of excellence. Equity and excellence together help strengthen and ensure students have an opportunity at mathematical success.

Background of the Problem

Over the past decade, there have been national, state, and local calls for improvement in students' mathematics performance and global competitiveness in the 21st Century (Atkins et al., 2010; National Council of Supervisors of Mathematics (NCSM), 2014; National Governors Association, 2010). Yet, results of large-scale international and national assessments reveal continuously low performance and low interest in mathematics by students in the United States (ACT 2016; Boaler, 2009; Glenn, 2000). Moreover, trends in the Mathematics and Science Study that was part of the "Third International Mathematics and Science Studies" (TIMSS) study as well as the TIMSS Advanced 2015 show slight stagnation on fourth-grade scores. This confirms Schoenfeld's (2002) reported results from TIMSS indicating American students continued to trail peers in many other countries. Furthermore, a study by Peterson, Woessmann, Hanushek, and Lastra-Anadón (2011) reported that only 32% of 8th-graders in public and private schools in the United States scored at the proficient level in mathematics. Hanushek, Peterson, and Woessmann (2010) also found the U.S. lacking behind 30 other countries, with only 6% of students performing at the advanced level in mathematics. Among all 65 participating countries, 23 had higher average scores than the United States. Similarly, using the Programme for International Student Assessment (PISA, 2009), the U.S. average score of 487 was lower than the Organization for Economic Co-operation and Development (OECD) average score of 496. Seventeen of 34 OECD countries had higher average scores than the U.S., and the U.S. ranked 18th in

mathematics literacy (along with 12 other OECD countries. It details average scores of 15-year-old students by country on a mathematics literacy scale (OECD, 2009).

According to the National Council of Teachers of Mathematics (2017), these international statistics and results continued to illustrate the need to prepare students for the increasingly complex mathematics of this century beginning in the elementary grades. This information also raised questions about how well schools are preparing all students for future success, such as the challenges of college or well-paying jobs. Domestically, leadership literature states schools should raise the educational bar to higher standards and graduate more students ready for college and a career in the current globally competitive economy (Hanushek, Peterson, & Woessmann, 2012). According to a study conducted by ACT (2013), “only 26% of American High School Students are ready for college-level coursework” (p. 1), and only 5% of African American students met all four readiness benchmarks (i.e., English, reading, mathematics and science). ACT reports, “none of the Benchmarks were met by 50% or more of African American, American Indian, or Hispanic students” (p. 5). While 26% met the ACT College Readiness Benchmark in all subjects, only 44% met the mathematics benchmark. According to President Barack Obama, “If we want America to lead in the 21st century, nothing is more important than giving everyone the best education possible — from the day they start preschool to the day they start their career.” (personal communication, August 18, 2012).

In addition to not being prepared for college, too many students are also not proficient in mathematics (ACT, 2013; Mathematics Study Panel, 2008; National Center

for Education RAND OECD, 2009; Peterson, Woessmann, Hanushek, & Lastra-Anadón, 2011; U.S. Department of Education, 2000). Data from the National Assessment of Educational Progress (NAEP, 2015) showed a decline from the all-time high score in 2013 for fourth-grade mathematics achievement. The NAEP 2015 report states only 40% of 4th graders and 33% of 8th grade students perform at the proficient level or above in math. As a nation, compared to 2013, scores in 2015 decreased in 30 states. Furthermore, in addition to the cross-national underperformance in mathematics, research studies revealed that disparities exist in the achievement and persistence in math within subgroups like African American, Latino/a, Native American, and low-income students (Flores, 2007; Ladson-Billings, 2006; Lee, 2002; Martin, 2009; Martin, Franco & Mayfield-Ingram, 2003; Schoenfeld, 2002; Tate, 1997).

While the US is not performing well overall, the case for Iowa, where the current study was conducted, may be considered more negative.. Iowa topped the list of states in 1992 on the NAEP, but now finds itself in the middle—trailing many other states in student achievement (Iowa Department of Education, 2012). For states like Iowa, “demographic changes present considerable challenges to Iowa and its education system” as evident by the changing percentage in minority enrollment over the past 17 years (Iowa Department of Education 2011 Report, 2012, p. 21). Table 1 presents the minority enrollment changes in Iowa since 2000.

Table 1

Iowa's Public School K-12 Minority Enrollments

Years	Number of Students	Percentage
2000 - 2008	46,250	9.7%
2009 - 2010	82,679	17.6%
2010 – 2011	86,512	18.5%
2011 - 2012	90,673	19.3%
2012 – 2013	95,370	20.2%
2013 – 2014	100,151	21.1%
2014 – 2015	104,052	21.8%
2015 - 2016	108,345	22.6%

Note. Adapted from the respective Iowa Annual Condition of Education reports 2000-2016.

Between 2000- and the present, Iowa's schools saw "increases in the number of students who come from diverse backgrounds, live in poverty, and do not speak English as their first language" (Iowa Department of Education 2000-2016 Reports), but did not have the needed resources to meet the diverse needs for these students. As recent as January 2017, Iowa saw a 12 % increase in racial or ethnic minority students over the past 16 years, such that 22.6 % of Iowa students were members of a racial or ethnic minority group. This increasing diversity has posed both a challenge for teaching and presented an opportunity to impact learning outcomes.

The Iowa Department of Education (2012) further reported, “students whose first language is not English, have special needs, or come from a low-income background perform significantly behind their peers who do not face similar challenges” (p. 4). Further, the report continued by stating that Iowa’s schools, “both urban and rural, have increasing numbers of students who face these potential obstacles to learning” (p. 4). The disparities are sometimes intensified by learners with multiple needs, impacting student achievement, performance, and school experiences.

Iowa’s Blue Print for Education (2011) and the Iowa Department of Education’s 2011 report (2012) “Rising to Greatness: An Imperative for Improving Iowa’s Schools,” documented Iowa’s stagnation in mathematics and reading proficiency compared to other states and nations. Iowa’s report aligned with literature pertaining to factors that contributed to the persistent gaps in mathematics achievement, and mirrors shifting demographics in local schools and schools in other parts of the nation. This situation begs for attention to equity and excellence in mathematics, particularly an understanding of how particular leadership practices can support equity and excellence in the classroom.

The Problem

Researchers, policy debates, and documents have reiterated the need for schools to develop and implement actions that will clearly improve the academic performance of all children. Schools face pressure to improve K-12 mathematics instruction to reach *all* students, regardless of economic, linguistic, or cultural background (NCSM, 2008). The No Child Left Behind Act of 2001 reinforced the mandate for schools to educate all students. The most recent Elementary and Secondary Education Act (ESEA)

reauthorization of March 13, 2010, not only required schools to educate all students, but went a step further to expand this requirement ensuring greater equity and opportunity for all students. Mathematics content can be learned in any number of ways under any number of circumstances. However, without equity, some students do not have access to mathematical understanding. Despite the continuous state and federal mathematics mandates for all as well as the casting of a greater vision of mathematics for each and every students by mathematics professional organizations like the National Council of Teachers of Mathematics (NCTM), National Council of Supervisors of Mathematics (NCSM), Achieve the Core, and YouCubed, a large amount of data has clearly proven “students from some groups are not learning as much as students from other groups” (Flores, 2007, p. 32). Policy documents, researchers, schools, education systems, and mathematics education leaders continue to face challenges and expressed concerns about disparities between the performance of minority and non-minority students across the nation on a number of educational measures (Brown & Benkovitz, 2009; Brown, Benkovitz, Mutillo, & Urban, 2010; Zhao, 2009). Disparities in mathematics achievement across different demographic groups are well documented. According to the National Center for Educational Statistics (NCES, 2015) the disparity gap is approximately 25 points, consistent over the last decade with little improvement (Bohrnstedt, Kitmitto, Ogut, Sherman, & Chan, 2015; DiME, 2007; Flores, 2007).

Some researchers cautioned against inherent biases in the standardized measures used to report mathematics achievement, as some of these measures focus on what a student has achieved and nothing about what a student *can* do (Stiggins, Arter, Chappuis,

& Chappuis, 2007). It resulted in more attention being directed at gaps, or what Gutiérrez (2008) referred to as "gap gazing" rather than focusing on students' strengths, changing social structures operating in society, and highlighting social relations in which students are engaged (Gutierrez & Dixon-Roman, 2011; Martin, 2010). To make progress to improve student achievement, some researchers suggested mathematics education leaders needed to reframe their understandings of these inequities from an "achievement gap" (Ladson-Billings, 2006) perspective to an "opportunity gap" frame (Flores, 2007; Hilliard, 2003). This reframing implied a need to shift from assessing what an individual student knows to discerning what she or he has an opportunity to learn within classroom mathematical practices (Greeno & Gresalfi, 2006), and included the enactment of mathematical content within a classroom culture to afford particular opportunities for engaging with mathematical practices and ideas (DiME, 2007). Reframing was not just the result of research in mathematics education showing content and pedagogy matters in mathematics education, but also what was happening in terms of equitable teaching and learning. Equitable practices were a part of pedagogy, however it was not just about rigorous content and/or good teaching strategies. Rather, it was about looking at both through an equity lens.

Attention to equity and excellence related issues required not only the effort of both formal and informal mathematics leaders and other stakeholders in schools (e.g., parents, community members, and marginalized students), but also an understanding of the leadership practices leaders engage in that are intended to promote equity and excellence in mathematics. This was important because documented research revealed

“it takes more than mathematics subject matter knowledge and pedagogical knowledge to do the kind of work necessary to be successful in urban and high poverty schools” (Milner, 2013, p. 348). However, research on the “how” of leadership, namely .how leadership practices can be used to support and ensure equity and excellence in mathematics, is limited. Recent research by Spillane and colleagues has begun to examine leadership practices from a distributed leadership theory perspective (Spillane, Halverson, & Diamond, 2004).

Purpose of the Study

Disparities in students' mathematics achievement scores have been well documented in literature. Recent emphases on equity have been outlined by the National Council of Teachers of Mathematics (NCTM), which represents the “why” by providing standards related to equity (why-establishes the need). The NCSM PRIME Leadership Framework outlined the “what” that leaders are pursuing (e.g., addressing gaps, providing opportunities for all, etc.) and that leadership for excellence is one solution. We know the why and what, but the purpose is to explore ways to get us to the how. Therefore, the main purpose of this case study was to explore the “how” of leadership, specifically how leadership gets us to the “why” (e.g., equity) and “what” (e.g., leadership for excellence). To do this, the current study focused on one particular elementary school to see how leaders navigated incredibly diverse classroom/teaching for equity and excellence. Using Spillane et al's (2004) “Distributed Leadership Perspective” as a lens (e.g., conceptual framework), I recognized leadership in a school does not fall on the shoulders of just one person. Rather, it “can involve multiple individuals”

(Spillane & Healey, 2010, p. 256). This study explored and worked to better understand what leadership practices leaders engage in that promote equity and excellence in mathematics.

Research Question

The overarching question driving this research was: “What are the leadership practices that are intended to promote equity and excellence?” In order to address this question in the current study, the unit of analysis was the distribution of leadership in a highly diverse Midwest school as it pertained to mathematics. The goal was to understand the respective distributed roles teachers and other individuals took in the process of achieving equity and excellence in mathematics at one elementary school. A 360-degree approach (Brookes, 2007), including interview questions, observations, and document analysis, was utilized as the methods of inquiry. The purpose was to gain a deeper understanding of the perspectives of formal and informal leaders, parents, and a community regarding mathematics leadership for equity and excellence.

Conceptual Framework

The conceptual framework is based on “why” and “what” is needed to shift the focus to ensuring equitable opportunities and practices that promote equity and excellence. Two policy documents helped establish this need. These policy documents were the National Council of Teachers of Mathematics Equity Principle (NCTM, 2000), which provides standards related to equity, and the National Council of Supervisors of Mathematics’ principles and indicators of mathematics education leadership (NCSM PRIME Leadership Framework, 2008), which is about leadership for equity. These

frameworks identify leaders as more than a singular leader in the form of the principal or other formal position. Additionally, it outlines the "what" that leaders are pursuing (e.g. addressing gaps, providing opportunities for all students), but it does not describe the "how". Figure 1 is a depiction of the conceptualization of the frameworks further expanded on in Chapter 2.

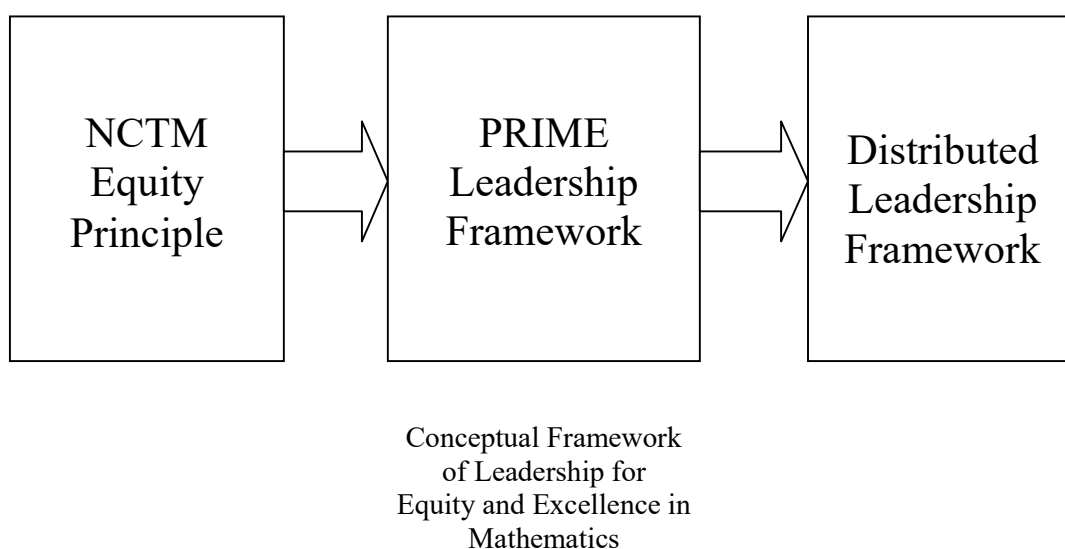


Figure 1. Conceptualization of equity and excellence for mathematics.

A distributed perspective of leadership (Spillane, Halverson, & Diamond, 2004; Spillane, 2006) provided the research theoretical perspective. Specifically, it outlines the “how” of leadership for equity and excellence. It is not a prescription for how to lead but rather a way to look at leadership practice. The distributed leadership perspective allows

for a better understanding (and identification) of the leadership practices that all stakeholders (e.g., teachers, parents, coaches, etc.) engage in that are intended to promote equity and excellence. Used alone, the NCTM and PRIME leadership frameworks do not fully address or capture the full understanding (e.g., major challenges, gaps and workings) of leadership practices for equity and excellence in schools and classrooms. However, when used together to understand the “why”, “what” and “how” of leadership, these frameworks are informative and appropriate.

The main components of the distributed leadership framework are the interactions of leaders, followers, and elements of the situation. Leadership is no longer viewed solely as a position or formally (Harris & Spillane, 2008; Spillane, 2005), rather leadership happens in a variety of ways throughout a school as interactions between people and their situations (Spillane, 2008). In order to study leadership practices, this study looked at the interplay between leaders, followers, and elements of the situation.

Methodology

This study used an interpretive qualitative case study research design. The 360-degree approach (Brookes, 2007) began with document analysis, followed by interviews, and observations as the method of inquiry. All data were collected from one site in the Midwestern United States. Purposive sampling was used to select 18 participants for interviews, such that ten teachers, three coaches, three parents and two administrators were interviewed. Classroom observations were conducted in eight of the ten classrooms, and planning meetings were observed during the duration of the study. Finally, various

documents (e.g., mission and/or vision statements from the district and school's websites) were collected for review.

Significance of the Study

In 1963, Jerome Bruner drew attention to the need for extraordinary measures in education to honor the diversity of students in schools and to offer quality education. He called for a recasting of knowledge about teaching and learning, making schools inviting and stimulating places for *all* young people. He contended “the construction of curricula proceeds in a world where changing social, cultural, and political conditions continually alter the surroundings and the goals of schools and their students” (p. 8). The changing world Bruner described in 1963 is more evident today both nationally and locally.

In the context of the United States educational system, student diversity varied in schools and classrooms. In general, the challenge was to ensure all students had an opportunity to pursue a quality education. In particular, the challenge was access to equitable and excellent mathematics education. In 1992, the National Council of Teachers of Mathematics accentuated teaching mathematics in a post-industrial society in a manner that equipped citizens with the mathematical competency to understand technology in the workplace, thereby enabling them to be competitive at the international level. Furthermore, Schoenfeld (2002) reminded us, “to fail children in mathematics or to let mathematics fail them is to close off an important means of access to society's resources” (p. 13). At the national and state levels, the aforementioned challenges coalesced with the publication of the Common Core State Standards (CCSS), and changed both the context and the urgency for strong mathematics education leadership.

As a result, there was a need to better understand the distribution of leadership for equity and excellence in schools as those responsible for mathematics teaching and learning (formal and informal leaders) faced additional pressures to improve K-12 mathematics instruction that reached *all* students, regardless of economic, linguistic, or cultural background.

This study provided information schools could use to make strategic decisions about equity and excellence, i.e., improving mathematics teaching and learning for all students. Through richly described accounts of how leadership is distributed, this study made several key contributions towards advancing the existing body of knowledge-educational research regarding the distributed roles a teacher or other individual took on in the process of achieving equity and excellence in mathematics and implications for policy and classroom/school practice. First, this study examined, and described the enactment of mathematics leadership by multiple individuals beyond formal leadership positions or designated roles for the purpose of erasing inequities in student learning, which provided each student opportunities to succeed. Second, the results of this study added to the body of research in the areas of school mathematics leadership, elementary school mathematics education, and school improvement regarding equity and excellence. The goals were to examine how diverse stakeholders (formal and informal leaders, parents, community members, and students) defined mathematics leadership for equity and excellence, how particular leadership practices supported equity and excellence, and how particular leadership practices were perceived as supporting or constraining equity and excellence.

This study further added to the extant literature on the topic of mathematics leadership through new insights into data collected as well as methodology (using the new conceptual framework in Figure 1 for analysis) to define leadership practices for equity and excellence. This study's findings helped move the discussions of equity and access from broad principles to specific leadership practices that resulted in equitable teaching and learning, and made visible the brilliance of all students (Martin, 2009).

Definition of Acronyms and Terms

The following are definitions of key terms utilized in this study.

Distributed leadership. This term denotes a theoretical perspective on leadership practice (Spillane, 2006; Spillane, Halverson, & Diamond, 2001; 2004). It is a leadership practice that allows the possibility of people without any formal leadership designations to take part in this work. Distributed Leadership comprises dynamic interactions between multiple leaders and followers. Within this leadership practice, “decisions about who leads and who follows are dictated by the task or problem situation, not necessarily by where one sits in the hierarchy” (Copland, 2003, p. 378). Spillane, Halverson & Diamond (2004) refer to this distribution as being stretched over people in different roles and places (meaning their situation, including the material artifacts, tools, and organizational structures).

Diverse Learners. Diversity can come in the form of language, culture, race, gender, socioeconomic status, and ways of learning and thinking, as well as cognitive and emotional characteristics (Malloy, 2009). The use of the term *diverse learners* here

refers primarily to differences in culture, including social class, race, ethnicity, and language. Thus, throughout this study *diverse student learners* includes students from racially, ethnically, culturally, and linguistically diverse families and communities, or using nomenclature also found in the literature, “students of color,” “culturally and linguistically diverse students,” and “students from low-income families.”

English language learner (ELL). ELL describes an individual who speaks one or more languages other than English as the first language, and who either lacks or is in the early stages of developing proficiency in English (Center for Research on Education, Diversity & Excellence, n.d.).

Equity. According to the Webster’s online dictionary, equity is defined as “the state, quality, or ideal of being just, impartial, and fair.” “Equity” – quality of being fair and impartial – NOT the same as equal. However, equity is not the same as equality. In the mathematics education literature, equity is complex with varied definitions. In this study, equity is defined based on NCTM’s equity principle which asserts that ALL students regardless of their personal characteristics, background, or physical challenges, must have opportunities to study—and support to learn—mathematics...equity does not mean that every student should receive identical instruction; instead, it demands that reasonable and appropriate accommodations be made as needed to promote access and attainment for all students

Excellence. “*Excellence in mathematics education requires equity—high expectations and strong support for all students*” (NCTM, 2000, p. 12). *Excellence* refers to the intersection between practices allowing for an understanding of students and

factors that continue to afford opportunities for all students to achieve individual success or levels of achievement (expectations, standards, etc.).

Formal Mathematics Leader. An individual with a leadership role in mathematics teaching and learning in elementary schools (Balka et al., 2010; NCSM, 2008).

Informal Mathematics Leader. An individual who provides instruction in mathematics for some part of the school day (e.g., elementary school generalist, an elementary school teacher specializing in mathematics, who serves as a math coach, as well as the elementary teacher who may assume a single leadership role during a mathematics lesson, unit, weekly, team, or other planning meeting, are all persons whose teaching quality is of interest—and of consequence—to mathematics the school).

Macro-Functions. These key functions are the large-scale tasks around which school leaders organize their practice. For example, examples of macro-functions include building a school vision, promoting teacher professional development, improving test scores, etc. (Spillane, Halverson, & Diamond, 2001).

Micro-tasks. Micro-tasks are the short-term tasks that leaders execute in order to accomplish macro-functions. Micro-tasks include such practices as observing classrooms and facilitating grade level meetings. “It is essential to identify these micro- tasks because it is through studying the execution of these tasks that we can begin to analyze the *how* as distinct from the *what* of school leadership” (Spillane, Halverson, & Diamond, 2001, p.24, italics in original).

Organization for Economic Co-operation and Development (OECD). This international body was established in 1961 “to promote policies that improve the economic and social well-being of people around the world” by providing “a forum in which governments can work together to share experiences and seek solutions to common problems,” (OECD, 2009).

Programme for International Student Assessment (PISA). An internationally agreed upon common assessment framework with key competencies in reading, mathematics, and science created in 1997 to monitor the outcomes of education systems in terms of student achievement in OECD member countries. For example, the PISA 2009 “standardized assessment jointly developed by participating countries” used “to measure how well students, at age 15, are prepared to meet the challenges they may encounter in future life” (OECD, 2009, p. 10).

Situation. Within Distributed Leadership Theory, leadership practices are “situated” within an “interactive web of actors, artifacts, and situation” (Spillane, Halverson, & Diamond, 2004, p. 20.). It is the sociocultural context within which leadership practices occur. The situation can be comprised of social aspects, history, culture, and the physical environment. Aspects of the situation can include tools and routines within the environment.

Organization of the Study

Chapter 1 presented an introduction, background of the problem, statement of the problem, purpose of the study, question to be answered, significance of the study, a brief description of the methodology, research design and the definitions of terms.

Chapter 2 reviews relevant literature. It addressed the following topics: general leadership; equity; excellence; background to mathematics education in a diverse/urban School and changing world; the practices and nature of mathematics leadership at the elementary school level; inequities in mathematics learning and achievement for all students, equity and excellence in mathematics, including specific policies and related standards that frame mathematics teaching and learning for all students; the role of leadership for equity and excellence in mathematics; and a distributed perspective to leadership and practice.

Chapter 3 presents the methodology used in the study, including the research design; population and procedure; and the instruments and their selection or development, together with information on validity and reliability. Each of these sections concluded with a rationale, including strengths and limitations of the design elements. This chapter also described the procedures for data collection and the plan for data analysis.

Chapter 4 presents the results of the study, while Chapter 5 discusses and analyzes the results, culminating in conclusions and recommendations for practice and future research.

CHAPTER 2. REVIEW OF LITERATURE

In this chapter, I draw from literature across multiple disciplines to develop and support a theory for the relationship between equity, excellence and leadership. I begin the chapter with definitions and background related to equity and excellence in mathematics, the importance of equity and excellence to education, and the current state of the issue. I then use the literature to define leadership in general, discuss the nature/role of leadership for mathematics education, and make the case for the potential of leadership to impact equity and excellence in mathematics. The final section of the literature review connects and develops the need for a distributed perspective of leadership, which draws on a combination of existing research in psychology, anthropology, sociology, cognitive theories and mathematics education to justify why the distributed perspective might serve as a foundation for examining leadership related to equity and excellence in mathematics.

Disparities in mathematics achievement across different demographic groups are well documented. According to the National Center for Educational Statistics (NCES, 2015) the disparity/gap is approximately 25 points, consistent over the last decade with little improvement across the years (Bohrnstedt, Kitmitto, Ogut, Sherman, & Chan, 2015; DiME, 2007; Flores, 2007). Yet, there is limited research examining (or a limited understanding of) leadership practices intended to promote equity and excellence in regards to mathematics – a discipline considered a gatekeeper, opening and closing access to higher level mathematics as well as future economic success (Berry, 2008;

DiME, 2007; Gutierrez, 2000, 2008; Gutstein, 2003; Leonard, 2008, 2009; Martin, 2009a, 2009b, 2010; Martin, Gholson, & Leonard, 2010; Stinson, 2009; Tate, 1995).

As reminder and for the purpose of this study, equity is defined based on the following premise:

All students regardless of their personal characteristics, background, or physical challenges, must have opportunities to study—and support to learn—mathematics...equity does not mean that every student should receive identical instruction; instead, it demands that reasonable and appropriate accommodations be made as needed to promote access and attainment for all students.... equity requires high expectations and worthwhile opportunities for all; accommodating differences to help everyone learn mathematics; resources and support for all classrooms and all students (NCTM, 2000, pp. 12-13).

Excellence can be defined in terms of access to, and quality of the instruction available to all students.

Equity and Excellence in Mathematics

NCTM (2008) first defined equity and excellence together as related concepts in a position statement entitled, *Equity in Mathematics Education*. In part, it read as follows:

Excellence in mathematics education rests on equity—high expectations, respect, understanding, and strong support for all students. Policies, practices, attitudes, and beliefs related to mathematics teaching and learning must be assessed continually to ensure that all students have equal access to the resources with the

greatest potential to promote learning. A culture of equity maximizes the learning potential of all students (p.12).

Typically, the word “excellence” is mentioned or used but not defined in detail.

Successfully meeting the goals of equitable teaching and learning continued to be elusive in mathematics education, for more than two decades following the creation of the *Curriculum and Evaluation Standards for Schools Mathematics* (NCTM, 1989) and updated standards including the *Principles and Standards for School Mathematics* (Barnes, 2006; Darling-Hammond, Hammerness, Grossman, Rust, & Shulman, 2005; Gutierrez, 2007; Molloy, 2004; NCSM, 2008; NCTM, 2000). Mathematics education leaders sought to develop improved pedagogical approaches to the teaching of mathematics, beginning with the National Council of Teachers of Mathematics post world-war plan (NCTM, 1944). More recently, the Curriculum and Evaluation Standards for School Mathematics (NCTM, 1989), Principles and Standards for School Mathematics (NCTM, 1991, 1995, & 2000), Curriculum Focal Points (2006) and the Common Core State Standards by the National Governors Association Center for Best Practices, Council of Chief State School Officers (2010), added to these efforts.

During the last three decades, researchers focused on ways to reform schools to reflect education in a democratic society aimed at helping students acquire knowledge, attitudes, and necessary skills to become productive workers. These reforms developed commitment, attitudes, and skills aimed at making the world a just place in which to live and work (e.g., Gutstein, 2009; Ladson-Billings, 2006). Specifically in the field of

mathematics education, significant attention was directed to equity in the last few years due to the following factors:

- Increased diversity in students' mathematics thinking and learning (Gutierrez, 2007);
- Continued diversity in achievement levels as well as significant numbers of students with limited opportunities participating fully in mathematics (Molloy, 2004);
- An increase in culturally diverse public school's student populations (Barnes, 2006);
- A teaching force that remains mostly homogeneous—predominantly white, female, and middle-class (Epstein, 2005; Howard, 1999; Hodgkinson, 2002; Swartz, 2003); and
- Increasing evidence of inadequate preparation of pre-service teachers to successfully teach a diverse student population (Barnes, 2006).

Mathematics education researchers were faced not only with the challenge of mathematics teaching and learning, but also the need to understand how broader educational and cultural contexts affected or shaped opportunities for all students to learn mathematics (Cobb & Nasir, 2002; Martin 2000; Moschkovich, 2002a). Most recently, the need to consider and understand the impact of identity, socialization and power in Mathematics teaching and learning involves or leads to “rethinking equity-based practices” (Aguirre, Mayfield-Ingram, & Martin, 2013, p. 9). Mathematics leaders have been called upon to help teachers learn to acquire culturally responsive pedagogical

strategies and infuse, when possible and appropriate, culturally situated contexts and connections specific to the culture and communities of the students they teach and implement them in their instruction” (NCSM, 2007).

Inequity in Access to Mathematics for All Students

Sixty-three years have passed since *Brown v. Board of Education* (1954), the landmark decision by the U.S. Supreme Court that launched court-ordered school desegregation. Although this decision and policies that followed to intervene made public schools across the nation a less separate and more equal place of learning for minority students, the focus of concerns about inequity and access (to a certain extent) remains unchanged. Alarming evidence existed of inequities and a lack of access to rigorous mathematics by certain groups of students, resulting in underachievement (Bishop & Forgaz 2007; Flores, 2007; Heffter, 2006; Ladson-Billings, 2011; National Research Council, 1990, 1989; Oakes, 1990; Secada, 1992; Schmidt & McKnight, 2012). An NCTM News Bulletin (October 2008) summed up the current reality of equity in mathematics education by stating clearly what many mathematics educators know very well—inequities exist in all contexts. Teaching and learning improved when the same attention was provided to equity as was devoted to curriculum, instruction, and assessment (Gutiérrez, Bay-Williams, & Kanold, 2008). The National Commission on Mathematics and Science Teaching for the 21st century (known as the Glenn Commission) posed this question: “As our children move toward the day when their decisions will be the ones shaping a new America, will they be equipped with the mathematical and scientific tools needed to meet those challenges and capitalize on those

opportunities?” (p. 6). In reality Ball (2008) argued, “Mathematical competence is no longer needed only by some; knowing and being able to use mathematics is increasingly seen as an essential form of literacy and, additionally, some occupations will continue to require even higher levels of mathematical skill” (p. 1).

Inequity in Performance in Mathematics for All Students

Inequity in performance has been at the center of research, educational reform, and Civil rights for decades. The academic achievement gap among different racial and ethnic groups of students is influenced by many interrelated factors simultaneously, and it is almost impossible to disentangle the effect of one factor from another. In the same way, many factors contribute to, or account for, the middling performance of U.S. students both domestically and on international assessments (Abedi & Herman, 2010; Lenkeit & Caro, 2014; Sousa & Armor, 2010; Schmidt, Burroughs, & Houang, 2012). The Coleman report in the 1960s brought attention to racial inequity in student outcomes, with particular emphasis on the achievement gap between White and minority students (Coleman et al., 1966; Ladson-Billings, 1997). Other recent studies have focused on the performance of other subgroups such as English language learners’ opportunity to learn mathematics (Abedi & Herman, 2010).

Despite policy attempts and other efforts in the past to realize the ideals of educational equity and social justice, not only have relative achievement gaps widened recently but a majority of minority students minimally meet adequate achievement levels and progress toward the standards (Coleman et al., 1966). This brings to the forefront the need to ensure and pay attention to equity, access and excellence in mathematics

education in our nation's classroom and schools. According to a 2015 large new study of 300,000 students in 62 countries, "unequal access to rigorous mathematics content is widening the gap in performance on the prominent international math literacy tests between low- and high-income students, not only in the United States but in other countries worldwide (see Table 2 below). The difference between poor and affluent children on this test is important because the mission of schools to educate everyone has long been held as the leveling forces in achieving mobility. Because of the special value that schools impart in society, their failure, to offer the same opportunity, for students to learn useful math skills, is a problem demanding attention" (Schmidt, Burroughs, Zoido, Houang, 2015).

Researchers, policy debates, and documents reiterated the need for schools to develop and implement actions that clearly improved the mathematics academic performance of all children. Such need for reform and accountability in the United States is ongoing. Prior elementary education reform efforts have included the following: the publication of *A Nation at Risk* (1983); the Education for All American Youth initiative of 1944; Goals 2000: Educate America Act (1994, March 31); George W. Bush's, No Child Left Behind Act of 2001; and most recently, former President Barack Obama's Elementary and Secondary Education Act (ESEA) reauthorization on March 13, 2010, which included revisions to the NCLB and a Blueprint for Reform: A Reauthorization of the Elementary and Secondary Education Act. The goal of *ESEA* was to ensure equity and opportunity for all students by calling for rigorous and fair accountability at all levels

of school performance, meeting the needs of diverse learners and greater fairness in providing students a fair chance to succeed (U.S. Department of Education, 2010, p. 5). There has been increased demand on schools, teachers, individuals most familiar with classroom realities, and those most affected by education reform to use effective research-informed practices and mathematics pedagogical approaches that facilitate learning for diverse learners (Anthony & Walshaw, 2009). For example, through the application and interaction of the three dimensions of culturally responsive teaching (Gay, 2000), “teachers can significantly meet the needs of a diverse student population” (Barnes, 2006, p. 86). The first dimension, academic achievement, focused on making learning rigorous, exciting, challenging, and equitable with high standards. The second dimension, cultural competence, had to do with knowing and facilitating in the learning process the various range of students’ cultural and linguistic groups. Finally, the third dimension is sociopolitical consciousness, which concentrated on recognizing and assisting students’ understanding that education and schooling did not occur in a vacuum (Gay, 2000).

NCTM Equity Principle (The “Why”)

The National Council of Teachers of Mathematics (NCTM) Equity Principle, advocates for having high expectations, resources and providing needed support for each and every student in learning mathematics. The NCTM Equity Principle addressed the “why” of what should be done, but not necessarily how. The NCTM’s (2000) “vision of equity in mathematics education challenges the pervasive societal belief in North America that only some students are capable of learning mathematics” (p.12). It

Table 2

Socioeconomic Effects of Poor Mathematics Instruction

Country	Percentage Contributed	Rank
Netherlands	58%	1
Korea	56%	2
Australia	52%	3
Austria	47%	4
United Kingdom	47%	4
Belgium	43%	6
Germany	43%	6
Japan	43%	6
Spain	42%	9
New Zealand	40%	10
Canada	37%	11
United States	37%	11
Czech Republic	36%	13
Ireland	35%	14
Italy	35%	14
France	34%	16
Finland	32%	17
Switzerland	32%	17

Table 2 (continued)

Country	Percentage Contributed	Rank
Slovak Republic	31%	19
Hungary	30%	20
Chile	29%	21
Denmark	26%	22
Mexico	25%	23
Luxembourg	24%	24
Israel	23%	25
Portugal	23%	25
Slovenia	20%	27
Turkey	20%	27
Estonia	16%	29
Poland	16%	29
Greece	13%	31
Iceland	9%	32
Sweden	1%	33

OECD Average: 32%

Note. Adapted from http://msutoday.msu.edu/_pdf/assets/2015/poor-students-in-us-receive-some-of-the-weakest-math-instruction-in-the-world.pdf. Copyright 2015 by W.

Schmidt, R. Houang, N. Burroughs, & P. Zoido.

stresses the importance of supporting all students by the adults working with them. This therefore sets the stage for the impact of “adult variables, including professional practices of teachers and the decisions leaders make” (Reeves, 2006) which “can be more important than demographic variables” (p. xxiii) in student mathematics success.

PRIME Leadership Framework (The “What”)

The PRIME Leadership Framework: Principles and Indicators for Mathematics Leaders (NCSM, 2008) outlines and advocates for leadership for equity where every leader ensures high expectations and access to meaningful mathematics learning for every student. Building upon this, the PRIME Leadership Framework talks about leadership to ensure these expectations are implemented in order to foster equity and excellence in the mathematics classroom. Figure 2 below is a way to continually think about the “why” of what should be done, the “what” coupled with how (leadership practices) to make it happen.

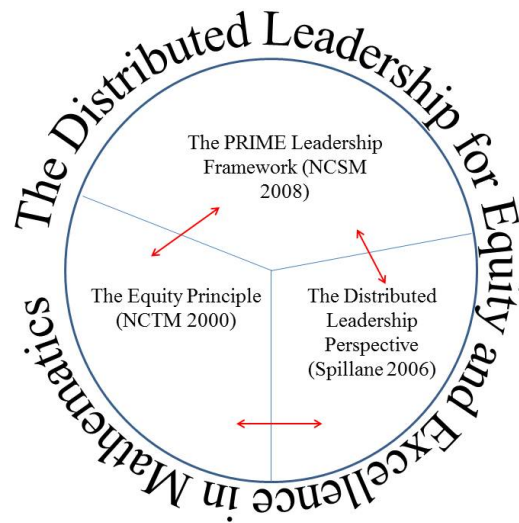


Figure 2. Distributed Leadership for Equity and Excellence Reciprocal Relationship Lens

Leadership

Western society defined leadership as a discipline more than 200 years ago.

Leadership has been studied, defined, and theorized in a variety of fields in many ways. For example, in the fields of psychology, sociology, anthropology, history, philosophy, as well as in applied fields like education, there was a focus on what made a person a leader, assigned or formal leadership positions, and components of leadership. From a historical perspective, leadership theory evolved from the 19th century great man theory (Carlyle, 1840s) which assumed leaders were born with innate or natural gifts (Bass, 1981). Trait theories in the 1930s–1940s presumed leaders possessed certain traits or characteristics differentiating them from non-leaders (Allport, 1968; Bass, 1981, 1990; Matthews, Deary, & Whiteman, 2003; Yukl, 1994, 2002). Behavioral theory in the 1940s–1950s focused on the things a leader did or said (Blake & Moulton, 1964; Blake & McCanse, 1991). In the 1960s, situational contingency theories proposed leaders' behaviors and approaches took into account the environment and situation. Therefore, leader effectiveness was determined, to a great extent, by the interactions of unique factors related to each situation, and specific leader characteristics and behaviors (Fiedler, 1967; Hersey & Blanchard, 1969, 1977; Vroom & Yetton, 1973; Vroom & Jago, 1988, 2007).

Charismatic or influence leadership theories, covering the 1920s to the 1970s, described a form of influence where the leader is perceived as “endowed with exceptional qualities” (Yukl, 1994, p. 317) to lead or to solve a problem. Reciprocal leadership theories, popular in the 1970s, resulted from multiple theories focused on the relational and reciprocal natures of leader-follower interactions. These theories posited leadership is

not just something a leader does to followers, but rather leadership is a process that meaningfully engages leaders and participants, values the contributions of participants, shares power and authority between leaders and participants, and establishes leadership as an inclusive activity among interdependent people (Komives, Lucas, & McMahon, 1988).

Today, the face of leadership has changed in response to numerous factors, including politics, demographics, technology, and economic dynamics. Increasingly, those who work in or study schools, educators, and policy-makers have recognized the crucial role leadership plays in schools and the difference leadership makes (Wahlstrom, Louis, Leithwood, & Anderson, 2010). Leadership has been found to influence student learning, second only to classroom instruction (Louis, Dretzke, & Wahlstrom, 2010; Louis, Leithwood, Wahlstrom, & Anderson, 2010). The Wallace Foundation funded a six-year longitudinal study with the goal “to identify the nature of successful educational leadership and to better understand how such leadership can improve educational practices and student learning” (Louis, Leithwood, Wahlstrom, & Anderson, 2010, p. 7). Researchers found a “collaborative leadership” approach between formal leaders (e.g., principals), informal leaders (e.g., teachers, parents), and others were strongly connected to student achievement. Other research studies and reviews of literature (e.g., Leithwood & Riehl, 2005; Louis, 2006; Spillane, 2006; York-Barr & Duke, 2004) yielded more information about “how to do” leadership, such as “the dimension of distribution or sharing of leadership” (Wahlstrom & York-Barr, 2011, p. 25). Distributing leadership is related to “having a common understanding that improved student learning is the result of

collaborative endeavors with different initiatives in the school or district having different persons leading the range of efforts” (Wahlstrom & York-Barr, 2011, p. 25).

The Nature of Leadership for Mathematics Education

Quality leadership within schools is essential to improving mathematics instruction and achievement in the United States, as well as promoting a legacy of continued aspiration towards equity *and* excellence. The Principles and Standards for School Mathematics (NCTM, 2000), Common Core State Standards for Mathematics (CCSSM), along with other recent reform documents, outlined essential features crucial to teaching mathematics, to ensure all students have opportunities to learn. Although these documents outlined extensive goals for teaching and learning mathematics, the majority of elementary schools fell short to “ensuring high quality mathematics learning for every student” (NCSM, 2008, p. 4), due to “social and structural realities faced by marginalized students outside of school and the ways that mathematical opportunities are situated in those larger realities” (Martin, 2003, p. 7). To facilitate such learning for all students, individuals involved in the mathematics planning and teaching were required to know, use, and have expertise in their subject matter content and pedagogical knowledge (Shulman, 1987). Additionally, these experts understood and received “contextual idiosyncrasies and nuances that present themselves as they work to teach their subject matter content” (Milner, 2013, p. 347). Martin, Gholson, and Leonard (2010) pointed out, “context produces different knowledge” (p. 20). Therefore, it was important for leaders to consider the multiple complexities of students’ contexts and their everyday lives (Martin, 2009b). Nieto (1999; 2010) suggested, “it is only by attending to the myriad conditions

that influence learning that we can ensure educational success for young people of diverse backgrounds” (p.7). Gutiérrez (2012) noted many approaches “sought to improve mathematics achievement with marginalized students with marginalized defined as Latino/a, Black, low-income, students with disabilities, and/or English language learners” and “often these approaches fail to be comprehensive enough to sustain positive results” (p. 32).

One of the best predictors of increased student learning was the access to learning opportunities (NRC, 2001; Siegler, 2012). Learning resulted in additional knowledge. Leonard (2008) added, “Knowledge is power, and mathematical literacy opens the door of opportunity” (p. 160). Even and Ball (2010) indicated improving the quality of learning opportunities for students in mathematics was something school leaders in the United States were increasingly experiencing and enacting. Additionally, leaders in other countries shared similar pressures. Varying success levels fueled the pressure to improve content-focused mathematic achievements of students who remained the most underserved (Martin, Gholson, & Leonard, 2011) or marginalized (Gutiérrez, 2012). Small gains aided the understanding of the interplay between “complex micro-, meso-, and macro-level forces” (Martin et al., p. 17). Bronfenbrenner’s (2005) bio-ecological model of human development provided an understanding of these forces and shed some light on the shortcomings of prior leadership efforts stating, “it was not the phenomenon of development that was the focus, but its outcome at a particular point in time” (p. 108).

The Role of Leadership for Equity and Excellence in Mathematics

Scholarly literature, in both educational leadership and mathematics education leadership, documented equity's place as a priority for leaders. This importance was obvious given the placing of equity as the first principle in both the *Principles of the National Council of Teachers of Mathematics* (NCTM) and the *PRIME Leadership Framework* of the National Council of Supervisors of Mathematics (NCSM). NCTM's stance required educators take an equity-for-all students approach to mathematics teaching so that "mathematics can and will be learned by all students" (p.13).

To capitalize on the changes wrought by accelerated demographic changes, linguistic make-up of classrooms and schools, urgent need for more young people with skills in mathematics and science, and the ability to think critically and work collaboratively, mathematics education leaders additional pressures to improve K-12 mathematics instruction that reached *all* students. The role of leaders to facilitate or lead the pursuit of equity is critical if educators are to purposefully address access and opportunity in the mathematics classroom (Balka, Hull, & Harbin-Miles, 2010). The National Council of Teachers of Mathematics' Equity Principle (NCTM, 2000), further defined by the National Council of Supervisors of Mathematics (2008) Principles and Indicators for Mathematics Leaders (PRIME), proposed making equity a reality for all students. This "requires raising expectations for students' learning, developing effective methods of supporting the learning of mathematics, and providing teachers and students with the resources that they need" (p. 12). The equity principle did not propose identical instruction for all students, but rather called for appropriate accommodations, learning

opportunities, high expectations, and adequate resources and support so outcomes for every student were equitable.

The Elementary and Secondary Education Act (ESEA) reauthorization blueprint for reform (2010) emphasized a focus on equity and investment in preparing and improving better leaders. Practice in the field in terms of the relationship between equitable leadership practices and excellent leadership practices in each school differed, due to various factors including those indicated by the NCTM and NCSM Equity Principles. However, they were not limited to the respective distributed roles a teacher or other individuals took on in the process of achieving equity and excellence in mathematics.

A Distributed Perspective to Leadership (“Why”)

In most schools, the responsibility of leadership falls on the principal (formal leader). However, leadership is no longer on the shoulders of a single person and has transitioned to more a collective leadership phenomenon (Elmore, 2004; Gronn, 2003; Mayrowetz, Murphy, & Smylie, 2009; Ross, 2005). Schools today face increased student diversity, including: language differences; learning differences; ethnic, racial, and cultural differences; economic differences; and gender and sexual orientation differences. To lead, manage, and improve schools in the current era of high stakes accountability while taking into account diversity involves multiple individuals, including those without formal leadership positions like teachers, parents, community members or even students who influence an organization’s core work (McKenzie & Locke, 2009; Spillane, Harris, Jones, & Mertz, 2015). When taking such a distributed perspective to mathematics

leadership practice, it becomes necessary to learn more about how “the practice is stretched over leaders, followers, and aspects of their situations” (Spillane et. al., 2015, p. 1).

Distributed leadership was conceived about 18 years ago from a combination of existing research theories in psychology, anthropology, sociology, and distributed cognition and activity theories (Gronn, 2003; Spillane 2006; Spillane, Halverson, & Diamond, 2011) and applied to mathematics education. The distributed leadership perspective explicitly focuses on understanding how the work of leadership happens among the stakeholders in schools (e.g., teachers, coaches, parents, principal, district math leader), as an activity stretched across the “social and situational contexts” (Spillane, 2004, p. 5). So, leadership from a distributed perspective denotes seeing leadership activities as a situated and social process at the interaction of leaders, followers, and the situation as illustrated in *Figure 3* depicted below. This means giving “context of action” and maintaining “the tension between agency and distribution” (Spillane, Halverson, & Diamond, 2001, p. 23). One example or way to operationalize this, are structured observations of managers conducted as part of Mintzberg’s studies of work activity to document what they actually did (an attempt to answer the questions...*What do managers do?*). In essence, each of the 3 points on figure 3 influences and is influenced by the other aspects (leaders influence the situation and followers but are also influenced by the situation and the followers).

Some researchers have agreed the leader dimension as it relates to equity and excellence can benefit from further exploration (McKenzie & Locke, 2009). The need in

mathematics education has been especially evident. New advances in practice and research, as well as focused concern on student mathematics learning and persistent disparities made the present a particularly good time to understand the distribution of leadership for equity and excellence in mathematics education. Given these changes, researchers and the scholarship on school leadership and administration (Brooks, Jean-Marie, Normore, & Hodgins, 2007; Leithwood & Riehl, 2005; Louis et al., 2010; Spillane, 2005; Timperley, 2005; Wahlstrom & York-Barr, 2011) continued to advocate for “other sources of leadership and management for instruction” (Spillane & Kim, 2012, p. 74) other than the “individual leader”, which often is the school principal in an education setting (Spillane, 2005, p. 143). Teacher involvement was identified as a source of instructional leadership, which positively enhanced the school and organization’s goals. In addition to increased involvement, teachers’ professional knowledge and expertise of one another was enhanced (Lieberman, Saxl, & Miles, 1988; York-Barr & Duke, 2004).

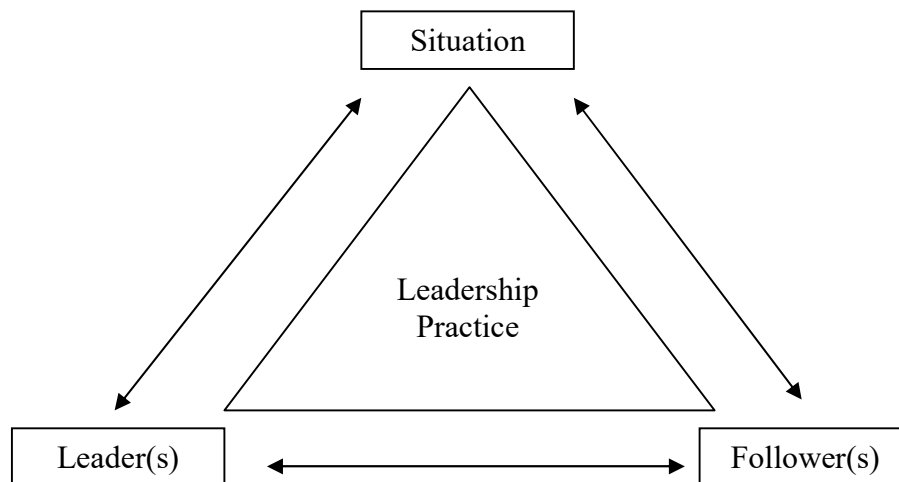


Figure 3. Elements of Distributed Leadership

Summary

Leadership is not a top-down approach with singular leaders but rather, requires multiple leaders, followers, and the interactions between them all. Distributed leadership aligns with this thinking in that it is a conceptual and analytical approach that has been developed and mostly used in education related research to understand how the work of leadership takes place among the people and within the context of a complex organization such as a school.

Although the idea of expanding, sharing or distributing leadership across people sounds helpful and could make for light work, this approach has come under scrutiny claiming it fails to make “explicit the political nature of education and how power operates to privilege, silence, and marginalize individuals” (Anderson, 1990; McIntosh, 1988; Ng, 2003, p. 214). While this may be true, the distributed leadership approach is a more comprehensive lens to understand the “how” of leadership practice for equity and excellence as it incorporates a wider lens to explore leadership beyond simply the “individual leader”. Therefore, while the NCTM Equity Principle addresses the “why” of equity and excellence, and the PRIME Leadership Framework the “what”, the distributed leadership perspective informs and captures the “how” of leadership practice and details what this approach/perspective offers that others do not (see Figure 4). A better understanding of the “how” of leadership may inform school leaders at all levels how to ensure both equity and excellence in math education.

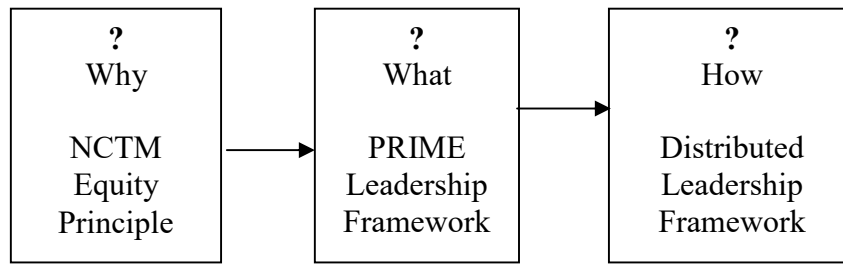


Figure 4. The why, what and how of leadership.

CHAPTER 3. RESEARCH METHODOLOGY

This study used qualitative research case study methods to understand perceptions of how mathematics leadership is distributed to support equity and excellence in one diverse elementary school in the Midwest. The overarching “What are the leadership practices that leaders engage in that are intended to promote equity and excellence?”

The design, methodology, research questions, and research design that guided this study are presented in this chapter. Also addressed are the theoretical perspectives on the data collection procedures, protocols, Institutional Review Board (IRB) review process, research site and participants, method and procedures for data analysis, including the role of the researcher, strategies for validating findings, and the anticipated ethical issues and limitations of this study. The overarching research question was: What are the leadership practices that are intended to promote equity and excellence?

Rationale for Qualitative Research Design

Qualitative research involves seeking to understand phenomena in-depth and within specific contexts. According to Gay and Airasian (2000), qualitative research is “useful for describing or answering questions about particular, localized occurrences or contexts and the perspectives of a participant group towards events, beliefs or practices” (p. 202). Creswell (2009) further explained how qualitative researchers conduct their research in the participants’ natural setting, collecting data at the site where the phenomenon is experienced. This affords the researcher an opportunity to understand the unique interactions in a particular situation—not to predict what might occur, but to understand the characteristics of the situation and the meaning brought to it by

participants (Patton, 2002). Another important characteristic of qualitative research is recognition of the researcher as “the primary” (Merriam, 2002, p. 5) or “key” instrument (Creswell, 2009, p. 175) for collecting and analyzing data. As researcher, I am the primary instrument in that it is I who will interpret the interview responses and observations collected from participants.

This study combined the qualitative traditions of interpretive and case study research. From an epistemological stance or perspective, these approaches were complementary. The interpretive and case study approaches were suitable for the purpose of this research study, which was to understand and describe the mathematics leadership practices leaders engaged in to promote equity and excellence in math using a Distributed Leadership Theory perspective. According to Merriam (2002), “the experiences of people are essentially context-bound” and “cannot be free from time and location or the mind of the human actor” (p. 8). Merriam described basic interpretive qualitative studies as those in which the primary interest of the researcher is to understand how individuals make meaning of a phenomenon. Additionally, other beneficial characteristics include that the researcher serves as the instrument, the process is inductive, and the outcome is descriptive in nature. The key concern in the current study was to understand the phenomenon of interest, namely the leadership practices used from the *emic* perspectives or the perspective of insiders: the teachers, formal leaders, and parents within the school.

Methodological Approach

This research used the case study research methodology. According to Yin (2009), case studies “are the preferred method when (a) ‘how’ or ‘why’ questions are

being posed, (b) the investigator has little control over events, and (c) the focus is on a contemporary phenomenon within a real-life context” (p. 2). This three-part description aligned well with the current study, which was intended to understand a bounded system, in this case, a particular elementary school. In the context of this study, the focus is on the “how” in that the goal is to better understand the leadership practices. Because I as a researcher have no control over the events, qualitative methods allow me to examine them more in depth. Finally, the study is in the real-world context of a specific school.” Yin (1994; 2003) noted that case studies involved conducting an empirical investigation of a contemporary phenomenon within its natural context, using multiple sources of evidence. A case study approach was deemed the best method to answer the overall research question for this study because it focused on the phenomenon of leadership in the context of the school.

The focus of this study was to understand and describe mathematics leadership distributed across one elementary school in the Midwestern United States. The case focused on one school. Specifically, an interpretive case study was conducted to “provide a general understanding of a phenomenon using a particular case.” According to Merriam (2002), the case “is a specific, complex, functioning thing” (p. 178). In this instance, the “thing” was the distribution of leadership in one school.

Research Procedures

Study Site Selection

The study site was selected based on established criteria. The initial criterion for the site selection was to find a very culturally diverse school because more research is

needed about the kind of leadership for equity and excellence necessary to ensure rigorous and meaningful mathematics learning for the increasingly changing demographics (population) in schools and cities across the Midwestern United States (Iowa Department of Education, 2010; Kreinbring, 2010) and underrepresentation or lack of diversity in both STEM fields and "in the student body as a whole at Iowa universities" (IMSEP, 2009). The selection process included viewing the Iowa State Department of Education's website for a district and school where words like equity, excellence, and diversity were used and where prioritizing student needs was part of their mission or vision statements. Other possible terms and phrases used by the school to frame its goals included "meeting the needs of diverse learners/students" or other equity related titles and headings. The combination of these factors resulted in a list of possible schools that could serve as a research site. Finally, a comparison was initiated between the schools that were identified using the above search terms and criteria of what was advertised on the school websites to comprehensive school improvement plans for goal alignment.

The Midwestern Public School District met these criteria and presented an urban diverse population. As part of the yearly comprehensive school improvement plans the district included the following goals:

1. Closing the achievement gap among ethnic groups in mathematics.
2. Closing the achievement gap between low and high socio-economic groups in mathematics.

3. Closing the achievement gap between English language learners (ELL) and non-ELL students in mathematics.
4. Differentiating mathematics instruction.
5. Focusing on under-represented groups in higher-level mathematics courses to meet the needs of its diverse students.

The importance of school leadership efforts on issues of equity by focusing on students as people was re-iterated by the Superintendent (of the School District where this study's was conducted) in a March 2013 progress report on the School Improvement Grant (SIG) entitled "Turning Around. Moving Ahead." Superintendent in study stated, "When the conversation turns to education, it usually revolves around numbers. Test scores.

Funding. Graduation rates. Demographics. And yet, walk into any school and you see people, not numbers...students eager learn" (p. 3). This is evidence that the school district leadership was focused on issues of equity and excellence. It is apparent that the focus is on the students, all the students, suggesting leadership for equity and excellence.

School Demographics

I selected Madison Elementary School, (the name has been changed to maintain anonymity of the school and district) a K-5 school located in the most diverse urban school district of the state with a total student population of over 25,000 students (2012-2013 school year). The percentage of students described as belonging to a minority ethnic group had increased, not only at Madison School, but also at the district level. The proportion of students of color at Madison Elementary increased from a little more than one-third to over half of all students in 2011-2012. There were approximately 350

students enrolled for the 2013-2014 school year. During the 2010-2011 years, 78.6% of the student body included students of color. The following academic year (2011-2012), over 75% were students of color, and this increased to 83% during the next school year (2012-2013). Over a 23-year period at Madison Elementary overall enrollment has been stable but the demographics have changed. There is been a smaller percentage of white students and larger percentage of blacks students.

Sampling and Participants

According to Esterberg (2002), purposive sampling is a technique that allows the researcher to mindfully choose participants “for the specific perspectives they may have” (p. 93) or those participants (individuals, groups or settings) who are “information rich” (Patton, 1990, p. 169). Crotty (1998; 2003) noted that such intentionality, “posits a quite intimate and very active relationship between the conscious subject and the object of the subject’s consciousness” (p. 44). In the current study, the participants were chosen purposefully rather than randomly. Maxwell (2005) defined purposeful selection as “a strategy in which particular settings, persons, or activities are selected deliberately in order to provide information that can’t be gotten as well from other choices” (p. 88). These were individuals “uniquely able to be informative” (Weiss, 1994) because of their knowledge about, contribution to, or roles in mathematics leadership in the school. Consequently, participants were selected because of their responsibility or role they played in mathematics planning, teaching, and learning for all students.

Purposive sampling was used to select 18 participants for interviews, such that ten teachers, three coaches, three parents and two administrators were interviewed. All

teachers were approached to participate in the study. At the K-2 level, all teachers instruct students in mathematics, so all teachers were invited to participate. Of the 10 teacher participants, 7 were K-2 teachers and 3 were 3rd - 5th grade teachers. All teachers consented to and participated in the first interview. Only two did not participate in the second follow-up interview. At the 3rd – 5th grade level, not all teachers instruct students in mathematics. Therefore, only those teachers who taught mathematics to students were included in the sample, all of which participated in both rounds of interviews. Formal school leaders were included in the sample, with interviews conducted with all instructional coaches, the head of school, and the district administrator. Finally, parents were selected. Both the head of school and two of the teacher participants each recommended parents who were actively involved in their student's education. These parents came to the school often to volunteer in the building, help out in the classroom, and/or eat lunch with their children. Most importantly, these parents helped their children with homework and made sure it was brought back and turned in to the teacher. They were described as trustworthy. I had intended to interview the Parent Teacher Organization (PTO) president and seek out participants through that organization but was unable to do so because the PTO did not exist in the school.

Approval from the District and Institutional Review Board

Prior to conducting any aspect of the study, appropriate approval was granted from both the school district and the Iowa State University Institutional Review Board (IRB). First, the necessary paperwork and procedures were completed to conduct research in the Midwestern Public Schools (MWPS) district. After approval from the

district, the researcher contacted the school principal to discuss the study goals. Approval was granted to complete the study at Madison Elementary School.

Second, approval was obtained from the Institutional Review Board (IRB) at Iowa State University (see Appendix A). Before the interviews, the goals of the research were explained to the participants. Additionally, participants were told they could discontinue their participation at any time without penalty. They were also asked to provide a pseudonym to protect their identity. Informed consent and agreement to record all interview sessions was obtained. The study purpose was re-iterated at the beginning of all interviews. All subsequent interviews started with a reflection and discussion of study-related concerns, questions, or emerging issues.

Methods of Data Collection

Data for this study was compiled through a collection of artifacts (documents), semi-structured audio taped interviews, and researcher observations and field notes. An explanation and justification for each data collection method follows.

Artifacts and Documents

The artifacts and documents collected for the study included institutional artifacts, such as meeting agendas, correspondence between staff, memos, handouts from staff meetings, mission and/or vision statements from the district and school websites, online feedback from parents about the school, and professional development activities. These sources provided information about the ways mathematics leadership was organized, used, and translated into practice (by both formal and informal leaders). These artifacts provided an understanding about how and why mathematics leadership for equity and

excellence described in the PRIME Leadership Framework was used and/or distributed in this school setting. In particular, such artifacts provided a window into how NCTM's equity principle was translated into practice in education, and how leadership for equity and excellence trickled down to the classroom level (teaching and learning). In my field memos section that follows, I further discuss how these artifacts were utilized.

Interviews

Three interview protocols were developed for this study. All stakeholders participated in a common first interview, and then a separate second interview was conducted with the teachers, formal leaders, and parents. The teacher and formal leader interview protocol focused on their daily practices, including interactions as leaders, followers and aspects of their situations taking responsibility for the work. The parent version of the interview protocol asked for their perceptions, experiences, and interactions with mathematics teachers and how the school was presenting mathematics instruction. The interview questions were based on the literature related to what it means to be an effective leader for equity and excellence in mathematics teaching and learning. Questions also related to the challenges of putting into practice the principles and indicators for mathematics education leadership in schools. These protocols are described in more detail below.

According to McNamara (1999), interviews are a useful way to gain a more in-depth understanding of a participant's point of view, story, or situation. An interview protocol, based on the literature, was developed and honed through faculty feedback for use in this study. An initial semi-structured interview to get to know and gather

demographic information about the teachers and others involved in mathematics teaching and learning at the school was conducted (see Appendix B). This interview lasted thirty to forty-five minutes. During this initial data collection phase, demographic information about the participants (e.g., the number of years in education or teaching, what subject areas they teach, etc.) and information that revealed participants' academic and professional backgrounds related to diverse learners was collected to better understand their current practices related to equity and excellence in mathematics.

A second interview, based on results of the first wave of interviews, was conducted to gain an extensive understanding or view from the various stakeholders (formal and informal leaders and parents) to understand how they perceive mathematics leadership. These interviews began to paint a picture of how leadership for mathematics was distributed in the school. This second interview was semi-structured but more in-depth and was "guided by a list of questions or issues to be explored" (Merriam, 1988, p. 75). The interview questions evolved from the research question, readings related to mathematics leadership, equity and excellence in mathematics education, and distributed leadership (see Appendix C). To understand the influence of distributed mathematics leadership on equity and excellence, follow-up interviews were conducted to produce a complete picture and deeper understanding of participants' examples, relevant to their leadership roles in mathematics teaching and learning, and the challenges and opportunities these roles presented for equity and excellence. Eight of the 18 participants participated in these phone conversations.

All interviews were audio-recorded. After every audio-recorded interview, the content was transcribed. I completed one-sixth of the transcriptions myself to gain insight into the data, and a transcriptionist completed the remaining interviews. I also listened to all of the audiotapes to become familiar with the data and to verify the accuracy of the transcriptions. Next, I created a log that included a brief description of what happened during a specific interview before preparing the data for analysis.

Field Notes and Researcher Observations

During the course of the study and visits to the site, I engaged in a variety of field work-related activities described by Schwandt (2007), which included watching, listening, engaging in conversation, recording, interpreting, and handling logistics. These necessitated taking notes and asking questions that emerged through observation. Taking good notes provided what Geertz (1973) referred to as “thick descriptions.” To ensure sufficient details that richly describe what occurred, I reviewed my notes at the end of each observation to fill in the details I was unable to add at the time of observation.

In addition to the field notes, observations were conducted of leaders at the school. Both teachers and formal mathematics leaders were sought out and asked permission to participate in two observations each. Additionally, an opportunity to observe participants occurred during a team or staff meeting or other meeting where these individuals took on or engaged in leadership. Observations were conducted in the school building or arranged in classrooms.

The main goal of the observations was to identify actions, perceptions and descriptions of leadership that supported equity and excellence and how such leadership

meshed with the documented needs in the field (Federal Advisory Committee Act, 5 U.S.C., App.2., 2013) when it came to the goal of teaching mathematics for equity and excellence. Observations were conducted soon after the interviews. In addition to audio-recording the observations, I took notes during and after each observation.

Data Analysis

Qualitative Data Analysis (QDA) is a non-linear and often recursive process that involves noticing, collecting, and thinking about interesting things. As information continued to be collected, new things were noticed, pondered, or reflected upon, leading to revisiting and re-analyzing previously collected. Analysis began during the initial phase of “reading the transcripts, observational notes, or documents that are to be analyzed” (Maxwell, 2005, p. 96) and continued through phase two, after collection of data was completed. In this way, I continued to “invent or piece together, new tools or techniques” (Denzin & Lincoln, 2005, p. 4) for analysis during the initial stages which influenced the direction of analysis of later stages.

Coding

All data analyses were conducted by hand. Notes and codes were written on the hard copies of the transcripts but also noted in an Excel spreadsheet, with an individual file created for each individual participant. This helped me to gain the essential meaning of data as it relates to my research question/topic, find and organize ideas and concepts, make comparisons within and across the multiple data sources and to keep track of changes and updates to the analysis. Multiple rounds of data analysis were conducted. The analysis was conducted taking into consideration and keeping in mind aspects of

distributed theory. Consequently, the transcripts were read with a focus on identifying leadership practices and tasks that participants engaged in.

To begin the data analytics process, all transcripts were read to get a sense of all the data. Analyses were conducted to focus on leadership practices. Per distributed leadership, there are main goals or functions toward which leadership practices are directed. These were noted during the coding of the transcripts.

Two types of coding were used during the first round of coding. These included descriptive and magnitude coding (Saldana, 2009). First, descriptive coding was used, such that while reading through the transcripts, labels were written in the margins that identified the main topic of the passage. These main topics consisted of the main goals or functions of leadership practices. The written descriptions or messages from the margins were used to create sub-codes within the initial codes that identified the goal or function of leadership. These sub-codes identified the specific leadership practices that were engaged in. These sub-codes were equivalent to the macro-functions per distributed leadership theory. An additional round of sub-coding, resulting in sub-sub-codes, was conducted. This resulted in the micro-functions. All codes and sub-codes were typed into an Excel file for each participant (as previously indicated).

Also during the second round, magnitude coding was used. However, the magnitude codes were not coded on the hard copies of the transcripts. Rather, those were coded in the Excel file. To indicate /differentiate the codes and sub-codes that were mentioned more frequently or with more importance, the codes were typed in bold font.

For those codes that reflected a negative or opposite view, the code was highlighted in yellow.

The second round of coding consisted of pattern coding (Saldana, 2009). Pattern coding consists of pulling together a large amount of material into a smaller set of themes or groups. This was accomplished by grouping micro-tasks together under the appropriate macro-function, and each macro-function was grouped into the overall goal or function of the leadership practice.

Analytic Memos

Analytical memos were employed in my reflections and analysis of the emerging themes and categories. Maxwell (2005) noted an analytic memo could span from comments in the margin of transcript to an essay. He further explained memos were a means of acquiring ideas on paper or a computer, and using such writing was a way to reflect and gain analytic insight. This type of memo assisted my efforts to identify connections and interrelationships between prior research and my observations (Maxwell, 2005) in addition to exploring and pursuing new ideas.

Validating Findings

Various validation strategies are used by qualitative researchers to render their studies both rigorous and credible (Cresswell & Miller, 2000). Out of the eight strategies put forth by Cresswell and Miller, I utilized four: (1) member checking, (2) peer review, (3) debriefing, and (4) triangulation.

Member Checking

According to Stake (1995), research participants should “play a major role directing as well as acting in case study” research. They should be asked to examine rough drafts of the researcher’s work and to provide alternative language, “critical observations or interpretations” (p. 115). After interview data were transcribed, all interviews were sent to the individual participants for member checking (Jones, 2002), to ensure nothing was lost in transcription and for participants to confirm their words, opinions, and statements were accurately represented. Five of the 18 participants acknowledged receipt of the transcripts and validated the contents with no corrections. The head of school made a remark about how much he had to say due to the number of pages (24 pages) transcribed, but had no corrections to make.

Peer Review and Debriefing

Whether it was having someone serve as a “devil’s advocate” (Lincoln & Guba, 1985), asking difficult questions about the study’s methods, meanings, and interpretations; validating research findings; or lending an ear to the researcher’s feelings regarding the study process, peer review or debriefing played an important role in the research process. I obtained peer feedback from a colleague who was also working on her dissertation, to safeguard and increase the trustworthiness of the study process, minimize any bias, and prevent inaccurate or partial presentation of the realities that existed at the school. We discussed issues of data collection.

Triangulation

Multiple sources of data (teachers, formal administrators, and parents) and data collection methods (semi-structured interviews, observations, and artifacts/documents) within the study's context were triangulated to "confirm emerging findings" (Merriam, 2002, p. 31) and better understand and answer the research question(s) (Esterberg, 2002). The combination of interviews, observations, and documents or artifacts provided the best findings. However, these methods shared a common characteristic of personal researcher bias—a validity threat that necessitated coming up with specific solutions, such as explaining my biases, ways I dealt with them, and being reflexive. To triangulate this data, I was able to validate or cross-check data with other data (e.g., statements about leadership practices with documents detailing leadership team meetings).

Role of the Researcher

My role in this study was researcher; meaning I was the primary instrument for data collection and analysis. I developed relationships and earned the trust of parent participants and the formal and informal mathematics leaders studied. Some of these individuals were people I knew nine years prior, when I worked in the school first as a teacher, later as a Math and Technology Coordinator and served as an assistant to the principal in the building. Due to this history with the school/district, I had to keep any biases that I might have had coming in check as best as I could.

As a researcher, I realized the possibility of becoming too involved in the study. I also recognized the potential for confidentiality issues and the need to protect the anonymity of participants (Merriam, 1988). To clarify these key concerns, I provided all

research participants the details of the study, ensured each participant signed the appropriate IRB informed consent form, and engaged in conversations about the confidentiality before conducting interviews. I used pseudonyms. Participants were allowed to discontinue participation at any time with no penalty. Although I had spent seven years in the building in the past, my history with the school was not helpful because only one of the current teachers and Counselor (who was not a study participant) was in place there when I was an employee in the building. Their jobs were in no way impacted by their participation or lack of participation. Data were not shared with school leaders.

CHAPTER 4. RESEARCH RESULTS

This study sought to understand perceptions of how mathematics leadership is distributed to support equity and excellence in one diverse elementary school in the Midwest. The results presented in this section inform the overarching research question posed: “What leadership practices do leaders engage in that are intended to promote equity and excellence?” The results describe the perceptions about leadership of stakeholders at all levels (from parents to central office administrators). The findings are presented in three sections that focus on the three themes identified from the data toward which leadership practices were focused: 1) Supporting the Teaching/Learning of all Students; 2) Supporting Teaching of Diverse Students; and 3) Parent/Family Connections.

Context

As indicated in Chapter 3, to ensure participants’ and research site confidentiality all names were changed and pseudonyms were used. A total of 18 individuals affiliated with the Madison Elementary school and the Midwestern school district participated in this study. Eleven of the educators were kindergarten through 5th grade classroom teachers (e.g., T01, T02, etc.). One of the teachers served as an in-class math support specialist in grades 3-5. At the K-2 level, each teacher taught all subjects (math, literacy, social studies and science). At grades 3-5 on the other hand, one teacher was responsible for the teaching of specific content at the respective grades. This departmentalization was the case for mathematics where only one teacher had to teach mathematics to all students at each grade level. The remaining research participants included a building level

administrator (described in this study as Head of School, HoS); a district level administrator (Central Office Administrator, CoA); one K-2 level Mathematics Coach (Coach K-2), a grade 3-5 Coach (Coach 3-5), one Instructional Coach (IC) and three parents (P01, P02, P03). Table 3 presents a summary of research participants.

Table 3. *Summary of Participants and their Roles*

Participants	<i>N</i>	Role/Position
Classroom Teachers	10	K-5
Math Facilitator	1	Math Facilitator K-2
Math In-Class Support Teacher/Specialist	1	Coach 3-5
Instructional Coach	1	K-5
Building Administrator	1	Head of School
District Level Administrator	1	Central Office Administrator
Parents	3	Parents

Data collected included two semi-structured audio taped interviews, researcher observations, artifacts (documents), and field notes. All research participants were interviewed during the first round of interviews. Two of the ten teachers consented but declined the second interview without providing a reason. Observations were completed in the teacher participants' classrooms as well as during team meetings. These data and other documents collected were used for triangulating data/findings.

All interview transcripts were read and coded individually. Codes were based on distributed leadership as it related to equity and excellence in mathematics education. Analyses were iteratively conducted by reading through each interview transcript individually and coding themes that arose related to the mathematics leadership enacted in a school as viewed through the three aspects of Spillane's Theory of Distributed Leadership (i.e., the interplay between leaders, followers, and elements of the situation), as well as the lens of equity and excellence. Figure 5 below depicts or illustrates how leadership practice (leadership tasks) is stretched (distributed) across leaders, followers, the situation and time (Spillane, 2004; 2006).

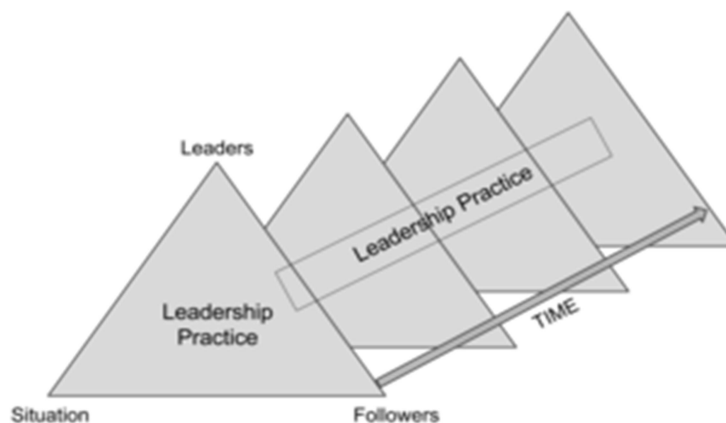


Figure 5. Leadership Practices As Distributed Across Leaders, Followers, the Situation and Time (From Spillane, 2006 used with written permission, see Appendix D).

Leadership Practices and Subgroup Tasks Defined

Research indicates that “Distributed leadership is a perspective; a conceptual or diagnostic tool for thinking about school leadership” (Spillane, 2005, p. 149). An

analytical approach is used to understand how the work of *leadership* takes place among the teachers, coaches, administrators and in a context of the school (Spillane, Halverson, & Diamond, 2004). Depending on the particular leadership task, participants' "knowledge and expertise may be best explored at the group or collective level rather than at the individual leaders level" (Spillane, Halverson, & Diamond, 2001, p.25).

According to Spillane, leadership "is grounded in activity rather than in position or role" (Spillane, Halverson, & Diamond, 2001, p.24). Therefore, it is important to look at the tasks that leaders undertake related to instruction and practice. These tasks occur at different grain-sizes, from large overarching tasks to small day-to-day tasks. Macro-level functions are the largest grain size. In school settings, macro-functions can include such activities as promoting teacher professional development and improving test scores. Micro-tasks are the short-term tasks that leaders execute in order to accomplish macro-tasks. Micro-tasks include such practices as observing classrooms and facilitating grade level meetings. "It is essential to identify these micro- tasks because it is through studying the execution of these tasks that we can begin to analyze the *how* as distinct from the *what* of school leadership" (Spillane, Halverson, & Diamond, 2001, p.24, italics in original). Only looking at macro-functions will not provide an understanding of leadership practices. Rather, one has to also study the micro-tasks that make up these macro-functions to understand leadership practices (Spillane, Halverson, & Diamond, 2004).

There are multiple functions that are important for instructional leadership, and these vary by location and situation. Participants were not directly asked to identify

purposes toward which leadership practices were directed, however these were identified based on their responses to other questions. In the current study, three primary themes related to these purposes and their relevant macro-functions and micro-tasks were identified as they related to the overall research question. These were:

1. Supporting the Teaching/Learning of all Students;
2. Supporting the Teaching of Diverse Students; and
3. Parent/Family Connection.

All three themes will be discussed. Because there was significant overlap in the macro-functions for the first two themes (Supporting the Teaching of all Students and the Teaching of Diverse Students), these two themes will be discussed together in one section: Supporting the Teaching and Learning of Students.

Within all three themes, multiple macro-functions and micro-tasks were identified. In order to gain a better understanding of the intersection of all three primary foci, the data will be presented with a focus on the macro- and micro-level tasks (i.e., leadership practices) identified by participants. It is the macro-functions and micro-tasks that leaders engage in to carry out the overall purpose of the theme (e.g., supporting the teaching of diverse students). Because the focus is on the leadership practices, the practices cited most often as well as those that were substantively different from what was expected are highlighted. Within each section, a table is or multiple tables are provided that summarize(s) the macro-functions and micro-tasks by participants as the most important for that specific function.

Results for Supporting the Teaching and Learning of All Students

This section presents the results for both themes related to supporting the teaching of students, in general (i.e., all students) and specific to diverse students. Multiple macro-functions were identified for these two themes. These macro-functions have been categorized into the following 4 groups for ease of presentation: 1) Relationships; 2) Instruction; 3) Support; and 4) School Climate, and further defined and discussed later.

Participants tended to indicate that supporting the teaching of all students included helping them engage in mathematics or be exposed to mathematics, helping them to be prepared to be high functioning members of society, and supporting their overall learning or understanding of mathematics. Participant responses related to supporting the teaching of diverse students spoke directly to issues specific to teaching to a diverse student population. While not all teachers in this study defined the two themes in the same terms, their descriptions focused teaching all students generally and diverse students specifically. Within their discussion, 11 distinct macro-functions consisting of a variety of micro-tasks were identified. These macro-functions will be presented together for both themes, but differences will be highlighted when they arise. In many instances, teachers and administrators talked about the functions and tasks similarly, however, they differed at times. These are discussed in order of how frequently they were mentioned or the importance placed on them by participants.

Relationships

The category of relationship includes the macro-functions of Goals/Expectations, Relationship Building, and Parent Involvement (for Teaching Diverse Students only). It

emphasizes encouraging students to learn, caring about students and their success, building their confidence, providing support in class that they don't get at home and being aware of their situation. All of the above micro-tasks together highlight the importance and interdependence of these macro-functions as detailed below. Tables 4 and 5 present the macro-functions and Table 6 and 7 present the micro-tasks for supporting the teaching of all students and for the teaching of diverse students for the category of Relationships.

Goals and expectations. Within this macro-function, there were several subgroups identified that could be combined to form four micro-tasks, namely: articulate goals/high expectations, expectations of students, paying attention to progress/meeting objectives, and ensuring understanding of progress by students. Each of these will be discussed below.

Articulating goals and high expectations. The important theme within articulating goals and having high expectations was that all expectations were high, the same for all students, and were known by everyone. Goals were not kept private, but all students and staff were aware of them. Seventeen of the 18 participants spoke passionately about articulating goals that reflect high expectations for students (to both teachers and students). Specifically, they indicated the importance of having and articulating high expectations for all students (e.g., boys and girls alike) and expecting all students to be successful. One teacher stated, "Everybody's expected to be successful in mathematics.....everybody is capable of learning it and being successful" (T08). The

teacher further stated that such a focus began at the top such that “[HoS] has really focused on having high expectations” (T08).

Expectations of students. This micro-task was more of a perception held by teachers and leaders. While the aforementioned micro-task of articulating goals and high expectations was related to the outward recognition, descriptions and how they were presented to students, the micro-task of expectations of students was more directed at the beliefs of participants and to the capabilities of students and helping to propel them to higher levels. Each student was expected to do well. This belief or sentiment was echoed by six participants, one of whom said, “We need to make sure they [students] understand that they can’t give up and not try” (C3-5). Another six participants described it in a slightly different way and talked about pushing students as high as they can go.

Paying attention to individual student progress and focus on meeting objectives.

This expectation involves paying attention to individual students’ progress to make sure they receive what they need in to reach their goals. This expectation is not only ensuring that all students succeed, but also that they have a voice and role in reaching their goals. In her definition and discussion of equity, one teacher indicated, “What’s fair and equal is not the same at all” (T08). She elaborated further by saying that, “What one child needs here is not what another child needs somewhere else” (T08). T04 expressed the same type of urgency and understanding as she stated, “I expect my boys and girls....to grow from where they are. It does not mean that they will all probably be at the same place at the end of the year....My goal is for them all to do well” (T04).

Ensure student understanding and growth. Interestingly, the only participants who spoke about ensuring student understanding of what they were expected to learn and their progress in their mathematics learning were two of the three parents. In defining excellence, both parents talked about leadership as "doing the best that you can at your level" (P1). In explaining how they know someone is leading for excellence, P1 continued by stating, "They are a leader because the child is getting it and grasping it and advancing [in mathematics], that shows that they [leaders] are doing their part" (P1). The second parent stated that you know someone is a leader because you are "...seeing improvement." (P2). One parent talked about the need for leaders to provide more support (for both the student and the parent) when students are first introduced to new content. The teacher takes into account the needs of the student and level of support available at home and provides the support to the student and parent in order to help the student learn. For students, this initial support may mean not being given as much homework, while for the parent it may mean having a better understanding of the content that their child is being taught. More specifically, the parent stated:

[Child's name] is really good at math, but when they first learn something--like the first time they started the division--they got two pages front and back sent home, and so I was trying to ...it was a disaster that night. I had another parent call me that has a student here as well and she was like, 'Do you understand it? She doesn't understand it.' So when they're first introducing something, maybe not as much homework to get them the hang of it and then say, 'Here you go, now you know,' because it was really overwhelming that night. (P1)

Relationship building. The second most frequently mentioned macro-function was building relationships, and this was emphasized multiple times by nine participants. Various micro-tasks comprised this macro-function, including getting to know students, their families, and communities, with an emphasis on building trusting relationships with them. One teacher emphasized the importance of relationship building stating, “A relationship is your building block... You learn what those children need because you have a relationship” (T01). Two participants emphasized that building relationships [with students] helps teachers better support students, with one teacher (T08) stating “once that relationship has been built, that helps you support and build their confidence.” Another participant surmised that relationships can be built through various means, including working with those who knew students from previous grades. In one instance, she recalled Coach K-2 helped her better understand one of her students who had not spoken to/with her for the first month of school. She concluded, “Everything is so focused on trust for them and if they don't trust you, they're not going to want to do anything for you” (T08). She went on to state that Coach K-2 helped build the relationship with the student since she had that student the previous year. “She [Coach K-2] had a lot of our kids last year as a 2nd grade teacher....she knows our kids already....just knowing our kids has been helpful”(T08) because Coach K-2 could answer questions from the new teacher and could help that student transition to both a new teacher and grade level. Given her knowledge of and relationship with the student from the previous year, Coach K-2 stopped in to check on him daily during a critical time of the year.

Table 4. *Macro-Functions for Relationships by Participant Group for Supporting the Students in Learning and Understanding Math*

Macro-Functions	“Formal” Leaders				Characteristic Response
	Administrators	Coaches	Teachers	Parents	
Goals/Expectations	CoA, HoS	IC, K-2, 3-5	T01, T04, T05, T06, T07, T08, T09	P1, P2	"What I expect from one student isn't always going to be the same as I expect from another, but I have high expectations for all of my students." (T09)
Relationship Building	HoS	IC, K-2	T01, T04, T05, T06, T07, T08, T09	P1, P3	"A relationship is your building block.....You learn what those children need because you have a relationship." (T01)

Table 5. *Macro-Functions for Relationships by Participant Group for Teaching Diverse Students*

Macro-Functions	“Formal” Leaders			Characteristic Responses
	Administrators	Coaches	Teachers	
Goals/Expectations		K-2	T07, T08, T09	"Every child would need to be and should expect to be presented with grade-level material, even if that is not necessarily accessible to all children at that time." (K2)
Relationship Building	CoA, HoS	3-5	T05, T06, T07, T08, T09	“We have seen a lot of growth in our students by just taking the time to learn and understand about who they are and where they come from.” (HoS)

Note. No parents provided responses that related to Teaching Diverse Students.

Table 6. *Macro-Functions and Micro-Tasks for Relationships for Supporting the Students in Learning and Understanding Math*

Macro-Function	Micro-Task
Goals/Expectations	<p>Articulate Goals/High Expectations for students (to teachers and students)</p> <p>Expectations of students</p> <p>Pay attention to individual progress/Focus on meeting objectives</p> <p>Ensure student understanding and progress/emphasize progress/growth by students</p>
Relationship Building	<p>Get to Know Kids/Families/Communities and Background/Build Trusting Relationship with them</p> <p>Provide Support in getting to know kids</p> <p>Encourage students to learn/Care about students/success/Teach Students to Support one another</p> <p>Support students/build their confidence/provide tools to succeed</p> <p>Provide support in class that they don't get at home</p> <p>Be aware of the situation</p>

Table 7. *Macro-Functions and Micro-Tasks for Relationships for Teaching Diverse Students*

Macro-Function	Micro-Task
Goals/Expectations	Articulate goals/expectations/progress to students
Relationship Building	Get to Know kids and Background
	Build Trusting Relationship with Students
	Provide Resources and materials to get to know students and support differentiation

In addition to teachers and leaders building relationships with students and families, one teacher mentioned students building relationships with and among each other. T01 focused on cultivating strong relationships inside the classroom through teaching students to support one another and to provide tools to students to help them succeed.

Instruction

The category of Instruction includes the macro-functions of Differentiation, Relevant Instruction, and Instruction. It emphasizes differentiating instruction via use of small groups to meet the needs of students, using a full inclusion model, engaging students and encouraging their participation, teaching mathematics for understanding, emphasizing the process rather than the solution, monitoring what is being taught, and tracking students' progress across time. Tables 8 and 9 present the macro-functions and

Table 10 and 11 present the micro-tasks for supporting the teaching of all students and for the teaching of diverse students for the category of Instruction.

Differentiation. This was the most talked about macro-function (or leadership practice), and it was mentioned by 13 participants (both administrators and 11 teachers). While most participants (10) tended to talk about differentiation in terms of ways to meet student needs through micro-tasks such as using small groups, others referenced other tasks (or ideas) including specific activities or strategies. One participant (Coach 3-5) said one important way to instruct students was by using pictures to assist in learning. Using pictures is an example of a tactic to assist visual learners but may also be helpful to all students. Using different strategies is one way to make sure each student can access the content and skills being taught.

Another way to differentiate instruction is to involve students in the choice of strategies they prefer. In other words, providing multiple modalities to teaching allow students to learn in ways that best meet their learning styles. One parent and two teacher participants spoke about letting students solve problems in multiple ways since there is not just one right way. Another teacher elaborated by saying, "so you [the teacher] present them [students] with many strategies so they can choose the one that works for them" (T07). However, the parent presented it as a request to allow for flexibility with instruction (e.g., to be more student centered) and making adaptations when students struggle.

One teacher participant stated, "so the homework that I give is very easy....stuff that they can do on their own" (T05). By giving easy homework, all students are given

access to the content. Yet another participant uniquely mentioned the micro-task (practice) of adapting homework based on the family bringing attention to the reality that some students "don't have parents that sit down and work with them" (T05). As a result, teachers need to adapt and differentiate homework based on individual student needs and situations. Finally, when talking about differentiation, two participants (CoS, T05) referenced the use of data to identify a student's needs, but Coach 3-5 cautioned not to overly focus on test data.

Relevant instruction. Making instruction relevant was a macro-function brought up specifically when talking about what teachers and leaders could do to help students learn primarily because of the student population they serve. One teacher summed it up by saying, "You are teaching them to actually apply their learning so they can take it back to life, and that is what you have to learn no matter what neighborhood you are in, you have to teach to the child" (T07). All participants discussed different related micro-tasks such as: articulating and emphasizing the importance of mathematics; actively engaging students via hands-on activities; modeling for students; encouraging and engaging students to participate, persevere and help each other (e.g., students as teachers); promoting community and active learning in classrooms; and the use of repetition.

Articulating and emphasizing the importance of mathematics. All categories of participants (administrators, teachers, and parents) talked about this micro-task in similar ways and highlighted its importance. The following quote from the head of school reinforced and summed up the role of distributed leadership in teaching mathematics when he stated, "That is why it is so important that we teach mathematics....these are

skills that we are teaching you that you are going to need for life" (HoS). The importance of learning mathematics was apparent in participants' responses (e.g., mention of the jobs and real world situations that require some knowledge of mathematics). One teacher participant alluded to the necessity of mathematics understanding to survive in the world. For example, students would encounter math to be able to use computers, to go to college, or to be able to figure out their payments. A parent participant added this about mathematics, "It's daily living, it's what our kids need" (P1). Similarly, making a real world connection during instruction was also discussed by the Instructional Coach when she mentioned the need for more community presence in the school. She reasoned that the importance of mathematics could come into play when trying to figure out ways to show students how using mathematics can help a greater purpose than their classroom and even their school. She asked, "How can we bring in community helpers...how can we bring them into the mathematics classroom to show you [students] the connection between what this person does and what you [students] are learning?" (IC).

Actively engaging students via hands-on activities. The emphasis on hands-on experiences was consistent across the school. According to three participants (T04, T05, T08), the use of hands-on instruction was emphasized from the top-down. The vision of the head of school is that students are active and engaged in learning. One teacher stated, "Our head of school wants everything to be hands-on and the kids moving" (T04). Another teacher stated that, "We try to make things as hands-on as possible" (T08). This teacher went on to state that while hands-on activities are encouraged, they are not

always easy, saying that, "A challenge is always going to be just the abstract thinking part of it [math]....trying to make things as hands-on as you can" (T08).

Model for kids. This micro-task was only mentioned by two participants (HoS, IC). Modeling was talked about in terms of modeling the use and practice of content specific language. The head of school talked about modeling in terms of correctly using terminology and concepts for the kids by stating:

...always making sure that we as the adults, are modeling the correct math vocabulary and when we are saying 'numbers', and we are saying 'whole numbers,' because that only confuses kids when they get into 5th grade and they start talking about decimals. Well, it's 100 and 42; well, no, it's 142; not 100 42. When they are [watching] TV, you hear those things on the radio, you hear those things, so it is about us modeling and practicing what we are preaching to the kids. (HoS)

Another participant (IC) talked about "leading by example" as modeling. When asked how she supports teachers in acquiring new subject matter and pedagogical knowledge, she noted:

I started teaching at a different district and this is my third year here at Madison. Although I came with background knowledge of general subject matter, the way that this Midwestern Public School District is asking teachers to implement it is new to me as it is new to the teachers. So, I take a collaborative approach to it. If this is the expectation for us, let's figure this out together and I'm noticing that

this could be a potential road block, let's problem solve how to make sure that doesn't happen (IC).

The saying "be the leader that you would want to lead you" applies here. It was obvious that modeling what it means to be a life-long learner, or to learn was beneficial to both the Coach and teacher participant.

Encouraging and engaging students to participate and help each other. Five teachers mentioned that making instruction relevant involved encouraging students to help each other learn. T01 supported this finding by sharing how she not only encourages and engages students to participate but also gets them to help each other learn by walking them through how they solved a problem. She said, "Sometimes I wait to see what they come up with because they've got an idea and they'll come at it from different directions, different ways. Then, I let them get up and say [how they did it]" (T01). Similarly, another participant shared what happened in their classroom stating that:

They [students] stand up in front of the class and share how they solved the problem, and I will usually choose somebody that has the wrong answer to share their thinking....'Can you help me teach them from what you did?' And the kids that got it wrong still feel like they are contributing. They don't shut down and get that math phobia....[I say] 'I need you to help me teach them. Is that okay with you?'....It is not a negative thing, so they like it. (T04)

It was evident that promoting student engagement and thinking was an important leadership task practiced in the school. T04 shared that "He [head of school] is good

about coming in and looking around and very good at questioning the kids about math when he comes in."

Promoting community and active learning in classrooms. Multiple teachers described their daily routine and emphasized how their classroom activities encouraged active learning. This particular micro-task was discussed by a teacher participant who detailed the classroom routines and daily schedules and how these promote community and encourage active learning. T07's description of the classroom routine serves as a good example of what occurs in multiple classrooms. She stated:

...the typical classroom would start out in whole group when we are all taking in what is going to be done that day. From that point, it goes into being a typical where they [students] are doing seat work where they are allowed to share because if it is not a testing situation, they should always feel they can go to someone else to ask questions and see their strategies. From the point of doing seat work, then it goes into independent practice where they take games and apply what we have learned on seat work and what we have learned on whole group, so now I can get a solid base for now I am applying the learning that I have had because it is kind of like Bloom's taxonomy, I have received it, now I have synthesized it in my seat work and now I am applying it into a knowledge level where I have experience with it and practicing it in playing with it in games. One corner of the math class would be dedicated to divergence where now I have different levels of learning going on within ability groups where, now, people who are wherever their ability level are pulled together in a like-mindedness so

now we can approach the area of need that would be like 5-6 kids may be in a group for maybe 15-20 minutes with their teacher to clarify some understanding that will help them pull that back into seat work and have that application. (T07)

Active learning is not silent. In active classrooms students are moving, actively talking or conversing with one another, and sharing and using information. If students feel like they are not grasping or getting something, teachers can encourage students to actively participate in the learning of the material. One teacher elaborated by saying:

You can present them with many strategies so they can choose the one that works for them where, in reading, I need to be basically silent and assimilating it in my head, math has to be something where I can talk, I can move it around, I can manipulate it, I have to be able to do this because, per se, 2nd grade is so visual anyway and they are so tactile, ...my tactile and my visual and have it make sense so now I can move that into my long-term memory and then apply it to pencil and paper. (T07)

Use of repetition. Repetition is about repeated practice and using multiple modalities. A participant (T01) argued for the use of repetition. She explained how she teaches her students to support each other through repetition. Specifically, she stated that if one of her students is not understanding a math concept like sphere, she will have the students sit in a circle and lay out three shapes, including a sphere, cylinder and cube. Next, she will have the student pass the shapes around and as they do, students will name each one aloud. By the time the sphere gets to the student who was having difficulty, he/she does get it. And, if s/he does, the entire class will clap for him/her. If he/she still

does not understand, they will try it again another time. Purposeful distributed practice can result in durable learning.

Instruction. Two teacher participants talked about the macro-function of instruction in terms of micro-tasks such as emphasizing the process rather than the solution or answers. One teacher stated, “We say in CGI [Cognitively Guided Instruction] that it is not the answer that matters...” (T04). She further added that students just like to share their thinking. She elaborated that to communicate the message and the emphasis on the process rather than the correct answer, students are told “it’s not like I am picking on you because you got it wrong” (T04). Three participants brought up the micro-task of engaging in the practice of gathering data via authentic assessments (rather than focusing on just tests) to both monitor student progress/growth and inform instruction. Finally, the head of school (HoS) spoke of instruction in terms of structuring and building a mathematics day in the classroom that is filled with different kinds of activities, learning, and experiences. Examples given included processes that students are engaged in extensive problem solving reflecting on real-life situations, problem-based learning activities, different groupings, and/or transferring the learning process to the medium of laptop computers.

Table 8. *Macro-Functions for Instruction by Participant Group for Supporting the Students in Learning and Understanding Math*

Macro-Functions	“Formal” Leaders				Characteristic Response
	Administrators	Coaches	Teachers	Parents	
Differentiation	CoA, HoS	K-2, 3-5	T01, T04, T05, T06, T07, T08, T09	P1	"You present them with many strategies so they can choose the one that works for them" (T07)
Relevant Instruction	HoS	IC, K-2, 3-5	T01, T04, T05, T06, T07, T08, T09	P1	“Making connections is important because if they can connect to the word problem, then they can....actually understand what is going on.” (T05)
Instruction	HoS		T04, T06, T07		Focusing on the test “is undermining the fluid thinking” (T04)

Table 9. *Macro-Functions for Instruction by Participant Group for Teaching Diverse Students*

Macro-Functions	“Formal” Leaders		Teachers	Characteristic Responses
	Administrators	Coaches		
Differentiation	HoS	K2, 3-5	T01, T04, T05, T06, T08, T09	“The main thing is understanding and knowing that out of your 20 kids, all 20 are going to be at a different spot. Being able to be diverse with what you’re teaching and if you can’t hit it from one way, try it another way to get them.” (T06)
Relevant Instruction	HoS	K2, 3-5	T01, T05, T06, T07, T08, T09	"And I try to make it [problems to solve] something that they can really connect with because it's their life." (T08) [e.g., uses Taco Bell and church dinners in problems)
Instruction			T07, T08	"I try not to help too much and just try it and even if you get it wrong, that's okay because we are going to correct it later....but you need to try it on your own first." (T08)

Note. No parents provided responses that related to Teaching Diverse Students.

Table 10. *Macro-Functions and Micro-Tasks for Instruction for Supporting the Students in Learning and Understanding Math*

Macro-Function	Micro-Task
Differentiation	<p>Differentiate Instruction to meet students' needs (e.g., small groups)</p> <p>Use Data to identify student's needs</p> <p>Don't overly focus on test data</p> <p>Use pictures to help students learn</p> <p>Adapt homework based on family</p> <p>Allow flexibility with instruction/adapt when kids struggle</p> <p>Use of multiple strategies</p>
Relevant Instruction	<p>Make Instruction Relevant</p> <p>Model for kids</p> <p>Articulate/Emphasize the Importance of Math</p> <p>Engage students/Hands-on/Active engagement</p> <p>Engage Students/Encourage participation/Students as teachers</p> <p>Promote community and active learning in classroom</p> <p>Collaboration</p> <p>Use repetition/distributed practice</p>
Instruction	<p>Emphasize the Process, not the solution</p> <p>Assessments/use of data</p> <p>Structure/Build Mathematical day in classroom</p>

Table 11. *Macro-Functions and Micro-Tasks for Instruction for Teaching Diverse Students*

Macro-Function	Micro-Task
Differentiation	Differentiate Instruction to meet students' needs (e.g., small groups) Use Full Inclusion Model
Relevant Instruction	Make Instruction Relevant Engage Students/Encourage student participation
Instruction	Teaching Mathematics for Understanding Emphasize the process, not the solution Monitor what is taught Track students' progress across years

Support

The category of Support includes the macro-functions of Teacher Support/Coaching and Resources & Professional Development. It emphasizes various aspects of teacher support and coaching as an essential component of effective professional development. Tables 12 and 13 present the macro-functions and Table 14 and 15 present the micro-tasks for supporting the teaching of all students and for the teaching of diverse students for the category of Support.

Teacher support/coaching. Participants repeatedly shared that the macro-function of supporting and coaching teachers along with the related micro-tasks were key to supporting students in learning and understanding mathematics. Participants from all four stakeholder categories (administrators, coaches, teachers and parents) talked about this support as critical but each group mentioned various aspects of teacher support and coaching including, but not limited to, the following:

- Observations and conversations;
- Provision of support in classrooms;
- Collaboration;
- Modeling and leading by example; and
- Discussions/feedback on lessons.

Each primary area will be discussed below.

Observations. This micro task was talked about in two different ways. For some, it had to do with providing opportunities for teachers to observe other teachers. One teacher said, “I went and observed her [colleague] for an afternoon and Mrs. [name] for another afternoon and I wish that I could do that again or do it more because I learned a lot” (T08). Another participant talked about the importance of coaches and administrators conducting classroom observations for the purpose of providing feedback that helps teachers better meet their classroom needs.

Meetings/conversations with teachers. In emphasizing the contributing role that a coach plays, one participant said, "You never leave their [teachers] side" (IC) despite the

teacher's frustrations as they work through challenges of diversity. In thinking about support of a new teacher, another participant discussed coaching and mentoring almost as interchangeable terms saying,

Have an administrator that understands new teachers. The first thing is understanding that there is going to be a lot of noise and a lot of chaos, and a lot of confusion of the kids and the teacher for that first year. That they [teachers] need someone who is going to be willing to go in and say, 'Hey! You are doing a really [good job] we are glad you are here.' You have to lift them up just like you have to lift the students. (T07)

Opportunities to collaborate. Participants cited not only the importance of collaboration as a teacher support strategy but also the provision of opportunities to engage in such collaboration. One example of a way in which opportunities to collaborate were provided to teachers was when they came together in Professional Learning Communities (PLCs) to look at student data and make instructional decisions. In regards to opportunities to collaborate to implement practices regarding student diversity and their math instruction, one participant noted the importance of collaboration and the manner in which such collaboration was undertaken by saying.

Well, for senior teachers, what we are doing now with this new curriculum, going in and talking about and introducing it, and looking at it and examining it and getting a chance to talk about it. For new teachers, the willingness for veteran teachers to come in and share and say, 'Oh, hey! You don't have to do this, but this is what I did with this, it might help you.' And do it in such a way that you

are not trying to be the know-it-all, but saying, ‘Hey! Let’s all talk about this.

(T07)

This teacher further elaborated on the importance of collaboration and having the opportunity to collaborate with colleagues and share ideas. The teacher talked about exchanging ideas and how she could “go into a meeting and just sit and listen, and I listen” (T07). Others spoke of collaboration in ways that blended with what other participants had shared but more generally related to accountability. She noted:

Because we (T05, T06, T07) will be held accountable for the explicitness of our direction, we will be held accountable for how we differentiate our lessons, and we will be held accountable for how our data trickles out. So that, in itself, would make us a leader in our classroom and, since we are kind of like a trifecta here, we definitely have to learn to lean on each other to ‘what did you do with this? What worked for you and how would you change this?’ So we can constantly be growing and getting into the new way of teaching. (T07)

Modeling. Modeling was a micro-task completed by the HoS and Coaches (K-2 and 3-5) as a part of leading by example. It was talked about by four participants (IC, C3-5, T04, and T08). One teacher shared, “Coach K-2 will come in model a lesson, and we will get together afterwards and talk about it” (T04). She further elaborated on another modeling example stating that,

The Head of School usually comes in to walk through or he will talk to the kids and they will question him, which is modeling as well. He is good to watch because he is great at mathematical questioning. He will also talk to me about

what was going on that was good, or what he saw with a kid who did not get it, or how I could maybe talk to that child to help them after the lesson. (T04)

Another participant stated:

I cannot speak highly enough of having someone in to my classroom. At the beginning of the year, Coach 3-5 would model a lot for me. I would ask him to teach like the very first day of large group of a new subject, so that was really helpful and I think a veteran teacher would most likely have more of a difficult time just teaching things the way that we need to teach them now, for sure; because if t's difficult for me, it's probably really difficult for someone who had been doing it for 15 years and then now has to try to do it a different way. (T08)

As described by participants, it is clear that for new teachers, modeling by a more experienced leader has a huge impact and is useful for teachers.

Provide support in classrooms. Administrators (CoA, HoS) talked about providing support in classrooms, but their perceptions differed slightly from those of teacher participants (T07, T08, T09) and all were in reference to Coach 3-5. For example, the Head of School stated, “We have our in-class support teacher Coach 3-5 who is doing a phenomenal job always being willing to do whatever it is that it takes to get our kids to learn the proper mathematical processes that we need them to. He also does a great job with working in collaboration with our 3-5 grade teachers to help support what they are doing in the classroom.”

The teacher participants' view of support in classrooms was a combination of “giving him [Coach 3-5] my lower group so he can work on different things with them”

(T09). Additionally, Coach 3-5 has given support in the form of giving teachers ideas and materials/resources as well as showing them “how to do” certain things related to mathematics teaching and learning (e.g. support classroom management) and how to manage their materials in a way that will make them last. Providing resources/materials and time to prepare them was an important support to teachers because some reported, “I have spent a lot of money on pencils and dry erase markers this year and so that’s a challenge” (T08). Also, “you need a lot of things to teach math and another challenge has been time to prepare them. Coach 3-5 had been a huge help” (T08).

One of the teachers talked about support in terms of who she turns to when she needs help. She mentioned that “Coach 3-5 would be the first person I would turn to, for my in-class support” and then identified other teacher colleagues and HoS as those who provided support in the classroom. One teacher mentioned support provided by Coach K-2 stating that “she comes and meets with us and prepares us for what we are going to teach next and gives us more understanding of the topic” (T05). Another teacher commented that “Coach K-2 is my instructional coach for math and so I go to her for, like, this unit is fractions, so she gave me a Marilyn Burns kit to use” (T08).

Resources and professional development. This macro-function differs from the micro-task of providing support in the classroom presented above as it focuses more specifically on resources and professional development. This macro-function had two associated micro-tasks. The first was to provide professional development to all teachers and staff, and this task was mentioned by both the administrators (CoA and HoS). Expanding on the first micro-task, CoA asserted the importance of providing effective

professional development in tandem with a clearly articulated curriculum. Two teacher participants (T01 and T06) both added another dimension to the second associated micro-task specifically that of providing differentiated support to staff and providing the resources and tools needed. The differentiated support that the HoS provides to new teachers included taking them to annual professional development workshops or conferences, which extended beyond providing the tools they need to distributing and building their leadership capacity. In the end, it is about “Helping them [teachers] shine with their strengths and helping build up the parts that do not feel as comfortable or as strong with” (CK-2).

School Climate

The category of School Climate includes the macro-functions of Leadership Characteristics, School Climate, and Consistency. It emphasizes various attributes and aspects brought to the table including respect for diverse thinking, openness to multiple ways of being/doing/knowing and, common themes/experiences in place across the environment, students and teachers. Tables 16 and 17 present the macro-functions and Table 18 and 19 present the micro-tasks for supporting the teaching of all students and for the teaching of diverse students for the category of School Climate.

Leader characteristics. Among the characteristics of a leader that came up across seven participants (CoA, IC, T04, T05, T06, T08, and P3), were personal and professional attributes herein summarized in the order of most discussed: being knowledgeable, background and experience (e.g., content and classroom management), keeping current on research, and having a positive attitude towards mathematics.

Table 12. *Macro-Functions for Support by Participant Group for Supporting the Students in Learning and Understanding Math*

Macro-Functions	“Formal” Leaders				Characteristic Response
	Administrators	Coaches	Teachers	Parents	
Teacher Supports/Coaching	CoA, HoS	IC, 3-5	T04, T05, T06, T07, T08, T09		“I cannot speak highly enough of having someone into my classroom...Coach 3-5 would model a lot for me. I would ask him to teach like the very first day of large group of a new subject, so that was really helpful.” (T08)
Resources and Professional Development	CoA, HoS	K-2	T06		"Helping them [teachers] shine with their strengths and helping build up the parts that do not feel as comfortable or as strong with" (K-2)

Table 13. *Macro-Functions for Support by Participant Group for Teaching Diverse Students*

Macro-Functions	“Formal” Leaders		Teachers	Characteristic Responses
	Administrators	Coaches		
Teacher Supports/Coaching	CoA, HoS	IC, K2	T04, T06, T07, T08, T09	"You never leave their [teachers] side" despite the teacher's frustrations as they work through challenges of diversity. (IC)
Resources and Professional Development Support	CoA, HoS	K2, 3-5	T06, T07	“I actually take a group of staff members every year now to a professional development. [Presenter] does a phenomenal job of making math fun and teaching math in various different ways.” (HoS)

Note. No parents provided responses that related to Teaching Diverse Students.

Table 14. *Macro-Functions and Micro-Tasks for Support for Supporting the Students in Learning and Understanding Math*

Macro-Function	Micro-Task
Teacher	Observe/Observing in the classroom
Supports/Coaching	Conversations about framework Streamline support structures Provide support in classrooms Encourage Collaboration/Provide Opportunities to Collaborate Modeling /Lead by example Give examples/directions Meetings/Conversations with Teachers Discussions/Feedback on lessons Answers questions
Resources and Professional Development	Provide Professional Development Provide differentiated support /resources/tools

Table 15. *Macro-Functions and Micro-Tasks for Support for Teaching Diverse Students*

Macro-Function	Micro-Task
Teacher	Coaching
Supports/Coaching	Provide Support
	Model
	Teaching Teachers
	Feedback
	Support/Oversee Implementation
	Provide opportunities for teachers to observe one another
	One-on-one observations
	Encourage collaboration/Collaborate with each other
	Talk with Teachers/Conversation with Teachers
Resources and	Build trust/relationship with teachers
Professional	Provide foundations pieces/structure
Development Support	Provide professional development
	Ideas/Suggestions to teachers
	Provide resources
	Advocate for needed resources/support

In defining a mathematics leader, IC talked about a person who is knowledgeable, further stating that a leader is:

Someone who understands the scope and sequence from Kindergarten through the top of whatever their area of expertise is (whether they are elementary or upper level). They understand how one thing leads to another. Understanding foundational skills first and how those are built is a characteristic of a strong mathematics leader, so knowing how to properly identify a problem if a student is experiencing it in mathematics, meaning what must they need before this skill is required, and how can we fill in the gaps, if you will. (IC)

Along the same lines, another teacher added that a leader is someone who is “multifaceted” and elaborated that,

It is more than just having a math facilitator, it is more than having a classroom teacher, it incorporates title, special ed; it incorporates collaboration within your team and within the building. It includes having a knowledgeable level of understanding of data and how to use that data for differentiating instruction. (T05).

A third teacher described how all teachers were leaders, but that each teacher brings their own experiences to the table as they help each other. This teacher stated:

Finally, it takes leadership as far as ourselves but even more so, veteran teachers who have been here longer that you can ask questions. They provide you with information or knowledge before you ask because they know you are going to need it. (T06)

Keeping current on research was a professional attribute /characteristic that was welcomed in a mathematics leader in that it provides the basis for the work of supporting teachers. One teacher participant assessed:

Since I learned about CGI [Cognitively Guided Instruction] from an identified math leader, I have realized how much more the students are capable of. I am a much better teacher now that I understand that I can push them to that point.

When I first started teaching, I didn't fully understand what they [students] were capable of. They are so little and I think there were really no standards when I started teaching years ago. (T04)

Leadership of teaching and learning are critical roles of a leader, hence the need to keep abreast of current research / changes in the field so that they are better able to share or integrate new pedagogic practices that directly result in classroom /school Improvement. Cognitively Guided Instruction (otherwise referred to as CGI) is an example of a research based approach to teaching mathematics that a leader knew about and then in turn shared that research approach with a teacher (one of the study participants). CGI builds on children's natural problem-solving strategies. CGI identifies specific strategies students use to help teachers understand how students think so that they can guide them toward mathematical understanding. This innovative leader's action emanate from a view of teaching and learning that includes building teacher capacity through sharing current research approaches to inform practice.

Given the often negative talk about the challenges of mathematics, leaders who portray a positive attitude toward this subject or content area may not only boost

teachers' level of confidence in the teaching and supporting of students in their mathematics learning but also affect accessibility and mindset. One participant likened having a mathematics leader with a positive attitude to having a sport coach, stating:

The way s/he has meetings or s/he will tell us really bad news like, 'Hey, we are not cutting it;' and they [students] can do it and we are going to do it and we are going to get there, period.' Not a 'You're a terrible teacher.'

This shows [leader] interest, encourages and tells teachers they will be supported; as well as reiterates the importance of promoting a positive school climate.

School climate. While no administrators mentioned school climate, five participants talked about the importance of this macro-function. Coach 3-5 explained that school climate had to do with being open to other ways to solve a problem or views that differ from your own, not using a top-down approach, and the importance of how ideas are presented. Four teachers opined that school climate was about allowing flexibility in instruction, supporting math as a priority, and leaders (i.e., HoS) trusting teachers and letting them work independently. One teacher who felt that flexibility was absent at a previous building where she worked, felt that lack of flexibility was a negative aspect of leadership, noting that flexibility is important so that teachers can adjust as needed. She stated, "Not here so much, but at another building I worked at – it was just, 'keep going.' You need to hit the pacing guide; it was all about the pacing guide. How do you keep going in math if they don't understand quantity? You can't. It doesn't work" (T04).

Consistency. Providing consistency was an important macro-function identified by both the Central Office Administrator (CoA), Head of School (HoS), Instructional

Coach (IC), three teachers (T04, T06 and T07) and two of the three parent participants (P1, P2). While parent comments tended to focus on consistency in the daily routine, both administrators elaborated and referred to consistency in terms of content, structure, assessment, expectations and daily routines. In addition, they also spoke of consistency as the use of correct mathematical vocabulary to prepare students and help them understand what was important across the board (e.g., across all areas of learning including gym and music). However, the two teachers (T04 and T07) differed slightly from administrators by talking about consistency in terms of the need for common goals and expectations of students. Additionally, these teachers mentioned coordination across grades so that students are presented with a consistent vocabulary and other learning aspects to help guard against barriers to a positive start to a new school year. For example, one teacher described that some activities are no longer done in kindergarten, hence she believes that students are behind when they start first grade. As a result, the teacher stated, "So I am always way behind. We get caught up, but I am behind the pacing guide" (T04).

Results for Parent/Family Connection

Similar to the results for supporting the teaching and learning for all students and for teaching for diversity, multiple macro-functions were identified for the Parent/Family Connection. The results will be discussed within the categories listed below, the first three of which mirror the results presented above:

1. Relationship: Getting to know families;
2. Instruction: Make instruction relevant;
3. Support: Teacher support and resources; and

4. Parent Involvement: Communication, Educating/support parents, Encouraging parent/child engagement/involvement, and Inviting/welcoming parents.

The additional grouping for Parent Involvement was a theme that arose separately from the other two, but it also was mentioned by a few teachers when they spoke about teaching for diversity. Table 20 presents the macro-functions and Table 21 presents the micro-tasks for Parent/Family Connection.

Relationship

When participants talked about parent involvement, the macro-function of relationship focused on getting to know the families and their backgrounds and needs. The re-occurring theme among parent participants in this category was that a leader is someone who cares for students. Participants named several individuals as math leaders at Madison. In almost all cases it was someone they or their student(s) have or have had a close relationship with. In justifying why they chose that person, one parent (P3) disclosed:

“ I’ve sat down and had my personal conversations with her and she is deeply concerned about the children at Madison School.”

On the other hand, for these four teacher participants (T04, T05, T06, T07), getting to know parents beyond “this is what your student is doing to actually have a connection with them” (T05) similar to the relationship described by parent (P3) is challenging. Another teacher participant (T01) went about getting to know her students by paying attention to their conversations.

Table 16. *Macro-Functions for School Climate by Participant Group for Supporting the Students in Learning and Understanding Math*

Macro-Functions	“Formal” Leaders			Parents	Characteristic Response
	Administrators	Coaches	Teachers		
School Climate		3-5	T04, T07, T08		<p>“Not here so much, but at another building I worked at—it was just, ‘Keep going.’ You need to hit the pacing guide; it was all about the pacing guide. How do you keep going in math if they don’t understand quantity? You can’t. It doesn’t work. “ (T04)</p> <p>(continued)</p>

“Formal” Leaders					
Macro-Functions	Administrators	Coaches	Teachers	Parents	Characteristic Response
Leader Characteristics	CoA	IC	T04, T05, T06, T08	P3	"It takes leadership as far as ourselves but even more so, veteran teachers who have been here longer that you can ask questions. They provide you with information or knowledge before you ask because they know you are going to need it." (T06)
Consistency	CoA, HoS	IC	T04, T06,T07	P1, P2	“Follow the same format, no matter what grade level you are in” (IC)

Table 17. *Macro-Functions for School Climate by Participant Group for Teaching Diverse Students*

Macro-Functions	“Formal” Leaders		Teachers	Characteristic Responses
	Administrators	Coaches		
Leader Characteristics	CoA	K2	T08	“I had a wealth of experience in terms of where children are at different grade levels and what they need to move on to the next grade level....I had a lot of information and experience and what to fall back on if they are not quite where they need to be, what we can try to get them to move forward.” (K2)
School Climate	CoA, HoS	K-2		"You have to be willing to change what it is that you are doing all the time to meet these little buddies' needs" (K2)

Note. No parents provided responses that related to Teaching Diverse Students.

Table 18. *Macro-Functions and Micro-Tasks for School Climate for Supporting the Students in Learning and Understanding Math*

Macro-Function	Micro-Task
Leader Characteristics	<p>Knowledgeable/Background/Experience (content and classroom management)</p> <p>Positive Attitudes towards math</p>
School Climate	<p>Open to other ways to solve a problem/views that differ from your own</p> <p>No top-down approach/importance of how ideas are presented</p> <p>Allow flexibility in instruction</p> <p>Support of math is a priority</p> <p>Leader trusts them and lets them work independently</p>
Consistency	<p>Consistency across all buildings (Curriculum, Structure, Assessment, Expectations)</p> <p>Consistency in Content/Structure/Daily Routine</p> <p>Use correct mathematical vocabulary to prepare students/help them understand (across all areas, e.g., gym, music)</p> <p>Common goals/expectations of students</p> <p>Coordination across grades (so students aren't behind when begin new year)</p>

Table 19. *Macro-Functions and Micro-Tasks for School Climate for Teaching Diverse Students*

Macro-Function	Micro-Task
Leader Characteristics	Knowledgeable
	Background
	Supportive Attitudes
School Climate	Flexible Hiring Practices
	Constantly Adapting/Flexibility
Consistency	Consistency across all buildings
	Common Goals/Expectations
	Emphasize use of correct mathematical vocabulary/terminology
	consistently across subject areas (e.g., gym, music, math, etc.)

They'll often talk about it. Like one little boy yesterday said he just didn't feel well and he said, 'I didn't have a cover last night; my brother took my cover!'

And boy, he started getting a fever around 1:00 p.m. yesterday. They talk about 'I have a dog that I lost.' Or one little girl has a little brother that stopped breathing.

He was a baby and I did ask Mom, 'Is that really true?' And she said, 'Yes, it is.'

And I said, 'Oh, I'm so sorry.' She said, 'Yeah, I still hurt from it.' (T01).

She also recognizes the fact that, "A relationship is your building block." She stated,

"I've got one little girl and she...she has issues. Sometimes all I do is just open my arms out like this and then she comes. She says "I don't want to do it."

There's love for you. Now, that doesn't work with everyone; it'll work with her. It won't work with the boy who's got anger, but it'll work with her. So when she will start watching someone else count, then it's your turn, all right, well then maybe she'll do it; if not, let's wait. You learn what those children need because you have a relationship. (T01)

Instruction

Instruction was related to parent involvement for both teachers and parents. When it comes to instruction, parent participants reported that the right support and relevance were key. For teachers, planning lessons and homework was impacted by the involvement (or lack thereof) of parents. One teacher noted that what was planned for class hinged on what was completed at home given the amount of support from parents. The teacher stated:

My planning and instruction, I mean, if it's something that's harder that I know they may not get support at home, I have to spend more time on it in here, so we can't move on as soon because I know no one went home and helped him that night, so it's okay, we are going to review this tomorrow." (T09)

Another teacher talked about using manipulatives and activities that the students see at home and might be able to talk with their parents about, stating, "Math is fun, and you get to use all the manipulatives and you get to use the clock and things they go home and see" (T01).

When it comes to instruction, parent participants reported that the right support and relevance were key. Parents need support when they are expected to help their

children. While they may have gone to college themselves or have their GED, they still need support to work with their kids and help with homework. Parent 3 captured this well when she said:

Mathematics was very hard for me when I was going to school. It still can be challenging for me at times, but I know if I have the right teacher and the right support behind me, I can get through that. I know that because 3 years ago, I got my GED. Math was my hardest subject, and I got through it through my teachers at the community college. (P3)

Another parent reiterated the importance of support because he/she was taught math a different way, stating "...they're teaching things different nowadays. I could see how hard it would be for a parent who doesn't have schooling at all to help kids" (P02).

One teacher gave an example of how she encourages parents to help their child at home. The teacher provided an example of an activity and stated,

We have small groups every day, and so I will count with them [students] and do 5s and 10s-10, 20, 30 like that, but if they are stuck, sometimes they will get to like 39, uh 80! 39, uh 50! You know, they just don't know what's next and so I will write down on a card [3x5'], "Can you please help your child count to 39? And then I put an arrow_--keep going. Maybe 39 to 59, something like that, and if I see them, I explain what that means. Otherwise, I just give them the little card with their name on it. (T01).

So this exemplifies not only having to adapt instruction to make it relevant to what the child knows, but also communicating to parents where they can help support their child

as they work with them to learn more and progress.

Additionally, parents emphasized the importance of math. One parent stated that teachers should stress the importance of math, stating “It’s daily living. It’s what our kids need. If you don’t encourage them to do it, they’re not going to do it.” (P1). Another parent mentioned that teachers should have high expectations of all students, saying that instruction should involve “being equal with everybody, expecting the same behaviors, expecting the same academic achievement from everybody” (P2). Even though learning may be hard, parents believed that the teacher “encourages the kids to learn math and not give up” (P1). Finally, one parent stressed the importance of consistency in instruction across teachers. This parent stated, “They [teachers] have to all be kind of on the same page of how to teacher it....teaching it the same way. They, all the children will be on task with it” (P1).

Support

Participants mentioned support related to parent involvement in two ways: Teacher support and Resources. Formal leaders discussed parent involvement from this standpoint, rather than teachers and parents. From the formal leader perspective, this is what they emphasized related to the parent connection....namely, supporting their teachers in doing so.

Teacher support. Teachers need support in nurturing parent involvement and a connection between home and school. The CoA talked about the New Teacher Mentor Support Program as one way that teachers are supported in involving families. The CoA stated:

[New Teacher Mentor Support Program implemented to] support them in the classroom and help them, you know, get a better understanding of their students, build those relationships, and establish trust with families, that was a huge piece of their work, as well as obviously their instructional practices. (CoA)

Resources. In addition to supporting teachers in getting to know their families, the CoA also talked about resources provided to teachers and families to support student learning. These resources were in the form of communication as well as online resources. Specifically,

One of the pieces that we are working to improve is our communication with parents and families regarding math instructional strategies and different ways that they can support their students at home with these math concepts.....There is also, with our online components, opportunities for kids to access different things from home on any device that they may have. I think we have very few families without access to any devices at home, so those types of opportunities just to practice and for parents to kind of engage with their students right alongside them. Those online components is huge because the technology provides the scaffolding and the parents, they are kind of engaging with their child and learning that concept as well.” (CoA)

Parent Involvement

Communication. This has to do with different aspects and ways of communication. One aspect was how the school/teachers say they communicate versus how parents feel they get communication. The school/teachers indicated communication

with parents and families happens via phone calls, calendars, etc.; that they also send communication in the students' native language or via interpreters; communicate children's progress to parent(s); listen to parent(s) feedback and concerns.

However, communication was defined differently by participants. Not all aspects of communication were found to be positive. For example, things were more negative at times. These sentiments were shared by five teachers (TO4, T05, T06, T07, T08) and Central Office Administrator (CoA) who said communication goes home, but that sometimes calling does not work (which indicates that there are challenges with getting in touch with parents). Parent also said lack of communication was an issue, and these were parents who likely were more involved parents, and they were stating that there was a lack of communication.

Another lack of communication example had to do with the school not telling parents about the new curriculum, programs. As one parent (P3) put it "I don't think anything has been said about the new programs [to start next school year]."

Parents were also saying that a commitment to promoting the academic success of students at Madison in general and their individual children specifically involved communicating well. "One of the pieces that we are working to improve is our communication with parents and families regarding math instructional strategies and different ways that they can support their students at home with these math concepts.....There is also, with our online components, opportunities for kids to access different things from home on any device that they may have. I think we have very few families without access to any devices at home, so those types of opportunities just to

practice and for parents to kind of engage with their students right alongside them. Those online components is huge because the technology provides the scaffolding and the parents, they are kind of engaging with their child and learning that concept as well” (CoA).

While there were some negative aspects related to the communication of math strategies, not all communication was found to be lacking. One parent noted that teachers were good at communicating the progress of their child, stating “They always positively reward him or write down on his homework what he is doing” (P3).

Educating / Supporting Parents. All three parents interviewed, as well as the HoS, CoA, and two teachers T06 and T08 expressed the need to provide support educational support for parents. All three parents specifically talked about the need for teachers to ensure they [parents] understood the homework themselves in order to be able to help their children. Referencing the division homework, one parent stated “a lot of children struggled with that, so people contacted her [meaning –teacher] and talked to her.” ...p1) so, communicating with and providing more support when first introduced new content was critical. This Parent’s need for support echoed across parent participants (as well as formal leaders and teachers themselves) who declared “We have to do a better job at educating them on the new things that we are using so that they can better help and support their children when they come home” (HoS).

Parents indicated that they needed additional support because they were taught math a different way. Parent 2 reported:

I try to help them, but sometimes it's a little difficult because I learned math one way, the old-fashioned way, and so when I'm trying to help, even my oldest ones, I no longer can help.... I was trying to help [Student Name]. He had word problems... You went to the store, you bought 3 candy bars, each candy bar was 55 cents, you paid with a \$20 bill, how much change will you get back? Well, I would have done 55×3 , and then 20 minus whatever it is. But I tried to tell him that you need to borrow, and he doesn't use the word 'borrow.' He says, "We need to regroup." I didn't know how to do that, because we were taught a different way. I even showed him how to check his answer to make sure it was correct, and he went to school and said, 'Oh, Mom, I know how to check my answer now.' I said, 'I told you yesterday'. But he just wasn't understanding. It's hard and I have college. But they're teaching things a different way nowadays. I could see how hard it would be for a parent who doesn't have schooling at all to help their kids. (P2).

Encouraging Parent/Child Engagement /Involvement.

In this section, I share the data or specific quotes related to encouraging parent/child engagement and involvement. Participants mentioned a variety of ways that parents were encouraged to become more involved. Parent 2 noted that "The school wasn't doing so well and once the Head of School (HoS) got there, there were a lot of positive changes." Among the things that were not going well is getting parents involved by engaging with their children be it at home or coming to the school. During a classroom observation and Staff meeting I sat in/observed, Teachers also shared the

frustration at this lack of involvement and the negative impact on student learning largely due to the number of parents incarcerated, in drug treatment centers, or homeless shelters.

The School encourages parent/family involvement by organizing events such as Parent-Teacher Conferences, Family Nights, and field trips. While most parents don't participate, Parents like P2 who was a para-educator at Madison School for 10 years before gaining a scholarship to be trained to now teach ELLs in the district has always been actively involved in her children's education and school activities. This is her 3rd child to attend Madison. She mentioned, "I like that they have a family night. I remember when I went on a field trip (P2).

There are other structures to engage parents. For example, assigning work to be completed outside of school, thereby creating space for the parent and child to engage. Note the following example provided by one teacher participant... "They've [student] got something in their head that they are going to go home and prove to their mom and dad." (T01 - when learning about clocks and writing times). And, for parents to help their child with homework or navigating through the process. Parent (P2) opined, "Usually I check his [her son's] work to make sure it's correct. Sometimes, he is messy; he does things very fast so I have to check it and make sure that if it's too messy, I'll have him redo it, just have him erase everything and redo it."

Inviting/Welcoming Parents. Given that relationships with families is really important to the well-being of a school and students, inviting and welcoming parents is essential to a school's success. Teachers participants (T07) mentioned that "Parents are invited to come in if they want to come in." (T07); She continued "we encourage parents

to come in and ask questions, and a lot of times they will go to the ELL department and she [ELL Teacher] will bring them down and explain to me what their concern is.” (T07). “When the community come in like on Fun Night, show them through fun things what you are actually accomplishing in math...you have to make it something that is going to involve them.”(T07).

Aspects of the Situation

Spillane (2005) described that leaders “also have interaction with aspects of the situation” which includes structures, routines, and tools. During interviews, mention of any aspect of the situation was coded. In addition to Spillane’s three aspects of the situation, a fourth aspect was identified that represented the background of the students and environment in which teachers were located (e.g., the diversity of the students and community). Within each aspect, participants identified and talked about a variety of examples of aspects of their situation. Table 22 summarizes the aspects of the situation for supporting the teaching and learning of students and supporting teaching diverse students by participants. Table 23 summarizes the aspects of the situation for the parent connection by participants.

Structures. Participants mentioned three primary structures: professional development, meetings, and math night. While administrators and coaches mentioned all of them, teachers only mentioned meetings. Based on my observation/participation as well as data drawn from participant interviews and collected artifacts (Weekly Building Team Meetings Schedule), typically, teachers met weekly (Wednesdays) in grade-level team meetings. All team members contributed topics or agenda items prior to or at the

Table 20. *Macro-Functions for Parent Connection by Participant Group*

Macro-function	“Formal” Leaders				Characteristic responses
	Administrators	Coaches	Teachers	Parents	
	Relationship				
Get to know families			T04, T05, T06		"Getting to know them beyond 'this is what your student is doing', and actually having a connection with them." (T05)
	Instruction				
Make Instruction Relevant			T01, T09		“My planning and instruction, I mean, if it’s something that’s harder that I know they may not get support at home, I have to spend more time on it in here, so we can’t move on as soon because I know no one went home and helped him that night, so it’s okay, we are going to review this tomorrow.” (T09)

Table 20 (continued)

Macro-function	“Formal” Leaders				Characteristic responses
	Administrators	Coaches	Teachers	Parents	
Support					
Teacher Support	CoA				“[New Teacher Mentor Support Program implemented to] support them in the classroom and help them, you know, get a better understanding of their students, build those relationships, and establish trust with families, that was a huge piece of their work, as well as obviously their instructional practices.” (CoA)
Parent Involvement					
Communication	CoA		T04, T05, T06, T07, T08	P1, P2, P3	"They always positively reward him or write down on his homework what he is doing." (P3)

Table 20 (continued)

Macro-function	“Formal” Leaders		Teachers	Parents	Characteristic responses
	Administrators	Coaches			
Educate/Support	HoS, CoA		T06, T08	P1, P2,	"Teaching the parents and the families how to better
Parents				P3	help their kids because they want to, they just don't have time or they don't know how." (T08)
Encourage		K-2	T01, T04,	P1, P2	“At the beginning of every unit, I always have the
Parent/Child			T06, T07,		kids interview someone at home, you know, for
Engagement/Involvement			T08		geometry and measurement, what are some things that you measure at home? What are some things you are using in your job? And that is then, I mean, it’s like a 2-question homework assignment that the kids bring back and then they share.... we have people whose family works in Taco Bell and they use it there, and things like that have been good.” (T08)

Table 20 (continued)

Macro-function	“Formal” Leaders		Teachers	Parents	Characteristic responses
	Administrators	Coaches			
Invite/Welcome			T07		"We encourage parents to come in and ask questions, and a lot of times they will go to the ELL department and she will bring them down and explain to me what their concern is." (T07)
Parents/Community					"When the community comes in like on Fun Night, show them through fun things what you are actually accomplishing in math....you have to make it something that is going to involve them." (T07)

Table 21. *Macro-Functions and Micro-Tasks for Parent Connection*

Macro-function	Micro-task
Communication	Communicate with parents/families (e.g., calls, calendars, etc.)
	Send communication in native language or via interpreter
	Communicate child progress to parent
	Listen to parent feedback/Concerns
	Lack of communication (about new curriculum, programs)
Teacher Support	New Teacher Mentor Program (helps new teachers build relationships with families)
Resources	Provide online resources (e.g., math coordinator created/updates website)
Educate/Support Parents	Educate parents/Answer parents' questions about curriculum and materials
	Provide more support when first introduce new content
	Provide Information to support students at home
	Provide support/help to parents to help them help their child
Make Instruction Relevant	Use examples in class that they might see at home
	Adjust lessons based on parent support at home (or lack thereof)

Table 21 (continued)

Macro-function	Micro-task
Encourage	Encourage students to tell parents what they learned at school
Parent/Child	Send cards home explaining how parents can help/what to work
Engagement/	on with their child
Involvement	Provide homework that involves parents
	Encourage Involvement
	Engage Families/Get them to come to school
	Hold parents accountable
	Provide Opportunities for Involvement/Provide events for involvement
Get to know families	Understand background of families
	Get to know parents/Sit down and talk to them
	Build relationship/Trust with families
Invite/Welcome	Reach out and invite parents into school
Parents/Community	

very beginning of the meeting. During these meetings they discussed and provided input on what needs to be taught, what the progressions for each standard should be, and as a team communicated what should happen next and what various individuals should do. The responsibility for the next step rest on not only the grade level teachers but was distributed to also “include the Head of School, Instructional Coaches, and support staff “(T05). One participant stated that during grade-level meetings

...if someone has a different idea for a test or review for a test or something because everything is so laid out” [in the district pacing guide] or if someone is wondering “what are you guys doing for this and what are you doing for that? We follow the pacing guide, and so if someone wants to divert form using it, they might bring something up and ask but, for the most part, we are all on the same page. (T06)

Routines. Participants mentioned four primary routines that comprise their situation. “Situation” in terms of distributed learning. These were: Daily classroom schedule/routines, 90-minute math, Evaluation (Classroom), and Meetings (e.g., weekly, monthly, bi-monthly). All administrators, coaches and teachers emphasized daily classroom schedule and routines. However, only the Head of School talked about the number of minutes that mathematics should be taught. The Instructional Coach solely discussed classroom evaluation. One teacher talked about routinely receiving direction either from the HoS or Coach K-2 on a weekly, bi-weekly basis or during monthly meetings. One of the artifacts collected during this study was a copy of one of the bi-weekly newsletters from the HoS with information and several directions about schedule

updates, and upcoming changes in the mathematics curriculum, and scheduled professional development around the new standard based curriculum materials.

Tools. Participants mentioned a wide variety of tools that they used to carry out the leadership practices to support student learning (made up their situation) or they were available to them as they worked to support student learning. Table 6 lists all tools mentioned by participants. The tools included below, were named by participants between three and eight times (beginning with the ones most mentioned): Manipulatives (8), Assessment (formative)(6), Student Data (6), and the Common Core State Standards (6), Rubrics (5), devices/technology (3), curriculum planning or pacing guides (3), white/smart boards (3), hands-on activities (3), charts (3). There were differences in the tools discussed by administrators/coaches versus those mentioned by teachers. Often, teachers focused on classroom-related tools, while administrators focused on instructional frameworks and tools geared towards system-ness or tools that impact the system as a whole. For example, based on the document analysis conducted on the various institutional artifacts collected as part of this study, formative assessment was a district-wide strategy documented in both the *District Comprehensive Improvement Plan* (DCIP) and the School's (research site) *Improvement Plan* (SIP) in not only mathematics but also reading and science.

Of the most frequently mentioned tools, one that was common across all categories of participants, was manipulatives. Defined as something designed for the purpose of helping a learner perceive some mathematical concept by manipulating it,

Table 22. *Aspects of the Situation for Supporting Teaching and Learning of Students and Teaching Diverse Students by Participant*

Aspects	Examples	“Formal” Leaders		
		Administrators	Coaches	Teachers
Structures	Professional Development	HoS	K-2	
	District PLCs	CoA		
	New Teacher Mentor Program	CoA		
	Grade Level Team Meetings		IC	T06, T09
	Math Meetings		3-5	
	Meetings/Wednesday meetings	HoS	3-5	T01, T08, T09
	Math Night		3-5	
Routines	Daily classroom schedule/routine	CoA, HoS	IC, K-2	T04, T05, T06, T07, T08, T09
	90-minute math/weekly mentor meetings	CoA, HoS		
	Evaluation (Classroom)		IC	
	Monthly PLC Meetings	CoA		
	Meeting (weekly, monthly, bi-monthly)			T06

Table 22 (continued)

Aspects	Examples	“Formal” Leaders		
		Administrators	Coaches	Teachers
Tools	Instructional materials/strategies	CoA, HoS	K-2	
	Instructional framework	CoA	K-2	
	Assessments (formative)/Tests/Quizzes	CoA	IC	T04, T05, T07, T09
	Student Data/Trends/Scores/Data Walls	CoA	IC, 3-5	T04, T05, T07, T09
	Units			T07
	Rubrics/Proficiency Rubrics	HoS	IC	T04, T05, T09
	State/Common Core Standards/Framework	CoA, HoS	3-5, IC	T01, T04, T05, T06, T07, T08, T09
	Curriculum/Planning/Pacing Guides	CoA	3-5	T01, T04, T06, T07
	Devices/Technology	CoA, HoS		T01, T06
	White Boards/Smart Boards	CoA	3-5	T04, T07
	Math Software	HoS		
	Support Teachers/Staff	HoS		

Table 22 (continued)

Aspects	Examples	“Formal” Leaders		
		Administrators	Coaches	Teachers
Tools	Manipulatives	CoA, HoS	IC, K-2, 3-5	T01, T05, T06, T07
	Hands-on Activities		IC	T04, T06
	Resources		IC	
	Math Vocabulary	HoS	K-2	
	Packets/Homework Assignments			T08, T09
	Music/Songs/Piano			T01
	Clocks			T01
	Notebooks/Worksheets			T01, T05, T09
	Charts/100s charts			T05, T06
	Games			T07
	GoMath			T07
	Live School Behavior Plan			T08

Table 22 (continued)

Aspects	Examples	“Formal” Leaders		
		Administrators	Coaches	Teachers
Background/ Environment	Get to Know Kids	CoA, HoS	K-2, 3-5	T04, T05, T06, T07, T08, T09
	Not account for student background			T01
	Get to know staff		K-2	
	Awareness of situation	CoA		T06
	Student Needs (pay attention to kids)		IC	
	Make math relevant		3-5	

Table 23. *Aspects of the Situation for Parent/Family Connection by Participant*

	Examples	Administrators	Teachers	Parents
Structures	New Teacher Mentor Program	CoA		
	District PLCs	CoA		
	Monthly meeting with teachers	CoA		
	Math Night		T04	
	Fun Night		T07	
	Family Night			P2
	Parent-Teacher Conferences/Meetings		T05, T07	P1, P2, P3
	Conversations with teachers			P3
	21 st century (after school program)		T06	
	Field trips			P1, P2
	Parties			P1
	Special Events			P1

Table 23 (continued)

	Examples	Administrators	Teachers	Parents
Routines	90-minute weekly mentor meetings	CoA		
Tools	Online material for at-home use	CoA		
	Websites	CoA		
	Note cards/ Homework/Lessons		T01, T06, T09	P1, P3
	Info sheets		T05	
	Weekly Calendar		T06	
	Phone calls		T04	
	Letters/Notes home	CoA	T07	
Aspects	Get to know kids/parents		T04, T05, T06, T07, T09	
	Take into account their background/language		T07	

several of the classroom-related tools listed could fit this criteria (e.g., charts/100 charts, clocks, etc.)

Background/Environment. Finally, almost all participants mentioned the background/environment of their situation by stating the importance of getting to know the students, the staff, and being aware of the situation itself. In responding to a question asked about how an administrator supports teachers in getting to know the context of their students' lives and learning, the Head of School (HoS) stated: "One of the biggest things that we do --and we talk about it each and every year at the beginning of the year—is to build a trusting relationship with our students." He further mentioned that "...by just taking the time to learn and understand about who they [students] are, and where they come from, and then how we can incorporate those things that we know about them into their daily instruction" (HoS). The Head of School shared the following example of how the staff and administration are using what is known about the background and environment to support students:

In music, they do a lot of addition and subtraction of notes now and different things like that. So, that is one way that we try to take into account those different languages and those different experiences that we know that we know that our students are coming to us with, and that has played a huge role in supporting my kids over the year. (HoS)

When talking about the role that children's communities play in teachers or the school's mathematics planning and instruction, HoS said:

It goes to understand our clientele, understanding our families and our students and that is one of the big things that we try to do. We try to get as much

background information as we can to see how much experience the students actually have with numbers and with the vocabulary and, if they don't then we make sure that we build on that. That is why we went to the 1-4 systems [referring to a rubric they created for helping students learn /progress through the Common Core State standards] because we recognize that we had a lot of kids that had a lot of gap. (HoS)

The above findings aligned with information from an institutional artifact put out by the school district related to the implementation of the Common Core State Standards for mathematics. The document details steps the district/school is taking to ensure that the standards are being implemented as follows:

The Midwestern Public Schools Mathematics Department has written and organized the curriculum guides and assessments in response to the expectations of the Common Core State Standards. Teachers will continue to receive district-led professional development for deep understanding of the Core Math Content Standards, as well as, Mathematical Practice Standards. An instructional coach or school improvement leader is assigned to each school to assist teachers in planning rigorous instruction, analyzing data and providing frequent feedback in the implementation of the Core. (2013-14 CSIP)

Triangulation

Data source triangulation was conducted in order to address validity of the data. The three types of data triangulated were documents, observations and interviews. As the data were analyzed, there was consistency across data collected from each of the three data sources. The findings from the interviews were consistent with documents. For

example, teachers' comments reflected what was found in the curriculum documents and meeting minutes (e.g., teachers mentioned weekly meetings, which was consistent with meeting minutes collected). A second example was that the aspects of the situation identified via the interviews (e.g., routines, tools, structures) matched up with the documents and observations. Because the data were consistent and aligned, this provides evidence of validity. Additionally, multiple sources of data collection can help a researcher gain a deeper understanding of the topic that may not be possible simply by examining one type of data. In the current study, multiple sources of data allowed for a richer examination of leadership practices than if only interviews had been conducted.

Summary

This chapter provided detailed descriptions of leadership practices intended to promote equity and excellence, how leaders navigated diverse classrooms and how they taught for equity and excellence. The leadership practices to support equity and excellence focused across three areas: Teaching for student learning, teaching for diversity, and parent involvement. Within these areas, leadership focused on a variety of macro-functions (aka leadership practices) and micro-tasks to complete these. In other words, the leadership practices were enacted through a variety of ways (e.g., getting to know families, differentiating instruction, providing support to teachers and parents, communicating, etc.).

The results of this study revealed the macro-functions and associated types of micro-tasks mentioned by participants. All macro-functions and micro-tasks were consistent across all categories of participants (i.e. administrators, coaches, teachers and

parents). Within each of these macro-functions and micro-tasks, there was an interplay of leaders, followers, and situation. Below is a review of the findings:

- Leadership practices were engaged in to some degree at all levels (admins, coaches, teachers, and parents).
- Leadership practices spanned activities that ranged from managerial (e.g., consistency, climate, hiring practices) to instruction (e.g., differentiation, relevant instruction), to interpersonal (e.g., building relationships with students, providing support to teachers).
- As such, leadership stretched across all areas of education and all participants in that education.

The findings are consistent with Spillane's theory of distributed leadership as an activity that involves leaders, followers, and the situation across time rather than necessarily a position or role. It also affirms differing usages and meanings of distributed leadership to different people as evidenced by the many leadership practices participants engaged in or took on that promote equity and excellence in mathematics education in this case study school.

CHAPTER 5: DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS

The overarching question driving the current study was: “What are the leadership practices that are intended to promote equity and excellence?” This case study explored what leadership practices leaders engage in that are intended to promote equity and excellence in mathematics. While much has been written about the “Why” (e.g., equity) and the “What” (e.g., leadership for excellence), less has been written about the “How” (e.g., leadership practices). Spillane et al’s (2004) Distributed Leadership Perspective was used as a lens to study one particular school, recognizing that the leadership does not fall on the shoulders of just one person but involves multiple individuals across the setting (Spillane & Healey, 2010). In so doing, this study gathered evidence about the “how” of leadership by gaining a deeper understanding of the perspectives of those who served as participants for the study (i.e., formal and informal leaders, and parents). This chapter reviews the implications of the study’s findings and recommendations for future research on distributed leadership and the leadership practices employed to support teaching of all students, but especially those in a diverse setting.

Research Question Results

Leaders focus their practices on various tasks within the school context. In the current study, three primary tasks were identified. These were:

1. Supporting the Teaching/Learning of all Students;
2. Supporting the Teaching of Diverse Students; and
3. Parent/Family Connection.

Per Spillane, leaders engage in macro-functions and micro-tasks to accomplish these tasks.

Macro-level functions are the largest grain size among the variety of *macro school-level functions* that are essential *or* characterize schools that are successful and well-run (*Spillane, Halverson, and Diamond (2004)*). In school settings, macro-functions can include such activities as promoting teacher professional development and improving test scores. Micro-tasks are the short-term tasks that leaders execute in order to accomplish macro-functions. Micro-tasks include such practices as observing classrooms and facilitating grade level meetings. It is important to look beyond the macro-functions to the micro-tasks, as it is by studying the micro-tasks that we can begin to better understand the “how” of school leadership (*Spillane, Halverson, & Diamond, 2001*).

In chapter one, the argument was brought forth that many different abstract definitions abound for equity and excellence. While bringing the abstract and concrete definitions together is challenging, it is also acknowledged as very beneficial to contribute examples of the “how” of leadership intended to promote equity and excellence (the central question of this study). Considering that it is grounded in the day-to-day practice, leadership is understood “as a matter of actions and processes” (*Eccles and Nohria, 1992, p. 13*). Consistent with a distributed perspective lens, study participants’ actions and processes were observed, identified and analyzed to understand the links among macro-functions and the micro-tasks. Within each of these macro-functions and micro-tasks, there was interplay of leaders, followers, and situation. Such interplay is consistent with Spillane’s distributed leadership perspective that describes

leadership as predicated on interdependency among multiple individuals (e.g., teachers, parents, coaches, principals, etc.) influence a school's or other organization's core work (Spillane & Mertiz, 2015) assuming various tasks over time depending on the situation. Figure 6 below is a graphic that illustrates and ties together all the macro-functions identified for the three primary themes (Relationship, Instruction, Support, School Climate, and Parent Involvement).

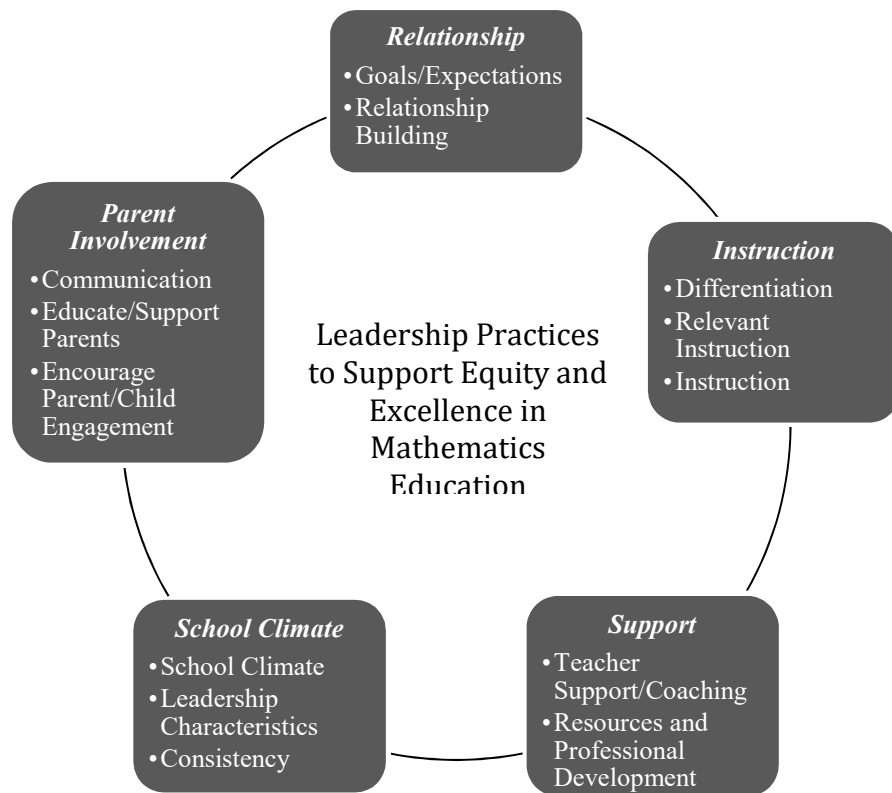


Figure 6. Leadership Practices to Support Equity and Excellence in Mathematics Education.

Relationship Related Practices

Participants had goals/expectations of their students. They articulated these goals to students, and in order to meet these goals and ensure students met their highest potential, they built relationships with students. The findings also indicated teacher participants paid attention to ensure individual students were understanding and progressing in their learning and goals. As such, leaders at all levels worked together to support one another and their students. It was not a top-down approach. It involved collaboration at all levels. It involved awareness of the situation and getting to know the kids. Consistent with a distributed leadership perspective, the situation here is not simply viewed as an influence on practice but as an integral and constituting component of practice (Spillane, Halverson, & Diamond, 2004).

The evidence also revealed that providing resources (CoA/district) and materials for teachers to get to know students and support differentiation was another leadership practice that increased the level of awareness of the need to build trusting relationships not only with students but between participants. This is consistent with research that states:

The nature of relationships among the adults within a school has a greater influence on the character and quality of that school and on student accomplishment than anything else. If the relationships between administrators and teachers are trusting, generous, helpful, and cooperative, then the relationships between teachers and students, between students and students, and between teachers and parents are likely to be trusting, generous, helpful, and cooperative. If, on the other hand, relationships between administrators and

teachers are fearful, competitive, suspicious, and corrosive, then *these* qualities will disseminate throughout the school community. (*Barth, 2006, p. 8*)

Instruction Related Practices

Participants tended to indicate that supporting students included helping them engage in mathematics or be exposed to mathematics, helping them to be prepared to be high functioning members of society, and supporting their overall learning or understanding of mathematics. Instruction related practices are those practices that have a high impact on instruction. Such practices create learning opportunities that allow all students access to the curriculum and clearly articulate meaningful and relevant learning experiences for all. The three macro-functions related to the category of instruction included: Differentiation, Relevant Instruction, and Instruction.

Differentiation

Participants emphasized the importance of differentiating instruction and worked hard to make their instruction relevant to students given their diverse backgrounds, individual levels and needs. This is consistent with Tomlinson's (2001) research about the process of teaching that assumes that there will be differences in the learning styles, abilities, and interests of students resulting in the teacher proactively planning multiple paths to learning to meet those differences. Differentiated instruction begins with truly knowing your students, both as individual learners and as a community of learners. To do so requires the recognition that students learn at different rates and in different ways therefore necessitating giving students what they need in order for them to learn, grow and be successful. It is important to intentionally create opportunities to learn about students' strengths, needs, interests, preferences and ways of learning. Participants'

emphasis on differentiated instruction was congruous with distributed leadership as leaders and followers worked together while keeping in mind the situation in order to best structure the curriculum and lessons to meet the needs of the students.

Teachers employed specific practices (micro tasks) such as differentiating instruction to meet students' needs, use of data to identify students' needs, adapt homework based on family strength or needs, use multiple strategies, allow flexibility with instruction and adapt when kids struggle to differentiate. These differentiated practices used were consistent with the research on school effectiveness that indicates that classroom factors explain more than one-third of the variation in student achievement (Leithwood, Day, Sammons, Harris & Hopkins, 2006;

Relevant Instruction

Teacher participants in this study all cited relevant instruction as being important (e.g., making instruction relevant to what their students know or their background). Teachers felt that students are all capable of doing math. This expectation and belief that students come with strengths is demonstrated by the goals/expectations articulated to the students. The study participants were not only talking about establishing clear goals for the mathematics that students are learning as outlined in NCTM's 2014 Principles to Actions- Ensuring Mathematical Success for All, but they also talked about having and articulating high expectations of all students, no matter the gender, race, etc. This fits with distributed leadership in that it stretched across all leaders and followers, taking into account the background of students and the situation in which they are learning, and included leaders and followers alike. This is also consistent with the effective mathematics teaching practices (NCTM (2016) which states that instruction should be

designed to build on student's background and having goals and high expectations of students, paired with any of the five equity-based practices geared towards supporting mathematics learning (Smith, Huinker & Bill, 2017).

Instruction

Findings revealed that, overall, participants felt it was important to teach mathematics for deeper understanding and tended to have strong opinions about practices that undermined, de-emphasized or took away opportunities for students to grapple and make sense of problems, think for themselves, or engage in the process rather than just finding the solution. This is consistent with research that indicates that, "Mathematics educators and researchers suggest that struggling to make sense of mathematics is a necessary component of learning mathematics with understanding" (Hiebert & Grouws, 2007). Furthermore, the nine micro-tasks (i.e., leadership practices) associated with this macro-function of instruction aligned with four of the eight research-based effective mathematics teaching practices outlined in the *Principal to Actions* put forth by the National Council of Teachers of Mathematics (NCTM, 2014). Listed below in bold are the four practices most related to the findings of the current study:

- a) Establish mathematics goals to focus learning;
- b) Implement tasks that promote reasoning and problem solving;
- c) Use and connect mathematical representations; and
- d) Facilitate meaningful mathematical discourse.

These all relate to relevant instruction or to how students engage in mathematics (e.g., active engagement, no right answer, focus on the process not always on the answer). This is consistent with data from this study.

Support Related Practices

Teacher support and professional development related practices are those at the heart of what happens in classrooms and schools. Such practices encourage collaboration, create opportunities and the space for the development of the necessary expertise, and build the capacity of those who impact student learning directly and indirectly. The two macro-functions related to the category of support were: teacher support (which sometimes happens in the form of, or through, coaching), and professional development and resources.

Participants who served in a teacher support capacity led by example and were willing to jump in or do whatever it took to support teachers. They modeled, were observed and/or observed others, and then met to discuss feedback on lessons to ensure teachers were supported. They had conversations about the framework for teaching and learning. In order to enhance understanding, they answered questions, provided directions for its implementation or use, and gave examples. All of these practices happened not only to provide professional development but, most importantly, to differentiate the support, resources and tools. The end result was to better reflect on ways that tasks and teaching could be improved to provide greater access, challenge, and support for every learner (Stein, Grover, & Henningsen, 1996; Stein, Remillard, & Smith, 2007).

Research tells us that one time professional development does not work. Study participants agreed and saw the need for ongoing, collaborative reflective strategies for teachers where they have a continuing relationship with someone (e.g. a coach, other colleagues and Professional Learning Communities). As a result, teachers, coaches and administrators collaborated with one another. This practice is in alignment with the

distributed leadership perspective where there are multiple individuals who serve as leaders as they share ideas, facilitate discussion, etc., but that these leaders also sometimes are in the role of followers depending on the situation or task (e.g., what they bring or can bring to the table). Schools continue to face pressure to improve K-12 mathematics instruction to reach *all* students, regardless of economic, linguistic, or cultural background (NCSM, 2008). With the passage of the *Every Student Succeeds Act* in 2015, the requirements to teach have been redefined with an emphasis on effective teachers. According to the ESSA definitions, professional development includes evidence-based, job-embedded, sustained activities geared towards developing effective teachers. Additionally, prior to the ESSA, the Common Core Initiative for mathematics necessitated professional development for all mathematics educators as a result of highlighting needed changes in how mathematics should be taught. The data from this study were consistent with both the ESSA's and the Common Core Initiative in that participants expressed the need and important role that professional development plays in the teaching and learning of students.

School Climate Related Practices

School climate improvement efforts aimed primarily at improving achievement. There are variations in students' mathematics achievement growth in schools based on school climate. Leaders play a key role in school climate. Practices such as positive attitudes towards mathematics, coupled with knowledgeable background and experiences that allow flexibility in instruction were among some of the school climate characteristics mentioned by participants. In chapter 4, I shared how participants defined a math leader as knowledgeable. Not only were leaders seen as those with more knowledge and

expertise, but they also had flexibility to bring to the table. Flexibility was important in that they did not expect there to be just one right answer, but they also allowed teachers to make instructional adjustments as needed.

The school climate related micro-tasks included being open to solving problems, having views that differed from one's own, making the support of mathematics a priority, and providing an environment where leaders trust teachers and let them work independently. As evidenced in the interviews, formal and informal leaders alike always took the approach as described by one participant, "I'm a learner too. I am not here to be an expert by any means; and you have something to offer me, just as much as I have something to offer you, so let's work together to find out what that is" (IC). Such attitudes supported a school climate that built trust and enhanced student learning.

There were some findings that were not always positive at best. As leaders shared their perceptions of, or described who the leaders were in the school, there still were tones of the top-down approach. Not everything was a collaborative effort. There was a mix of tasks with some top-down and some collaborative leadership. There were two distinct areas of focus: managerial tasks and distributed leadership tasks. Teachers were not used to this kind of an approach. Figuring out curriculum was a more top-down task. Teachers talked about instruction in the classroom and where they saw themselves as leaders, but when it came to meetings and where or who they went to for help (e.g., PD), it was top-down. Teachers went to the "formal" leaders for guidance. While this may appear negative or contrary to the practice of leading, it is consistent with the distributed leadership perspective which "acknowledgment that leading and managing schools (and other organizations) involves multiple individuals, not just the school principal, including

other formally designated leaders and individuals without such designations (e.g., teachers with no formal leadership position, parents, or even students who influenced an organization's [schools's] core work", Spillane & Mertz, 2015, p. 1. One has to also pay attention to interactions rather than only focusing on the actions of an individual leader. While the top-down approach is "negative", it is not unexpected given that this approach has been the traditional approach used. However, there were definite examples of distributed leadership given, so strides are being made to become more distributed across leaders and followers. It is a matter of learning these new roles.

Parent/Family Connection Related Practices

Findings indicated that building relationships was important and allowed participants to get to know both students and parents alike much better. This meant that teachers and leaders had to invest in a relationship with the students, to get to know them and their interests. It meant having to invest in their community, learning about the culture from which they come, and what is meaningful / relevant to and for them. It is a bridge for understanding the mathematics concepts or skills they are learning or need to learn. Gaining some insight about students' thinking is helpful because, "We may exhibit an admirable command of content, and possess a dazzling variety of pedagogical skills, but without knowing what's going on in our students heads, that knowledge may be presented and that skill exercised in a vacuum of misunderstanding" (Brookfield, 2006). Sometimes it was hard to learn about their background. While they could learn a lot from students, they had trouble making family connections. Or, it was difficult given that teachers were unfamiliar with cultural references that were familiar to students.

Subsequently, allowing for a better understanding of students' families, determining what teacher support and resources may be required or necessary, and then a chance to reflect on their own as well as school's practices around connecting with parents. The parents, teachers, and administrators who participated in the study referenced the value of parent/child engagement. Such engagement included students completing their homework with help from parents and families participating in school-planned Parent/Family activities such as Parent/Family Nights, Parent-Teacher Conferences, etc. Although their view of family engagement was sometimes defined differently, the above is consistent with best practices as described by findings from a synthesis of research on parent involvement ages birth through high school. This research indicates that, regardless of family income or socioeconomic background, students with involved parents tend to be ready to start school, do better, stay in, and like school more (Henderson & Mapp, 2002). Additionally, more recent studies have documented the positive results produced by increased family engagement (Biag & Castrechini, 2016; Cavanagh, 2012; Ferlazzo & Hammond, 2009; Mapp & Kuttner, 2013). While teachers/leaders stressed the importance of parent connection and engagement, the reality was that there was very little of it. Teachers faced challenges communicating to parents, getting them to help with homework, etc. There was no PTO/PTA at the school.

These research studies also echoed the general/differing understandings of parent engagement. Teachers held different beliefs about what role parents play. They want them to get involved and be at school, help their child, etc. Parents are more interested in getting the information they need, but aren't always willing to get involved beyond that. They don't see their role as more than that.

In this study, the three parents that I interviewed were selected because of their involvement both at the classroom level and school level. Their concerns were about teacher communication with and to parents. However, the teachers wished more parents would get more involved. This situation was unusual in the sense that the school had no existing Parent Teacher Organization or Association (PTO or PTA) as do most schools. Such organizations can be instrumental to ensuring communication flows between the school and families and organizing/facilitating communication among families and teachers.

Limitations

While this study was carefully designed, inherent limitations exist. For example, due to faculty mobility, there were many changes in the constitution of my dissertation committee during the duration of my doctoral studies. As a result, feedback from new committee members prompted a revision of my Research Question (RQ) which necessitated changes in the framework used. Therefore, distributed leadership was selected as the framework to guide my study. Consequently, the interview questions were not written specifically to get at (ask about) leadership practices from a distributed leadership perspective. Despite this change, the questions did elicit responses from participants that allowed them to provide their perspective on how leadership was distributed within their setting.

Although not particularly consequential in qualitative research, the limited number of parents who were interviewed impacted the interpretation of the findings from this research. As such, the role of parents and their voice as it relates to leadership for equity and excellence was minor. However, this was the reality of this particular

school/district. Future research should examine the role of parents with a larger sample of participants.

Similarly, the role of students as leaders (and not just followers) was not examined. The purpose of the current study was to examine leadership practices of formal and informal leaders. With this in mind, the focus was not on students as leaders. Therefore, broadening the research lens by shifting the focus into leadership within the classroom would help provide a better understanding of the leadership role of students. The current study focused on a K-5 school. Leadership practices may differ at middle to upper grades. For this reason, the current study may be limited in terms of recommendations for action at these upper graders. Future research is needed to examine leadership practices and the roles of students in grades 6 -12.

Recommendations for Action

Given the results from this study, recommendations can be made to leaders/school/districts, educators, and/or future researchers regarding mathematics for equity and excellence. Some of the areas needing improvement include instruction, School climate, the need for Teachers to be seen as leaders more than just in the classroom, and less of a top-down approach to leadership, and increased cultural competence training. These along with other practices identified and discussed throughout this paper, will get us to the *how* of leadership (actions, interactions, etc.) to enhance students mathematics learning through distributed leadership and for equity and excellence.

The research and theory of leadership has been evolving from specific traits, roles, and individuals (Spillane, 2006) to a distributed perspective with the potential to

improve teaching and increase learning for all students (Harris, 20005). With the limited number of studies that have been done to investigate and understand what leadership practices leaders engage in that are intended to promote equity and excellence, this study offers a glimpse into the “how” within one school. The significance of the study lies in the data collected from a sample of all stakeholders using a distributed perspective. Future research should continue to examine the leadership roles that stakeholders at all levels play in ensuring equity and excellence in mathematics learning.

Second, on the part of the parents, the study highlighted a willingness of parents to engage with their children and their homework at a deeper level if both students and parents were given the needed support prior to students being assigned any homework. However, the three parent participants in question are a minority when compared to the number of parents at the school. The three parents accounted for only four of the 350 students that attended the school at the time of the study. One recommendation is that teachers and leaders provide a higher level of support to parents in terms of materials and resources to help their children complete homework. However, parental involvement and support goes beyond simply helping with homework. It is about getting all parents, or at least a majority, to be involved in schools more broadly. Efforts should be made to involve parents beyond just homework.

This study took place or was conducted in a low socioeconomic status area of the city in a very diverse school. While it is not pretty, the truth is that in this environment there are parents who, due to a variety of reasons, do not have the time to appropriately parent their children. This was not a finding of the study, however it was well known by the staff and those who have worked in this building. Parents are busy, some are

overwhelmed, and some have alcohol/drug, financial and legal problems. Research states and recommends the involvement of parents/families. The reality at this school was that there was no formal PTO, and teachers reported difficulty connecting with parents and families. However, establishing relationships with students was cited by teachers as being very important when it comes to helping them to learn. Therefore, it might be a good starting place to get to know the students and their families in order to build relationships that will facilitate parent/family involvement in the classroom/school. While some teachers did go above and beyond to reach parents, practices that encourage reaching out to families need to be reinforced and supported by leaders in order to connect more with and increase parent/family participation in their children's education. The question becomes, How do we utilize our parents and bring them to the table?

Some suggestions include:

1. Encourage the district to conduct a demographic analysis to determine the risk factors for academic failure of students (e.g., look at minority students, students eligible for Free and Reduced Lunch/ low income students, student attendance, English Language Learners). This will allow for proactive or early interventions to be put in place and provide the needed support for students and involve the family.
2. Seek out and nurture those parents who are currently very involved in the life of the school and provide/research opportunities for them to build their leadership capacity to develop a PTA/PTO. Keep diversity in mind and create opportunities for parents to work collaboratively, learn from, and help each other.

3. Re-Engage stakeholders (e.g., community partners, parents, teachers, administrators, Family/Success/Social Workers, Associates, etc.) and ask for their input on designing a program/parent involvement strategies.
4. Implement multiple strategies that will likely increase the odds of getting families to engage and to positively affect the school and student outcomes. Seek individuals/volunteers who can form social networks, take classes, engage with students after school, at home, engage with the school, creating high aspirations for students' academic success.
5. Complete parent and student surveys to determine the best hours for programs and activities that interest them, to identify transportation needs, and to allow them to provide additional feedback as needed.
6. Compile and share results with all.
7. Develop next steps based on results, including:
 - Offering classes/courses for families (e.g., online, face-to-face, blended);
 - Creating spaces for conversation and dialogue to get feedback from Stakeholders.

A final recommendation is that there be an increased focus on cultural competence and related training. According to Nieto (2004), students of all backgrounds deserve the very best our society can give them, and their cultures, languages, and experiences need to be acknowledged, valued, and used as important sources of their education (p. xix). The above quote highlights the importance of celebrating students and helping students recognize each other's abilities not disabilities. The statement also shines the light on the role that diverse factors can play in necessitating culturally

relevant teaching and learning of mathematics. Given the diversity and needs evidenced in the research setting, study participants and perceptions of the stakeholders interviewed and observed, and documents reviewed, it is recommended that the predominantly European-American (98%) teachers, from rural areas / small towns, working with a student demographic that is socio-economically different from themselves be provided cultural competence training. Such training should be provided to staff, teachers, and all leaders within the entire school district and all buildings therein.

Sonia Nieto's address of teaching diverse populations of students is an interwoven thread within the tapestry of America's education fabric. The larger picture of student learning within that tapestry is comprised of such diverse factors as home culture, language, children's mathematical thinking, and community experiences, but also of the fact that such factors influence the effectiveness of teaching and learning. This is not surprising considering Terry and Irving's (2010) assertion that it is now becoming common place "to find classrooms where three or four different languages and cultures are represented", and that "for culturally and linguistically diverse (CLD) students, issues of diversity, difference, ... can be quite complex and challenging for classroom teachers" (p.10). This once again brings to light the importance of cultural relevant pedagogy which has to do with the ability to link principles of learning with deep understanding of and appreciation for culture (Ladson-Billings, 1995 & 2014), culturally sustaining pedagogy (Paris, 2012), and cultural competence training (Ladson-Billings, 2014) for teachers and leaders like those in this study.

Nationally, teachers report a lack of preparation to work with diverse learners (Samson, & Collins, 2012). In a 2002 study conducted by MET Life of a nationally

representative sample of 1,000 public school teachers of grades 6 through 12, the majority (59%) indicated that strengthening programs and resources to help diverse learners with the highest needs (e.g., low-income students, English language learners, etc.) “must be done as one of the highest priorities in education” (p.10). Additionally, the study found that almost two-thirds of teachers (63%), parents (63%), and Fortune 1000 executives (65%) believed that knowledge of cultures other than one’s own and awareness of international issues are important for college and career readiness. In practice, this means that teachers need to create a bridge between students’ home and school lives, while still meeting high expectations of school districts and state curricular requirements. Such a culturally relevant teaching utilizes the backgrounds, knowledge, and experiences of all students to inform a teacher’s lessons and approaches (Ladson-Billings, 2014). The findings of this study suggest that focusing on getting to know students is both a critical and fruitful beginning point (for helping educators improve equity in their classrooms and schools) and a strategy for catalyzing equity through culturally responsive education. Therefore, it is recommended that cultural competence training be provided. Such training will allow them to evaluate their own facilitation, curriculum, and grading practices to identify implicit and explicit bias as well as systemic policies and patterns that perpetuate inequities.

Implications for Research

There are two primary implications for future research that can be derived from the current study. The first focuses on using a critical perspective and how that might impact the definition of equity, while the second expands the view of leadership to include students. First, from a critical perspective, equity might be defined differently

than was expounded in this study. While others draw upon intellectual currents in literature, pop culture, social theory, history, and other fields to challenge the idea of equity, this study focused on understanding leadership practices that promote equitable opportunities and outcomes for students. Thus, rather than adopt a critical perspective, I sought to understand first, and then to interpret the leadership practices through a distributed leadership lens.

Giroux stresses the importance of dialogue/discourse and dynamic movement, meaning that even though many critical pedagogues—Greene, Freire, Apple, Bowles and Gintis, Adorno, Marcuse—have been successful in critiquing schools, we cannot merely repeat these criticisms in hopes of creating an emancipatory effort within schools. It is important to note that the above pedagogues were specific to certain types of schools, not to all schools or all teachers. Therefore, educators instead must use dialogue to build alliances within and across communities that will contribute to create the conditions for a collective challenge.

By tracing the legacy of critical theory from the Frankfurt School, Henry Giroux imagines a radical pedagogy that moves beyond, what he claims, is the New Left's quagmire of reproduction theories and hidden curriculum (Darder, 2003). In this essay, he unpacks the Frankfurt School's notion of theory, analysis of culture, analysis of depth psychology and how they all contribute to constructing a radical view of knowledge, one that challenges truth as one-dimensional. Additionally, Giroux wants to problematize the idea of *fact* by using a central tenet of the Frankfurt School: historical development of a nature of theory with "a grasp of the relationship that exist in society between the particular and the whole, the specific and the universal" (p. 35). Another important

element of critical theory is the emphasis that is placed on self-criticism, what Giroux calls a meta-theory. To conceive of a radical pedagogy that can instruct the oppressed, enlighten the oppressed of their false consciousness, “instruct the oppressed to appropriate the most progressive dimension of their own cultural histories”, and provide action itself, one must participate in dialectical thinking so as to criticize great truths.

Foremost to the conception of radical pedagogy is critical theory, which the Frankfurt School claims is the “precondition for human freedom.” It is only through engaging in critical thought, in the recognition, deconstruction and rearticulation of the link between knowledge, power and domination that one can work toward emancipation. Giroux argues that theory is most valuable when it becomes the impetus “for reflexive thought and practice . . . and instrument of critique and understanding” (p. 38).

Although issues of equity and social justice are never far away in the burgeoning mathematics education literature, the Frankfurt School of Critical Theory and its attention to the construction of cultural and psycho-social meanings are central to continuing to build on the importance of a critical perspective. In a book chapter titled, *(Re)Defining Equity: The Importance of a Critical Perspective*, Guitierrez (2007) argues for a need to define equity to give teachers and researchers a clear sense of purpose. One example is to focus on critical mathematics that “squarely acknowledges the positioning of students as members of a society rife with issues of power and domination” (p. 40) and engages them in finding resonance with postmodernist deconstruction where they can examine perspectives from different cultures and social and political issues, such as the negative and detrimental framing of black children and their competencies (Martin, 2012). The

implications for research from this study reinforce the need for critical perspectives that could potentially offer new insights for researchers and practitioners.

The second implication for future research is to examine students as leaders. In distributed leadership, all stakeholders are equally important. However, not all stakeholders were highlighted in the current study due to the research question I was attempting to answer. Similar to the literature on distributed leadership, the role of students and their related practice of leadership was not explicitly examined or discussed. While students are part of the distributed leadership process, their role was mostly viewed as followers and beneficiaries or recipients of the leadership practices of teachers, formal school leaders, and parents. However, other researchers examining educational and social equity and the democratization of schools extends the concept to include students and view their role as an advancement of student voice and inclusion (Southworth, 2010) as well as a difference maker when it comes to student performance (NCSL 2004a, 2006c).

A holistic approach to distributed leadership needs to include and more explicitly highlight the role of students. Such an approach will reflect a circle of viewpoints where all stakeholders ideas/perspectives and practices related to equity and excellence will be represented. More research points to the importance of students seeing themselves as part of the mathematics classroom. Mathematics educators and leaders continue to advocate for social justice, working to make mathematics teaching and learning in more inclusive communities. We need leaders/leadership practices that promote mindful assessments for innovative learning and a shared sense of belonging, affirming all identities. And classroom leadership is often central in orchestrating, motivating and empowering students to engage and connect with other stakeholders in schools. Such engagement by

students may prove to be a key component if schools are to be places where pools of leadership talent are created and from which tomorrow's school leaders will be drawn!

Conclusions

Most participants evidenced distributed leadership for equity and excellence in their daily practices although task responsibilities were distributed across traditionally defined organizational roles in some instances (*Principal* referred to in the study as Head of School, *District Curriculum Director* or Central Office Administrator, *Instructional Coach*, and *Instructional Math Coaches*). From a distributed leadership stance, which takes leadership practice in this school as a unit of analysis, the cumulative respective distributed roles that teachers and other individuals took in the process of achieving equity and excellence in mathematics was not consistent across all participants. It differed in some instances based on their vantage point. Sometimes what teachers were saying was not consistent with what parents, administrators and coaches were saying. For example, teachers talked about how they interacted with parents while parents stated what they needed and those did not necessarily match.

The practices identified in this study go beyond simply telling us about the “what” and “why” but start to tell us the “how” of leading for equity and excellence in mathematics teaching. More specifically, the leadership practices of differentiating and making instruction relevant, providing support to teachers and school climate were found to encapsulate and facilitate an understanding of the “how” of leading and distributed perceptive simultaneously. Leadership should no longer be viewed as one person in a top down manner. Rather it should be distributed among all the key participants and stakeholders who bring their backgrounds and experiences to the context of their

particular students and school. In the case of this school, it means both formal and informal leaders (i.e., leaders and followers) having a role as they take into account their situation and collaborate to meet their purpose of ensuring all students learn.

So, what should schools do? First and foremost, schools need to begin by changing their view of who they consider as mathematics leaders in buildings. Ask themselves who the leaders are for mathematics. Shift their view and reliance on formal leaders to a more collaborative perspective. The work of mathematics teaching and learning can incorporate the input of multiple individuals taking the lead at times and following at other times depending on the situation.

Leadership has greater influence when it is widely distributed. Based on the discussion, leadership should be distributed across all levels. This is consistent with Spillane's distributed perspective. As a result of their different roles, they should decide whether the leadership takes the form of collaborating or top down. While a top down approach often is still used, a distributed perspective might be a better model when teaching for equity and excellence. Such an approach encourages collaboration among formal leaders, teachers, parents and students, while taking into account the background and situation in which learning occurs, to best educate all students at expected levels of excellence. While such a perspective is not new, shifting the views and roles of leaders and leadership practices is more difficult in practice and will take time and effort at all levels, but the potential rewards for equity and excellence in mathematics are well worth it.

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APPENDIX A: IRB APPLICATION APPROVAL MEMO

Retained original application page
with signatures

IRB ID: 13-462

INSTITUTIONAL REVIEW BOARD (IRB)
Application for Approval of Research Involving Humans

Title of Project: Distributed Leadership for Equity and Excellence in Mathematics: An Elementary School Case Study		
Principal Investigator (PI): Comfort Akwaji-Anderson		Degrees: Ph. D. RECEIVED
University ID: 257685693	Phone: 319-339-4348	Email Address: comfota@iastate.edu SEP 25 2013
Correspondence Address: 2756 Jacque Street, Iowa City, IA 52246		
Department: School of Education	College/Center/Institute: Human Sciences By IRB	
PI Level: <input type="checkbox"/> Tenured, Tenure-Eligible, & NTER Faculty <input type="checkbox"/> Adjunct/Affiliate Faculty <input type="checkbox"/> Collaborator Faculty <input type="checkbox"/> Emeritus Faculty <input type="checkbox"/> Visiting Faculty/Scientist <input type="checkbox"/> Senior Lecturer/Clinician <input type="checkbox"/> Lecturer/Clinician, w/ Ph.D. or DVM <input type="checkbox"/> P&S Employee, P37 & above <input type="checkbox"/> Extension to Families/Youth Specialist <input type="checkbox"/> Field Specialist III <input type="checkbox"/> Postdoctoral Associate <input checked="" type="checkbox"/> Graduate/Undergrad Student <input type="checkbox"/> Other (specify:)		
FOR STUDENT PROJECTS (Required when the principal investigator is a student)		
Name of Major Professor/Supervising Faculty: Dr. Linda Hagedorn & Dr. Corey Drake		
University ID: 218659441	Phone: 515-294-5746	Email Address: lindah@iastate.edu
Campus Address: E262 Lagomarcino Hall		Department: School of Education & Human Sciences Admin.
Type of Project (check all that apply): <input checked="" type="checkbox"/> Thesis/Dissertation <input type="checkbox"/> Class Project <input type="checkbox"/> Other (specify:)		
Alternate Contact Person: Dr. Corey Drake		Email Address: cdrake@msu.edu
Correspondence Address: School of Education, Michigan State University, 118A Erickson Hall, East Lansing, Michigan		Phone: 517-355-1713

ASSURANCE

- I certify that the information provided in this application is complete and accurate and consistent with any proposal(s) submitted to external funding agencies. Misrepresentation of the research described in this or any other IRB application may constitute non-compliance with federal regulations and/or academic misconduct.
- I agree to provide proper surveillance of this project to ensure that the rights and welfare of the human subjects are protected. I will report any problems to the IRB. See Reporting Adverse Events and Unanticipated Problems for details.
- I agree that modifications to the approved project will not take place without prior review and approval by the IRB.
- I agree that the research will not take place without the receipt of permission from any cooperating institutions, when applicable.
- I agree to obtain approval from other appropriate committees as needed for this project, such as the IACUC (if the research includes animals), the IBC (if the research involves biohazards), the Radiation Safety Committee (if the research involves x-rays or other radiation producing devices or procedures), etc.
- I understand that IRB approval of this project does not grant access to any facilities, materials, or data on which this research may depend. Such access must be granted by the unit with the relevant custodial authority.
- I agree that all activities will be performed in accordance with all applicable federal, state, local, and Iowa State University policies.

Signature of Principal Investigator: Comfort Akwaji-Anderson Date: 9/24/13
 Signature of Major Professor/Supervising Faculty: Linda S Hagedorn Date: 9/24/13
 (Required when the principal investigator is a student)

- I have reviewed this application and determined that departmental requirements are met, the investigator(s) has/have adequate resources to conduct the research, and the research design is scientifically sound and has scientific merit.

Printed Name of Department Chair/Head/Director: JOHN H. SCHULT
 Signature of Department Chair/Head/Director: John H. Schult Date: 9/25/13

For IRB Use Only	Full Committee Review: <input type="checkbox"/>	Review Date:
	EXPEDITED per 45 CFR 46.110(b): Category Letter	Approval/Determination Date:
	Approval Not Required: <input type="checkbox"/>	Approval Expiration Date:
	Not Research: <input type="checkbox"/>	
No Human Subjects: <input type="checkbox"/>	EXEMPT per 45 CFR 46.101(b):	
	Not Approved: <input type="checkbox"/>	Risk: Minimal <input type="checkbox"/> More than Minimal <input type="checkbox"/>

IRB ID: 13-462

INSTITUTIONAL REVIEW BOARD (IRB)
Application for Approval of Research Involving Humans

RECEIVEDTitle of Project: Distributed Leadership for Equity and Excellence in Mathematics: An Elementary School Case Study **DEC 19 2013**

Principal Investigator (PI): Comfort Akwaji-Anderson		Degrees: Ph.D.	By IRB
University ID: 157685693	Phone: 319-339-4348	Email Address: comfota@iastate.edu	
Correspondence Address: 2756 Jacque Street, Iowa City, IA 52246			
Department: School of Education		College/Center/Institute: Human Sciences	
PI Level: <input type="checkbox"/> Tenured, Tenure-Eligible, & NTER Faculty <input type="checkbox"/> Adjunct/Affiliate Faculty <input type="checkbox"/> Collaborator Faculty <input type="checkbox"/> Emeritus Faculty <input type="checkbox"/> Visiting Faculty/Scientist <input type="checkbox"/> Senior Lecturer/Clinician <input type="checkbox"/> Lecturer/Clinician, w/Ph.D. or DVM <input type="checkbox"/> P&S Employee, P37 & above <input type="checkbox"/> Extension to Families/Youth Specialist <input type="checkbox"/> Field Specialist III <input type="checkbox"/> Postdoctoral Associate <input checked="" type="checkbox"/> Graduate/Undergrad Student <input type="checkbox"/> Other (specify:)			

FOR STUDENT PROJECTS (Required when the principal investigator is a student)		
Name of Major Professor/Supervising Faculty: Dr. Linda Hagedorn & Dr. Corey Drake		
University ID:	Phone: 515-294-5746	Email Address: lindah@iastate.edu
Campus Address: E262 Lagomarcino Hall	Department: School of Education & Human Sciences Admin.	
Type of Project (check all that apply):	<input checked="" type="checkbox"/> Thesis/Dissertation <input type="checkbox"/> Class Project <input type="checkbox"/> Other (specify:)	

Alternate Contact Person: Dr. Corey Drake	Email Address: cdrake@msu.edu
Correspondence Address: School of Education, Michigan State University, 118A Erickson Hall, East Lansing, Michigan	Phone: 517-355-1713

ASSURANCE

- I certify that the information provided in this application is complete and accurate and consistent with any proposal(s) submitted to external funding agencies. Misrepresentation of the research described in this or any other IRB application may constitute non-compliance with federal regulations and/or academic misconduct.
- I agree to provide proper surveillance of this project to ensure that the rights and welfare of the human subjects are protected. I will report any problems to the IRB. See Reporting Adverse Events and Unanticipated Problems for details.
- I agree that modifications to the approved project will not take place without prior review and approval by the IRB.
- I agree that the research will not take place without the receipt of permission from any cooperating institutions when applicable.
- I agree to obtain approval from other appropriate committees as needed for this project, such as the IACUC (if the research includes animals), the IBC (if the research involves biohazards), the Radiation Safety Committee (if the research involves x-rays or other radiation producing devices or procedures), etc., and to obtain background checks for staff when necessary.
- I understand that IRB approval of this project does not grant access to any facilities, materials, or data on which this research may depend. Such access must be granted by the unit with the relevant custodial authority.
- I agree that all activities will be performed in accordance with all applicable federal, state, local, and Iowa State University policies.

Signature of Principal Investigator

Date

Signature of Major Professor/Supervising Faculty

Date

(Required when the principal investigator is a student)

- I have reviewed this application and determined that departmental requirements are met, the investigator(s) has/have adequate resources to conduct the research, and the research design is scientifically sound and has scientific merit.

Printed Name of Department Chair/Head/Director

Signature of Department Chair/Head/Director

Date

For IRB Use Only	Full Committee Review: <input checked="" type="checkbox"/>	Review Date: February 4, 2014
	EXPEDITED per 45 CFR 46.110(b): Category Letter	Approval/Determination Date: February 4, 2014
Approval Not Required: <input type="checkbox"/>	EXEMPT per 45 CFR 46.101(b):	Approval Expiration Date: February 3, 2016
Not Research: <input type="checkbox"/>	Not Approved: <input type="checkbox"/>	Risk: Minimal <input checked="" type="checkbox"/> More than Minimal <input type="checkbox"/>
No Human Subjects: <input type="checkbox"/>		
IRB Reviewer's Signature: Kerry A. Agnibid February 6, 2014		

APPENDIX B: INTERVIEW PROTOCOL #1: TEACHER

Getting Acquainted / Demographic Items Questions

Date:**Time of Interview:****Interview Venue:****Interviewer:****Interviewee:****Introductions**

Following are initial questions that will provide some demographic information to inform description of participant background for this study. Respondents will not be personally identified in any use of these data. Rather, the data will be pooled to learn more about the distribution of leadership for equity and excellence in mathematics in the school.

“Hello!

*Thank you for agreeing to participate in this research study. My central focus is to understand how mathematics leadership for **equity and excellence** is distributed throughout an elementary school. In particular, I am referring to an understanding of how particular leadership practices support equity and excellence. Mathematics content can be learned in any number of ways under any number of circumstances. However, without the equity, some students may not have access to mathematical understanding. Despite the continuous mandates (state and federal) for mathematics for all, a large amount of data clearly points to the fact that “students from some groups are not learning as much as students from other groups” (Flores, 2007, p.32)*

Equity will be defined based on the premise that “all students regardless of their personal characteristics, background, or physical challenges, must have opportunities to study---and support to learn---mathematics” (NCTM, 2000, p.12).

Excellence in this study refers to the intersection between the practices that allow for an understanding of students and factors that continue to afford opportunities for all students to achieve individual success or levels of achievement (expectations, standards, etc.)

In order to explore this topic, I will conduct an initial interview to get to know you, discuss your background and experience in the field of education; and mathematics teaching and learning at Madison Elementary school.

This interview will last about thirty to forty five minutes. All interviews will be audiotaped for the purpose of reviewing and transcribing the data later. If you would like for me to turn off the audio recording at any point during this interview, please let me know. The transcripts will be presented to you to verify for accuracy and approval. A copy of an abstract of my findings will be given to your building principal. Additionally, I will provide a working paper (10 to 40 pages) and abstract of study findings to the Midwestern Public Schools Assessment Department within one year of the completion of my data collection.

Before we begin, do you have any questions?

Once again, thank you for your willingness to participate in this interview”.

-
1. How long have you been at Madison Elementary School?
 2. What is your educational background?
 - ___ Bachelor's degree
 - ___ Master's degree
 - ___ Special Certificates and/or endorsements related to mathematics. Please specify.
 - ___ Other? (please specify)
 3. What is your current title/job description at your school?
How long have you held this title or job?
 4. What is your definition of a "mathematics leader" at Madison?
 5. Who do you consider a mathematics leader at Madison?
Please supply the names:
 - 1)
 - 2)
 - 3)
 - 4)

Please provide a justification for your choice. (e.g. what function(s) do these mathematics leaders serve? Are these assigned roles?)
 6. How would you describe your current level of **preparation to lead / support mathematics teaching and learning** for under-represented students (diverse economic, racial/ethnic/language backgrounds) in your school? With other teachers?

Interview Protocol #1: Getting Acquainted / Demographic Items Questions

Date:

Time of Interview:

Interview Venue:

Interviewer:

Interviewee:

Introductions

Following are initial questions that will provide some demographic information to inform description of participant background for this study. Respondents will not be personally identified in any use of these data. Rather, the data will be pooled to learn more about the distribution of leadership for equity and excellence in mathematics in the school.

“Hello!

*Thank you for agreeing to participate in this research study. My central focus is to understand how mathematics leadership for **equity and excellence** is distributed throughout an elementary school. In particular, I am referring to an understanding of how particular leadership practices support equity and excellence. Mathematics content can be learned in any number of ways under any number of circumstances. However, without the equity, some students may not have access to mathematical understanding. Despite the continuous mandates (state and federal) for mathematics for all, a large amount of data clearly points to the fact that “students from some groups are not learning as much as students from other groups” (Flores, 2007, p.32)*

Equity will be defined based on the premise that “all students regardless of their personal characteristics, background, or physical challenges, must have opportunities to study---and support to learn---mathematics” (NCTM, 2000, p.12).

Excellence in this study refers to the intersection between the practices that allow for an understanding of students and factors that continue to afford opportunities for all students to achieve individual success or levels of achievement (expectations, standards, etc.)

In order to explore this topic, I will conduct an initial interview to get to know you, discuss your background and experience in the field of education; leadership, and mathematics teaching and learning at Madison Elementary school.

This interview will last about thirty to forty five minutes. All interviews will be audiotaped for the purpose of reviewing and transcribing the data later. If you would like for me to turn off the audio recording at any point during this interview, please let me know. The transcripts will be presented to you to verify for accuracy and approval. A copy of an abstract of my findings will be given to your building principal. Additionally, I will provide a working paper (10 to 40 pages) and abstract of study findings to the PublicMidwestern Schools Assessment Department within one year of the completion of my data collection.

Before we begin, do you have any questions?

Once again, thank you for your willingness to participate in this interview”.

1. How long have you been Principal at Madison Elementary School?

2. What is your educational background?

☐ Bachelor's degree

☐ Master's degree

☐ Special Certificates and/or endorsements related to mathematics. Please specify.

☐ Other? (please specify)

3. What is your definition of a “mathematics leader”?

4. What is your definition of a “mathematics leader” at Madison?

5. Who do you consider a mathematics leader at Madison?

Please supply the names:

1)

2)

3)

4)

Please provide a justification for your choice. (e.g. what function(s) do these mathematics leaders serve? Are these assigned roles?)

6. How would you describe your current level of **preparation to lead / support mathematics teaching and learning** for under-represented students (diverse economic, racial/ethnic/language backgrounds) in your school? With teachers, staff, parents community and others?

Interview Protocol #1: Getting Acquainted / Demographic Items Questions

Date:

Time of Interview:

Interview Venue:

Interviewer:

Interviewee:

Introductions

Following are initial questions that will provide some demographic information to inform description of participant background for this study. Respondents will not be personally identified in any use of these data. Rather, the data will be pooled to learn more about the distribution of leadership for equity and excellence in mathematics in the school.

“Hello!

*Thank you for agreeing to participate in this research study. My central focus is to understand how mathematics leadership for **equity and excellence** is distributed throughout an elementary school. In particular, I am referring to an understanding of how particular leadership practices support equity and excellence. Mathematics content can be learned in any number of ways under any number of circumstances. However, without the equity, some students may not have access to mathematical understanding. Despite the continuous mandates (state and federal) for mathematics for all, a large amount of data clearly points to the fact that “students from some groups are not learning as much as students from other groups” (Flores, 2007, p.32)*

Equity will be defined based on the premise that “all students regardless of their personal characteristics, background, or physical challenges, must have opportunities to study---and support to learn---mathematics” (NCTM, 2000, p.12).

Excellence in this study refers to the intersection between the practices that allow for an understanding of students and factors that continue to afford opportunities for all students to achieve individual success or levels of achievement (expectations, standards, etc.)

In order to explore this topic, I will conduct an initial interview to get to know you, discuss your background and experience in the field of education; leadership, and mathematics teaching and learning at Madison Elementary school.

This interview will last about thirty to forty five minutes. All interviews will be audiotaped for the purpose of reviewing and transcribing the data later. If you would like for me to turn off the audio recording at any point during this interview, please let me know. The transcripts will be presented to you to verify for accuracy and approval. A copy of an abstract of my findings will be given to your building principal. Additionally, I will provide a working paper (10 to 40 pages) and abstract of study findings to the Midwestern Public Schools Assessment Department within one year of the completion of my data collection.

Before we begin, do you have any questions?

Once again, thank you for your willingness to participate in this interview”.

1. How long have you been a Mathematics Coach/Strategist at Madison Elementary School?
2. What is your educational background?
 - ___ Bachelor's degree
 - ___ Master's degree
 - ___ Special Certificates and/or endorsements related to mathematics. Please specify.
 - ___ Other? (please specify)

3. What is your definition of a “mathematics leader”?
4. What is your definition of a “mathematics leader” at Madison?
5. Who else do you consider a mathematics leader at Madison?

Please supply the names:

1)

2)

3)

4)

Please provide a justification for your choice. (e.g. what function(s) do these mathematics leaders serve? Are these assigned roles?)

6. How would you describe your current level of **preparation to lead / support mathematics teaching and learning** for under-represented students (diverse economic, racial/ethnic/language backgrounds) at Madison? With teachers and others?

Interview Protocol #1: Getting Acquainted / Demographic Items Questions

Date:

Time of Interview:

Interview Venue:

Interviewer:

Interviewee:

Introductions

Following are initial questions that will provide some demographic information to inform description of participant background for this study. Respondents will not be personally identified in any use of these data. Rather, the data will be pooled to learn more about the distribution of leadership for equity and excellence in mathematics in the school.

“Hello!

*Thank you for agreeing to participate in this research study. My central focus is to understand how mathematics leadership for **equity and excellence** is distributed throughout an elementary school. In particular, I am referring to an understanding of how particular leadership practices support equity and excellence. Mathematics content can be learned in any number of ways under any number of circumstances. However, without the equity, some students may not have access to mathematical understanding. Despite the continuous mandates (state and federal) for mathematics for all, a large amount of data clearly points to the fact that “students from some groups are not learning as much as students from other groups” (Flores, 2007, p.32)*

Equity will be defined based on the premise that “all students regardless of their personal characteristics, background, or physical challenges, must have opportunities to study---and support to learn---mathematics” (NCTM, 2000, p.12).

Excellence in this study refers to the intersection between the practices that allow for an understanding of students and factors that continue to afford opportunities for all students to achieve individual success or levels of achievement (expectations, standards, etc.)

In order to explore this topic, I will conduct an initial interview to get to know you, discuss your background and experience in the field of education; leadership; and mathematics teaching and learning at Madison Elementary school.

This interview will last about thirty to forty five minutes. All interviews will be audiotaped for the purpose of reviewing and transcribing the data later. If you would like for me to turn off the audio recording at any point during this interview, please let me know. The transcripts will be presented to you to verify for accuracy and approval. A copy of an abstract of my findings will be given to your building principal. Additionally, I will provide a working paper (10 to 40 pages) and abstract of study findings to the Midwestern Public Schools Assessment Department within one year of the completion of my data collection.

Before we begin, do you have any questions?

Once again, thank you for your willingness to participate in this interview”.

1. How long have you been in the Midwestern Public Schools District?

2. What is your educational background?

___ Bachelor's degree

___ Master's degree

___ Special Certificates and/or endorsements related to mathematics. Please specify.

___ Other? (please specify)

3. What is your current title/job description?

How long have you held this title or job?

4. What is your definition of a “mathematics leader”?

5. Who do you consider (a) mathematics leader(s) at Madison?

Please supply the names:

1)

2)

3)

4)

Please provide a justification for your choice. (e.g. what function(s) do these mathematics leaders serve? Are these assigned roles?)

6. How would you describe your current level of **preparation to lead / support mathematics teaching and learning** for under-represented students (diverse economic, racial/ethnic/language backgrounds) in the district? At Madison school in particular?

Interview Protocol #1: Getting Acquainted / Demographic Items Questions

Date:

Time of Interview:

Interview Venue:

Interviewer:

Interviewee:

Introductions

Following are initial questions that will provide some demographic information to inform description of participant background for this study. Respondents will not be personally identified in any use of these data. Rather, the data will be pooled to learn more about the distribution of leadership for equity and excellence in mathematics in the school.

“Hello!

*Thank you for agreeing to participate in this research study. My central focus is to understand how mathematics leadership for **equity and excellence** is distributed throughout an elementary school. In particular, I am referring to an understanding of how particular leadership practices support equity and excellence. Mathematics content can be learned in any number of ways under any number of circumstances. However, without the equity, some students may not have access to mathematical understanding. Despite the continuous mandates (state and federal) for mathematics for all, a large amount of data clearly points to the fact that “students from some groups are not learning as much as students from other groups” (Flores, 2007, p.32)*

Equity will be defined based on the premise that “all students regardless of their personal characteristics, background, or physical challenges, must have opportunities to study---and support to learn---mathematics” (NCTM, 2000, p.12).

Excellence in this study refers to the intersection between the practices that allow for an understanding of students and factors that continue to afford opportunities for all students to achieve individual success or levels of achievement (expectations, standards, etc.)

In order to explore this topic, I will conduct an initial interview to get to know you, discuss your background and experience as the parent of a student at Madison Elementary school.

This interview will last about thirty to forty five minutes. All interviews will be audiotaped for the purpose of reviewing and transcribing the data later. If you would like for me to turn off the audio recording at any point during this interview, please let me know. The transcripts will be presented to you to verify for accuracy and approval. A copy of an abstract of my findings will be given to your building principal. Additionally, I will provide a working paper (10 to 40 pages) and abstract of study findings to the Midwestern Public Schools Assessment Department within one year of the completion of my data collection.

Before we begin, do you have any questions?

Once again, thank you for your willingness to participate in this interview”.

1. How long have you been affiliated with Madison Elementary School?

2. What is your background /ethnicity?
3. Apart from being a parent, how /what is your current involvement in the school?
4. What is your definition of a “mathematics leader” at Madison?
5. Who do you consider a mathematics leader at Madison? (This could include both teachers, parents and administrators or formal leaders)

Please supply the names:

1)

2)

3)

4)

Please provide a justification for your choice. (e.g. what function(s) do these mathematics leaders serve? Are these assigned roles?)

6. How would you describe your current level of **preparation to lead / support mathematics teaching and learning or the mathematics program** at Madison School? With others (parents, teacher, administrators?)

APPENDIX C: INTERVIEW PROTOCOL #2 - TEACHER

Please note that during this semi-structured interview, other questions may be asked outside this protocol. Other items or ideas will be added as I move through the processes of data collection and analysis.

“Hello,

Once again, thank you for participating in this study. This is part 2 of the interviews.

Some of the questions will be based on the first wave of interviews. My goal here is to gain an extensive understanding or view from various stakeholders (formal and informal leaders, and parents) to understand how they perceive mathematics leadership and begin to paint a picture of how leadership for mathematics is distributed at Madison school.

Any questions before we start?. ”

1. Why is it important for students to learn of mathematics?
2. Describe a typical mathematics classroom.
3. How would you describe your current level of **expertise to teach mathematics**?
4. Tell me about how Madison is presenting mathematics instruction to students. Please describe your vision for mathematics teaching and learning. What does it look, feel, or sound like? What kinds of activities are the students engaged in? Who is expected to be successful in mathematics? Are ALL students engaged in the mathematics they are learning? Are there things that can be changed?
5. What roles do children’s families and native language play in your classroom/ school and teachers mathematics planning and instruction? If possible, describe some specific examples.
6. How do **you as a teacher** get to know the contexts of children’s/students’ lives and learning?
7. How do you acquire new subject matter and pedagogical knowledge?

8. What roles do children's communities play in your classroom/ school or teachers' mathematics planning and instruction?
9. Describe your role in the mathematics teaching and learning of diverse learners within your school.
10. How confident are you in teaching mathematics to under- represented students (diverse economic, racial/ethnic/language backgrounds) in your classroom?
11. What roles do children's mathematics thinking play in your mathematics planning and instruction? If possible, please provide specific examples.

Note: I will provide the following explanation (for clarification as/if needed): This means the way that children reason about different mathematical concepts and strategies they use to solve problems and the way that they make sense of mathematical ideas or make connections.

12. What kinds of support do you (**teacher**) provide students/teachers with respect to teaching and learning mathematics? Please provide specific examples.
 - How are you affected by what happens nationally in regards to mathematics education? (NCTM Equity Principle, Principles and Standards for School Mathematics, Iowa Core, PRIME Leadership Framework, etc.)
 - How are you affected by what the state, district does?
 - What changes have you seen in mathematics education leadership at the building?
 - How have those affected you?
13. What is your understanding of what it means to ensure high expectations and meaningful mathematics learning for every student?
 - As a **teacher** (of mathematics) what is your working definition of equity?
 - If you had to give a public talk and list 3 points that summarize the goals you have around equity in mathematics at your school/building, what would those 3 points include?
 - How do you communicate your vision for mathematics education with others? (teachers, parents, community members, students?)
14. What challenges might a new teacher at Madison School face as he/she begins a career as a teacher of mathematics?
15. What challenges might a new teacher to the profession face as he/she begins a career as a teacher of mathematics?

16. What kinds of supports would help a new or veteran teacher to *implement high expectations and meaningful mathematics learning for all students in their classroom?*
17. Can you tell me how the teaching of mathematics at Madison may differ from other schools?
18. When you have a question about the mathematics instruction at Madison, who would you turn to for advice?
19. What kinds of supports would help a new or veteran teachers teacher to *implement practices regarding student diversity in their math instruction?*
20. If you could make a change at the building or classroom level what will it be?

What is running well and should NOT be changed?
21. During a grade level team meeting who decides what topics are to be discussed? What will be taught next? How are decisions made?
22. What does excellence in mathematics mean to you?
23. When you receive the building student achievement data who do you go to for questions regarding the interpretation of the data? And ideas for instruction to address /reflect that information?
24. Can you think of a time when you were struggling to understand what math materials were telling you (or telling you to do)? Who did you turn to?
25. What particular leadership practices do you think support equity and excellence?
26. What particular leadership practices do you think constrain equity and excellence?

Interview Protocol #2 – Principal

Please note that during this semi-structured interview, other questions may be asked outside this protocol. Other items or ideas will be added as I move through the processes of data collection and analysis.

“Hello,

Once again, thank you for participating in this study. This is part 2 of the interviews.

Some of the questions will be based on the first wave of interviews. My goal here is to gain an extensive understanding or view from various stakeholders (formal and informal leaders, and parents) to understand how they perceive mathematics leadership and begin to paint a picture of how leadership for mathematics is distributed at Madison school. Any questions before we start?.”

1. Why is it important for students to learn of mathematics?
2. Describe a typical mathematics classroom.
3. How would you describe your current level of **expertise to teach mathematics**?
4. Tell me about how Madison is presenting mathematics instruction to students. Please describe your vision for mathematics teaching and learning. What does it look, feel, or sound like? What kinds of activities are the students engaged in? Who is expected to be successful in mathematics? Are ALL students engaged in the mathematics they are learning? Are there things that can be changed?
5. What roles do children’s families and native language play in your classroom/ school and teachers mathematics planning and instruction? If possible, describe some specific examples.
6. How do **you as an administrator** support teachers in getting to know the contexts of their students’ lives and learning?
7. How do you support teachers in acquiring new subject matter and pedagogical knowledge?

8. What roles do children's communities play in your classroom/ school or teachers' mathematics planning and instruction?
9. Describe your role in the mathematics teaching and learning of diverse learners within your school.
10. How confident are you in supporting the teaching of mathematics to under-represented students (diverse economic, racial/ethnic/language backgrounds) in classrooms/in your school?
11. What roles do children's mathematics thinking play in your teachers /school's mathematics planning and instruction? If possible, please provide specific examples.

Note: I will provide the following explanation (for clarification as/if needed): This means the way that children reason about different mathematical concepts and strategies they use to solve problems and the way that they make sense of mathematical ideas or make connections.

12. What kinds of support do you (**building administrator or principal**) provide students/teachers with respect to teaching and learning mathematics? Please provide specific examples.
 - How are you affected by what happens nationally in regards to mathematics education? (NCTM Equity Principle, Principles and Standards for School Mathematics, Iowa Core, PRIME Leadership Framework, etc.)
 - How are you affected by what the state, district does?
 - What changes have you seen in mathematics education leadership at the building?
 - How have those affected you?
13. What is your understanding of what it means to ensure high expectations and meaningful mathematics learning for every student?
 - As an educational leader (for mathematics) what is your working definition of equity?
 - If you had to give a public talk and list 3 points that summarize the goals you have around equity in mathematics at your school/building, what would those 3 points include?
 - How do you communicate your vision for mathematics education with others? (teachers, parents, community members, students, other mathematics leaders?)

14. What challenges might a new teacher at Madison School face as he/she begins a career as a teacher of mathematics?
15. What challenges might a new teacher to the profession face as he/she begins a career as a teacher of mathematics?
16. What kinds of supports would help a new or veteran teacher to implement high expectations and meaningful mathematics learning for all students in their classroom?
17. Can you tell me how the teaching of mathematics at Madison may differ from other schools?
18. When you have a question about the mathematics instruction at Madison, who would you turn to for advice?
19. What kinds of supports would help a new or veteran teachers teacher to implement practices regarding student diversity in their math instruction
20. If you could make a change at the building or classroom level what will it be?

What is running well and should NOT be changed?
21. During grade level team meetings who decides what topics are to be discussed?
What will be taught next? How are decisions made?
22. What does excellence in mathematics mean to you?
23. When you receive the building student achievement data what do you do next?
Who do you go to for questions regarding the interpretation of the data? And ideas for instruction to address /reflect that information?
24. What particular leadership practices do you think support equity and excellence?
25. What particular leadership practices do you think constrain equity and excellence?

Interview Protocol #2 – Mathematics Coach & Strategist

Please note that during this semi-structured interview, other questions may be asked outside this protocol. Other items or ideas will be added as I move through the processes of data collection and analysis.

“Hello,

Once again, thank you for participating in this study. This is part 2 of the interviews.

Some of the questions will be based on the first wave of interviews. My goal here is to gain an extensive understanding or view from various stakeholders (formal and informal leaders, and parents) to understand how they perceive mathematics leadership and begin to paint a picture of how leadership for mathematics is distributed at Madison school.

Any questions before we start?.”

1. Why is it important for students to learn of mathematics?
2. Describe a typical mathematics classroom.
3. How would you describe your current level of **expertise to teach mathematics**?
4. Tell me about how Madison is presenting mathematics instruction to students. Please describe your vision for mathematics teaching and learning. What does it look, feel, or sound like? What kinds of activities are the students engaged in? Who is expected to be successful in mathematics? Are ALL students engaged in the mathematics they are learning? Are there things that can be changed?
5. What roles do children’s families and native language play in your classroom/ school and teachers mathematics planning and instruction? If possible, describe some specific examples.
6. How do **you as a Mathematics Coach / Strategist** get to know and/or support teachers in getting to know the contexts of their students’ lives and learning?
7. How do you support teachers in acquiring new subject matter and pedagogical knowledge?

8. What roles do children's communities play in your classroom/ school or teachers' mathematics planning and instruction?
9. Describe your role in the mathematics teaching and learning of diverse learners within your school.
10. How confident are you in supporting the teaching of mathematics to under-represented students (diverse economic, racial/ethnic/language backgrounds) in classrooms/in your school?
11. What roles do children's mathematics thinking play in your, teachers /school's mathematics planning and instruction? If possible, please provide specific examples.

Note: I will provide the following explanation (for clarification as/if needed): This means the way that children reason about different mathematical concepts and strategies they use to solve problems and the way that they make sense of mathematical ideas or make connections.

12. What kinds of support do you (**Mathematics Coach / Strategist**) provide students/teachers with respect to teaching and learning mathematics? Please provide specific examples.
 - How are you affected by what happens nationally in regards to mathematics education? (NCTM Equity Principle, Principles and Standards for School Mathematics, Iowa Core, PRIME Leadership Framework, etc.)
 - How are you affected by what the state, district does?
 - What changes have you seen in mathematics education leadership at the building?
 - How have those affected you?
13. What is your understanding of what it means to ensure high expectations and meaningful mathematics learning for every student?
 - As an educational leader (for mathematics) what is your working definition of equity?
 - If you had to give a public talk and list 3 points that summarize the goals you have around equity in mathematics at your school/building, what would those 3 points include?
 - How do you communicate your vision for mathematics education with others? (teachers, parents, community members, students, other mathematics leaders?)

14. What challenges might a new teacher at Madison School face as he/she begins a career as a teacher of mathematics?
15. What challenges might a new teacher to the profession face as he/she begins a career as a teacher of mathematics?
16. What kinds of supports would help a new or veteran teacher to implement high expectations and meaningful mathematics learning for all students in their classroom?
17. Can you tell me how the teaching of mathematics at Madison may differ from other schools?
18. When you have a question about the mathematics instruction at Madison, who would you turn to for advice?
19. What kinds of supports would help a new or veteran teachers teacher *to implement practices regarding student diversity in their math instruction*?
20. If you could make a change at the building or classroom level what will it be? What is running well and should NOT be changed?
21. During grade level team meetings who decides what topics are to be discussed? What will be taught next? How are decisions made?
22. What does excellence in mathematics mean to you?
23. When you receive the building student achievement data what do you do next? Who do you go to for questions regarding the interpretation of the data? And ideas for instruction to address /reflect that information?
24. What particular leadership practices do you think support equity and excellence?
25. What particular leadership practices do you think constrain equity and excellence?

Interview Protocol #2 – District Elementary Mathematics Coordinator

Please note that during this semi-structured interview, other questions may be asked outside this protocol. Other items or ideas will be added as I move through the processes of data collection and analysis.

“Hello,

Once again, thank you for participating in this study. This is part 2 of the interviews.

Some of the questions will be based on the first wave of interviews. My goal here is to gain an extensive understanding or view from various stakeholders (formal and informal leaders, and parents) to understand how they perceive mathematics leadership and begin to paint a picture of how leadership for mathematics is distributed at Madison school. Any questions before we start?.”

1. Why is it important for students to learn of mathematics?
2. Describe a typical mathematics classroom.
3. How would you describe your current level of **expertise to teach mathematics**?
4. Tell me about how mathematics instruction should be presented to students at King. Please describe your vision for mathematics teaching and learning in the district. What does it look, feel, or sound like? What kinds of activities are the students engaged in? Who is expected to be successful in mathematics? Are ALL students engaged in the mathematics they are learning? Are there things that can be changed?
5. What roles do children’s families and native language play in your classroom/ school and teachers mathematics planning and instruction? If possible, describe some specific examples.
6. How do you as a leaders support teachers in getting to know the contexts of their students’ lives and learning?
7. How do you support teachers in acquiring new subject matter and pedagogical knowledge?

8. What roles do children's communities play in your classroom/ school or teachers' mathematics planning and instruction?
9. Describe your role in the mathematics teaching and learning of diverse learners within your school/district.
10. How confident are you in supporting the teaching of mathematics to under-represented students (diverse economic, racial/ethnic/language backgrounds) in classrooms at Madison?
11. What roles do children's mathematics thinking play in teachers /schools/district's mathematics planning and instruction? If possible, please provide specific examples.

Note: I will provide the following explanation (for clarification as/if needed): This means the way that children reason about different mathematical concepts and strategies they use to solve problems and the way that they make sense of mathematical ideas or make connections.

12. What kinds of support do you (**District Elementary Mathematics Coordinator**) provide students/teachers with respect to teaching and learning mathematics? Please provide specific examples.
 - How are you affected by what happens nationally in regards to mathematics education? (NCTM Equity Principle, Principles and Standards for School Mathematics, Iowa Core, PRIME Leadership Framework, etc.)
 - How are you affected by what the state, district does?
 - What changes have you seen in mathematics education leadership at the building/district level?
 - How have those affected you?
13. What is your understanding of what it means to ensure high expectations and meaningful mathematics learning for every student?
 - As an educational leader (for mathematics) what is your working definition of equity?
 - If you had to give a public talk and list 3 points that summarize the goals you have around equity in mathematics at your school/building, what would those 3 points include?
 - How do you communicate your vision for mathematics education with others? (teachers, parents, community members, students, other mathematics leaders, other district leaders?)

14. What challenges might a new teacher at Madison School face as he/she begins a career as a teacher of mathematics?
15. What challenges might a new teacher to the profession face as he/she begins a career as a teacher of mathematics?
16. What kinds of supports would help a new or veteran teacher to implement high expectations and meaningful mathematics learning for all students in their classroom?
17. Can you tell me how the teaching of mathematics at Madison may differ from other schools?
18. What kinds of supports would help a new or veteran teacher's teacher to *implement practices regarding student diversity in their math instruction*?
19. If you could make a change at the building or classroom level what will it be? What is running well and should NOT be changed?
20. Who decides what topics are to be taught or discussed in mathematics? Or what will be taught next? How are those decisions made?
21. What does excellence in mathematics mean to you?
22. When you receive the district student achievement data what do you do next? Who do you go to for questions regarding the interpretation of the data? And ideas for instruction to address /reflect that information?
23. What particular leadership practices do you think support equity and excellence?
24. What particular leadership practices do you think constrain equity and excellence?

Interview Protocol #2 - Parent

Please note that during this semi-structured interview, other questions may be asked outside this protocol. Other items or ideas will be added as I move through the processes of data collection and analysis.

“Hello,

Once again, thank you for participating in this study. This is part 2 of the interviews.

Some of the questions will be based on the first wave of interviews. My goal here is to gain an extensive understanding or view from various stakeholders (formal and informal leaders, and parents) to understand how they perceive mathematics leadership and begin to paint a picture of how leadership for mathematics is distributed at Madison school. Any questions before we start?.”

1. Tell me about your children attending Madison Elementary School (gender, age, and grade)
2. Tell me about your own experience with mathematics. Was mathematics a favored subject? Do you consider yourself “good” at mathematics?
3. What is your opinion about how Madison School is presenting mathematics instruction to your child?
4. Have you had discussions with teachers or others at Madison regarding your child’s mathematics education? If yes, with who?
5. If you have questions or concerns about specifically your child’s mathematics curriculum, assignments, or other related issues, who would you contact?

6. Are there things that you would like to see changed? Are there things in the Madison program that you especially like and appreciate?
7. Have you or do you plan to interact with Madison Teachers about mathematics?
8. How would you rate your child's (children's) progress in mathematics?
9. How do you interact with your child in regards to mathematics? Do you regularly view assignments? Assist with homework? Provide additional instruction or practice?
10. What does equity mean to you?
11. How do you define excellence?
12. Explain how you know someone is leading for equity? Or excellence?
13. What particular leadership practices do you think support equity and excellence?
14. What particular leadership practices do you think constrain equity and excellence?

APPENDIX D: PERMISSION TO USE COPYRIGHTED MATERIAL

**James P. Spillane** <j-spillane@northwestern.edu>

Sep 7 ☆

to me ▾

Hi Comfort
 You have my permission to use the diagram
 best
 j

On Sep 7, 2017, at 5:24 AM, Comfort Akwaji-Anderson <comforta@iastate.edu> wrote:

----- Forwarded message -----

From: **Comfort Akwaji-Anderson** <comforta@iastate.edu>
 Date: Wed, Sep 6, 2017 at 11:22 PM
 Subject: Permission to Use Distributed Leadership Graphic
 To: permissions@wiley.com

Dear Dr. Spillane or Representative,

Below is a distributed leadership graphic I would like to ask for your permission to use in my dissertation titled "**Distributed leadership for equity and excellence in mathematics: An elementary school case study**".

I plan to do my final defense the 3rd week in October. I would greatly appreciate your letting me use this graphic.
 <image.png>



James P. Spillane

Spencer T. & Ann W. Olin Professor of Learning & Organizational Change
 Professor of Human Development & Social Policy
 Professor of Learning Sciences
 Faculty Associate Institute for Policy Research

James P. Spillane

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