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Elementary Administrators' Mathematics Supervision & Self-Efficacy Development

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ELEMENTARY ADMINISTRATORS’ MATHEMATICS SUPERVISION

& SELF-EFFICACY DEVELOPMENT

By

Kelly M. Gomez Johnson

A DISSERTATION

Presented to the Faculty of

The Graduate College at the University of Nebraska

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Major: Educational Administration

Under the Supervision of Dr. C. Elliott Ostler, Ed.D. and Dr. Tamara J. Williams, Ed.D.

Omaha, Nebraska

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Abstract

Mathematics curriculum reform is changing the content and resources in today’s elementary classrooms as well as the culture of mathematics teaching and learning. Administrators face the challenge of leading large-scale curricular change efforts with limited prior knowledge or experiences with reform curricula structures. Administrators, as the bridge between district and building-level initiatives, are in a unique position to impact and drive change. However, they face increasing responsibilities in their demanding roles and draw on their beliefs and leadership abilities to take action. Increased beliefs in their abilities as leaders, known as self-efficacy, guide administrators to commit and persevere during times of change and influence their effectiveness. In a quest to equitably enact sustainable curricular change, school districts are reviewing how to best support administrators through professional development in areas such as mathematics. The purpose of this study was to examine one Midwestern, suburban school district’s efforts to provide professional development for elementary administrators in the area of mathematics instructional leadership. The concurrent transformative mixed-methods study examined the self-efficacy of 38 elementary administrators during a mathematics curriculum adoption year.
Albert Bandura’s Social Cognitive Theory and self-efficacy construct (1977) framed this mixed-methods study which aimed to answer whether professional development for administrators impacted their self-efficacy as instructional leaders of mathematics. Pre- and post-survey results from the Administrator Self-Efficacy Scale for Mathematics revealed that subject-specific professional development increased administrators’ mathematics instructional leadership self-efficacy. In addition, evidence indicated that district-led professional development activities narrowed the gap between administrators’ general and mathematics instructional leadership self-efficacy during the initial curriculum adoption year. Qualitative findings based on naturalistic inquiry and document analysis collection methods provided further insight into the professional development activities leading to significant quantitative outcomes. Conclusions and implications may serve school districts and administrators as they plan or review their professional development processes especially when enacting curricular change. In addition, district leaders utilizing Bandura’s four sources of self-efficacy as a framework provides more high-quality professional development for administrators.
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The only impossible journey is the one you never begin.

– Anthony Robbins

Earning a doctorate degree is a milestone I never envisioned I would achieve. The blessings God has bestowed on my life reach far beyond this educational and professional endeavor, but I am grateful His plan is greater than mine. How true it is that “With God, all things are possible.” (Matthew 19:26)

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Chapter 1

Introduction

“This is not the way I learned mathematics.”

The look and feel of mathematics education in many United States classrooms is changing. While students are innocently unaware, many educators are grappling with the shifting instructional and philosophical landscape occurring in mathematics. Many teachers and administrators are being asked to lead and teach in ways far different from how they learned or were trained to teach mathematics. The deficit of experiential knowledge creates a challenging reform environment where all parties are cognizant of the simultaneous learning, leading, and implementation occurring in schools. Although traditionally the focus of professional development was on teachers, that focus has shifted to increased professional development opportunities for building administrators in recent decades (Leithwood, 2004). School districts have increased their attention and resources on professional development for administrators so that school-based leaders can be equipped with skills beyond managerial to implement new instructional and learning practices.

For decades, research identifies strong administrator leadership as a pivotal component in the school improvement process (Branch, Hanushek, & Rivkin, 2012; Edmonds, 1979; Grissom & Loeb, 2011; Hallinger & Heck, 1996; Leithwood & Louis, 2012; Leithwood, Louis, Wahlstrom, & Anderson, 2010). Administrators possess substantial reach and access to leverage the many variables that impact student achievement into a collective critical mass (Wallace Foundation, 2011). Longitudinal studies have confirmed these findings, showing empirical evidence that principal
leadership was second only to classroom teaching in impacting student achievement (Leithwood, Louis, Anderson, & Walstrom, 2010; Marzano, Waters, & McNulty, 2005; Wallace Foundation, 2011). School administrators take on the roles of managers, systems experts, budget analysts, disciplinarians, and curriculum and instructional leaders, to name a few. As a central factor in the success of a school, administrator beliefs, and the resulting actions, come into question as administrators lead in various capacities to enable effective teaching and learning for teachers and students in their building.

The beliefs of administrators can be crucial in the establishment and sustainability of effective school environments, as beliefs directly relate to leadership behaviors and how administrators initiate, commit, and persist during times of change (Bandura, 1997; McCormick, 2001; Smith, Guarino, Strom, & Adams, 2006). As curriculum and instructional practices evolve over time, a factor to consider in the systematic process of reform is how administrators are supported as leaders with professional development opportunities.

As the roles of school administrators expand, challenges naturally arise. One such challenge is guiding and leading teachers through instructional reform or a process of change, with the goal to improve. Lambert (1998) stated, “Leadership is about learning that leads to constructive change” (p. 9). In schools, reform is a collective process where systematic school improvement requires a wealth of knowledge and commitment from an army of stakeholders such as district leaders, curriculum experts, building administrators, and teachers. While perhaps highly committed to the rationale or purpose for reform, administrators can find they are expected to lead and manage initiatives in which they themselves lack familiarity, knowledge, and hence, confidence.
District-level support for school administrators in building their capacity to lead, and not just manage change, is vital in the school improvement process (Honig, 2012). For administrators to be fully engaged during a period of reform, administrators need the knowledge and skills necessary to not only lead, but cultivate an environment for sustainable change (Elmore, 2004). Although school districts recognize the need to provide professional development to administrators, funding for training and resources to support administrators is a challenge.

Historically, instructional leadership has been an important component of building and sustaining school excellence (Edmonds, 1979; Hallinger, 2005; Murphy, 1988). Instructional leadership is broadly defined as the practices exhibited by administrators to improve teaching and learning in the classroom (Grissom & Loeb, 2011; Grissom, Loeb, & Master, 2013; Hallinger, 2003, 2005; Hallinger & Heck, 1996; Horng, Klasick, & Loeb, 2010; Neumerski, 2013). Administrators engaged in the teaching and learning aspects of their building have significant, but indirect impact on student learning outcomes (Louis, Dretzke, & Wahlstrom, 2010). Societal expectations and needs require curriculum to evolve over time to continuously improve student learning. Even though administrators do not directly implement teaching and learning practices, they are expected to stay abreast of new research and trends to positively drive instructional effectiveness in their building. This expectation involves both the leadership of the logistical implications of change and the introduction and implementation of new instructional practices.

Curriculum reform can be a tremulous time as it influences educational beliefs, instructional practices, and at times the overall structure of schooling. Students, parents,
teachers, administrators, and district leaders are all impacted by the ripple of curricular change. Elementary mathematics is a recent example of major curriculum change over the past decade. Seeley (2015), the former president of the National Council of Teachers of Mathematics (NCTM), stated that “workers of tomorrow need a richer, deeper, and fundamentally different education than those of the twentieth century” (p. 33). With more emphasis on conceptual understanding versus procedural fluency, reform mathematics curricula are facing political and social criticism. Unfamiliar and non-traditional teaching and learning practices cause uneasiness for adults who “never learned like that”. This discomfort can include administrators who play a major role in the successful implementation of new curriculum and instructional change. For this reason, the further examination of administrators’ knowledge and beliefs in times of reform is warranted as those factors can greatly contribute to the level of implementation and action taken by administrators.

**Theoretical Framework- Self-Efficacy**

Bandura’s Social Cognitive Theory defines efficacy as “beliefs in one’s capabilities to organize and execute the courses of action required to produce given attainments” (Bandura, 1997, p. 3). A leader’s judgement of self-efficacy in accomplishing a task or enacting change greatly influences not only how they initiate the change, but also their commitment and persistence to the desired change (Bandura, 1977, 1986, 1997; Lucas, 2003; Tschannen-Moran & Woolfolk-Hoy, 2007). In other words, administrator self-efficacy to lead curricular change could impact not only the amount of time devoted to the curriculum reform process, but also how administrators persist when faced with obstacles. A fundamental premise of self-efficacy is the notion that it is
situationally specific. Whereas certain tasks required of school administrators may result in high self-efficacy (where they feel more confident in enacting change), other situations could result in the opposite feelings and, therefore actions. For school districts, this lack of consistent behaviors can be a crucial aspect in the fidelity of implementing new curriculum from school to school and subject to subject. As districts adopt new curriculum or large-scale changes in teaching and learning practices, they simultaneously review professional development efforts to ensure instructional and systematic change. In reviewing professional development, a focus on self-efficacy may inform the professional learning processes and actions of building administrators as instructional leaders.

**The Formation of self-efficacy beliefs**

Research on self-efficacy identifies four sources that influence an individual’s beliefs in their ability to accomplish a task: (a) performance outcomes (enactive mastery experience) (b) watching others (vicarious experiences), (c) verbal persuasion, encouragement and feedback, and (d) attention to psychological state (Bandura, 1977). These sources provide insight about how to enhance the self-efficacy of individuals. For district leaders and researchers, the knowledge and utilization of this powerful construct could translate training into action with fidelity.

**Statement of the Problem**

Todd Whitaker (2003) states that “the difference between more effective principals and their less effective colleagues is not what they know. It is what they do” (p. 1). A major factor impacting the behaviors of school administrators especially as they enact change is their self-efficacy or beliefs in their abilities. With heightened accountability and expectations of 21st-century schools, school administrators are at the
forefront of school improvement discussions across the United States. Research and national policy support the concept of administrator training, however, there is minimal information regarding the systematic process of providing professional development which can best promote the self-efficacy of administrators as instructional leaders during a time of change. This study examined one suburban school district’s professional development sequence during a curriculum reform process in elementary education and its impact on administrator self-efficacy in instructional leadership. The purpose of this study was to investigate the impact of professional development on the self-efficacy of school administrators during reform, in this case, elementary mathematics reform.

Research Questions

This study focused on self-efficacy and professional development. A mixed-methods research design utilized survey results, field notes and document analysis to attend to the following research questions:

Main Research Question: How does school administrators’ professional development for mathematics instructional leadership impact their own self-efficacy?

Sub-Research Question 1: What opportunities have administrators had to develop their self-efficacy in mathematics instructional leadership?

Sub-Research Question 2: Did district-provided professional development change administrators’ general instructional leadership self-efficacy?

Sub-Research Question 3: Did district-provided professional development change administrators’ mathematical instructional leadership self-efficacy?
Sub-Research Question 4: How does administrators’ general instructional leadership self-efficacy compare to their mathematical instructional leadership self-efficacy before and after district-provided professional development?

Methodology

The research design for this study was a concurrent transformative mixed-methods design (Creswell, 2014) in which two data collection phases (quantitative and qualitative) are given equal priority. In this explanatory study, the quantitative survey data was collected both prior to (pre-) and after (post-) the qualitative data. The analysis of the survey data helped inform the professional development activities put into place and were later evaluated qualitatively through documentation, field notes and a post-survey. The self-efficacy construct as well as the transformative nature, guided the study and determined its research design. The intention was to cross-validate a variety of data through triangulation to learn more about the process and impact of professional development on administrator self-efficacy as instructional leaders in mathematics.

Quantitative design- survey

Surveys are commonly used in trend studies (Babbie, 1998; Creswell, 2005). For this study, a survey studied a potential change in self-efficacy over time in administrators. The Administrator Self-Efficacy Scale for Mathematics (ASES-M) survey (Appendix B), is a derivative of the Principal Self-Efficacy Survey (PSES), developed and validated by Smith and Guarino (2005). PSES mimics the work of Tschannen-Moran, Hoy, and Hoy (1998) in relation to their work studying self-efficacy beliefs of teachers and students and its’ relationship to teaching and learning. The authors of PSES, Smith and Guarino, granted permission for use of their copyrighted instrument for this study (Appendix C).
Qualitative design- naturalistic inquiry & document analysis

Over an eight-month period, the researcher observed district instructional leadership facilitate professional development activities for elementary building administrators. Through conversations with elementary district leadership, naturalistic inquiry observations, and document analysis over an eight-month time period, the researcher identified and coded a history of milestone professional development activities and subsequent significant outcomes for administrators using the four sources of self-efficacy (Bandura, 1977). The researcher took observation and field notes at monthly elementary administrative curriculum meetings, informal Lunch and Learn conversations, and district-sponsored professional development activities for administrators. Additionally, prior to the eight-month qualitative collection period, the researcher analyzed district-mathematics leadership activities related to the curriculum change process dating back to 2014. The district leadership team made each professional development opportunity discussed in this study open to all administrators.

Definition of Terms

• **Administrators**: Administrators are defined as elementary building-level principals, assistant principals or principal interns.

• **District Leaders**: District leaders are defined as central office personnel including roles such as curriculum directors and specialists and district supervisors. The primary district leaders involved in this study included the Mathematics Curriculum Facilitator (MCF), the Director of Elementary Education (DEE), and the Director of Staff Development & Instructional Improvement (DSD).
• **Instructional Leadership:** Instructional leadership is defined as practices exhibited by administrators (principals, assistant principals, principal interns) to improve teaching and learning in the classroom or school building.

• **Professional Development:** Professional Development is defined as ongoing learning opportunities provided to enhance the knowledge and skills specific to one’s occupation.

• **Reform:** Reform is defined as a process of change in order to improve.

• **Self-efficacy:** Self-efficacy is defined as an individual’s beliefs in their ability to organize and execute a specific task.

**Assumptions**

Since a portion of the data was collected using a survey, the process relies on the accurate self-reporting of administrators in their beliefs of their abilities to be instructional leaders. Also, during the qualitative coding of professional development documents and activities, the researcher’s understanding and judgement of the four sources of self-efficacy in order to tag activities appropriately is assumed to be accurate and consistent. Lastly, the researcher designed the survey for this study, in part, on the Principles Self-Efficacy Survey (PSES) structure (Smith & Guarino, 2005). It is assumed that with paralleled mathematical construction of the ASES-M, the construct validity remains consistent with the original PSES survey.

**Limitations**

The study was limited to only elementary administrators defined as building principals, assistant principals and principal interns. Instructional leadership roles exist beyond administrators in the participating school district, however, a smaller population
was chosen to ensure all participants had access to a defined set of professional
development activities. With a specific and isolated sample, the diversity (age,
experience, race, ethnicity, etc.) of participants was not representative of the studied
community as it was limited to the current demographics of the district administrators.
All participants had access to each professional development activity, yet attendance and
participation in all district-offered opportunities varied. Additionally, administrators had
prior professional experiences as instructional leaders due to their number of years as an
educational leader, history with reform mathematics curriculum, and/or history
implementing prior curriculum reform initiatives. The study intended to report these prior
experiences on the baseline self-efficacy pre-survey, however diverse backgrounds and
professional experiences outside of district-provided professional development could not
be controlled. Lastly, when implementing qualitative research practices such as field
notes from observation, observer bias may be a factor. Observer bias is the researcher’s
viewpoints or background which may affect what they see. The researcher was cognizant
of observer bias and remained as nonjudgmental and objective as possible (Fraenkel &

**Delimitations**

The study was conducted in one, Midwestern school district and participants
represented a small population of building-level elementary administrators. The
specificity of the convenience population was a delimitation of the study. Additionally,
the professional development process investigated for this study will not be generalizable
to all districts or administrator experiences due to its small population size and particular
focus on unique mathematics state standards and curriculum organization.
Significance of the Study

This study is significant because schools are constantly evolving systems. Instituting a significant curricular change requires a commitment to following through and supporting those individuals not only enacting change, but also leading change. Considering the diverse and important roles administrators fulfill, the examination of self-efficacy in specific task-related areas, such as instructional leadership and subject-specific instructional leadership, could bring awareness to areas where beliefs in one’s abilities are lacking and could be developed through professional development. Studying the professional development layers necessary to enact systemic reform through the beliefs and actions of leaders may provide insight to an alternative avenue for indirect student achievement gains. Self-efficacy beliefs of administrators is a gap in educational research which has opportunities for further studies that are promising (Tschannen-Moran & Gareis, 2004; Smith & Guarino, 2006). Lastly, this study hopes to add to the body of knowledge on professional development, self-efficacy, and the potential relationship between the two during a time of reform. If a relationship exists, district leaders could utilize the construct of self-efficacy as a platform for future professional development planning and implementation. Professional development and instructional leadership are familiar topics in both literature and nationwide conversations pertaining to school improvement. The intersection of these topics, especially through the lens of self-efficacy as a means to enrich professional development, has little known associated research.

Outline of the Study

As curriculum and instructional practices continue to evolve to meet the needs of students, educators are challenged to change with the times. Adding to an already
complex role, administrators are required to lead during times of instructional reform where they may feel ill prepared. As professional development and instructional leadership continue to be a focus in educational research, however, investigating professional development practices and how they impact the beliefs of administrators as instructional leaders warrants careful consideration and attention. Chapter One introduced and identified the problem, explored the significance of the study, stated the research questions to be studied and briefly outlined the methodology. In addition, Chapter One shared a definition of terms and also the limitations of the study. Chapter Two will highlight literature that supports the study in the areas of (1) self-efficacy, (2) leadership, and (3) professional development. Chapter Three will outline the research design, describe the participants of the study, detail the process for collecting and analyzing data, and provide a description of the researcher’s perspective. Chapter Four will be a detailed analysis of the qualitative data specifically aligned to the first sub-research question related to administrative professional development opportunities. Chapter Five will provide an analysis of quantitative survey data aligned to sub-research questions 2-4. Additionally, Chapter Five will summarize the study’s mixed-methods findings to analyze, if any, the connections between qualitative and quantitative data results. Chapter Six will offer discussion, considerations, and implications for the future and provide a conclusion to the study.
Chapter 2

Review of Literature

Chapter Two presents a review of literature, both theoretical and empirical, that support this study. The purpose of this study is to investigate the impact of professional development on the self-efficacy of school administrators during reform, in this case, elementary mathematics reform. The chapter is divided into three major categories including self-efficacy, leadership, and professional development.

Bandura’s Social Cognitive Theory

Bandura’s Social Cognitive Theory (SCT) (1977, 1986, 1994, 1997) serves as the theoretical lens from which this study was examined. The SCT describes human functioning as a triadic, reciprocal intersection among personal factors, behaviors, and environmental influences impacting adaptation and change (Bandura, 1986, 1997; Pajares & Usher, 2008). Figure 2.1 represents what is referred to as Bandura’s Triadic Reciprocal Determinism model (Bandura, 1986; Wood & Bandura, 1989).

![Figure 2.1 Bandura's triadic reciprocal determinism model. This model represents Albert Bandura’s beliefs regarding the internal and external factors that impact human behavior.](image-url)
A unique feature of the SCT is the emphasis on internal (personal factors) and external (social influence and environment) reinforcements and their impact on behavior. In other words, the way in which individuals attain and continue certain behaviors relies not only on past experiences and expectations, but also the environment where behaviors will occur. Consequently, individuals are products of their environments and they are considered producers as well.

At the core of the triadic intersection is the concept of human agency. This factor represents how individuals are capable of actively engaging in their own development largely due to their self-beliefs and ability to act on those beliefs. For example, individuals may alter their behavior or other personal factors in response to how they interpreted results from a previous situation and future behaviors could also be impacted. This relationship between factors is the essence of Bandura’s reciprocal determinism theory (Bandura, 1986). Key to the sense of human agency through the personal, environmental and behavioral factors, individuals possess self-beliefs regarding what they can accomplish given their skills or circumstances. This set of beliefs, termed self-efficacy, can have a major influence on the actions and therefore, effects of an individual’s life and work (Bandura, 1997).

**Self-Efficacy Beliefs**

The cornerstone of the SCT, self-efficacy, is defined as an individual’s beliefs in their ability to organize and execute a specific task (Bandura, 1977, 1986, 1997). Bandura’s (1986) seminal work indicated that humans have the ability to organize, analyze, regulate, and reflect on their own thoughts, feelings, and actions. Humans are not just reactive creatures influenced by their environment. Self-efficacy is not
considered to be a personality trait, but a situation-specific construct (Bandura, 1997; Linnenbrink & Pintrich, 2002). Self-efficacy depends on a particular task, prior experiences of the individuals related to the task, and the particular circumstances surrounding the task. (Bandura, 1977). This is an important finding as it indicates self-efficacy beliefs can be changed and influenced depending on the situation, whereas personality traits are described as consistent and stable regardless of time and across situations (Diener & Lucas, 2016).

Bandura argued that an individual’s beliefs are a primary factor to behavior and motivation and their own cognition such that “what people think, believe, and feel affects how they behave” (Bandura, 1986, p. 25). A number of studies have supported Bandura’s claim and found that individuals who perform well, develop high self-efficacy (Davis, Fedor, Parson, & Herold, 2000), high self-efficacious individuals succeed often and better than individuals with low self-efficacy (Mitchell, Hopper, Daniels, George-Falvy, & James, 1994), and individuals who have high self-efficacy persist for a longer amount of time when faced with adversity and are resilient in the face of failure (Bandura, 1982). Additionally, Graham and Weiner (1996) found that in psychology and education in particular, self-efficacy is a more consistent predictor of behavioral outcomes than any other motivational construct.

Having low self-efficacy or little belief in one’s ability to accomplish a goal or task, does not necessarily equate to failure, just as high self-efficacy will not always result in a desired outcome. Schunk and Pajares (2002) cautioned that efficacy and outcome judgments can have inconsistencies and therefore, careful consideration should be made not to combine these two ideas. Whereas a desire and expectation to be
successful may not always produce the expected outcome, an efficacious individual armed with the appropriate knowledge and skills necessary to complete a task is more likely to have positive behaviors related to choice, effort, and persistence during stressful circumstances (Bandura, 1977). The next sections will detail self-efficacy influences such as choice, effort, and persistence, as well as sources for increased attainment of self-efficacy.

**Self-efficacy influences**

There are three tenets, or ways, in which a person’s perception of efficacy for a specific task influences their behavior. First, individuals are more likely to engage in tasks where they feel competent and are more likely to resist tasks where they feel inept. Often this results in individuals being unwilling to not only enter challenging environments, but also actively avoid being engaged in endeavors (Stajkovic & Luthans, 1998). Second, efficacy beliefs provide insight to the amount of effort a person will exert in an activity and if or how long they will persevere when faced with a challenge. Lastly, self-efficacy beliefs impact an individual’s reactions and thought patterns (Pajares, 1996). The impact of self-efficacy on behavior in these tenets of choice, effort and persistence, and thoughts and actions cannot be ignored.

The tenets of self-efficacy, as a sub-category of the SCT, have been tested and validated in various disciplines and settings over the past four decades (Aderhold, 2005; Bandura, 1997; Chemers, Watson, & May, 2000; Collins, 1982; Daly, Moolenaar, Bolivar, & Burke, 2010; Lehman, 2007; Lent & Hackett, 1987; Maddux & Stanley, 1986; Schunk, 1991, Tschannen-Moran & Gareis, 2004; Wood & Bandura, 1989). In one example, Collins (1982) examined the effects of efficacy beliefs on an individual’s
persistence in mathematics. He first identified and tagged students by either high or low self-efficacy towards mathematics. He then divided students by ability into three groups. In all three groups of students with like ability, the students with high self-efficacy persisted longer and had improved performance in comparison to their low self-efficacy peers. Collins concluded based on results that students’ mathematics self-efficacy beliefs were a better predictor of mathematics achievement than their actual mathematical abilities. His research supported the tenet (two) that belief in one’s ability has incredible influence on the individuals drive to succeed on a task. Having awareness of the influences surrounding self-efficacy beliefs on thought processes and behaviors is only the first step. In order to engage individuals in tasks where they can build competence through risk taking, persevere, and positively reflect on their efforts as the tenets suggest, examining ways to develop self-efficacy beliefs as a malleable construct becomes a key element of focus.

**Self-efficacy sources**

Self-efficacy has proven to be a powerful force in learning and motivation due to its ability to be acquired and enhanced through four main sources of an individual’s belief system (Bandura, 1997). These sources are influential in forming an individual’s beliefs in their ability to accomplish a task (see Figure 2.2).
The four sources are: (a) performance outcomes (enactive mastery experience); (b) watching others (vicarious experiences); (c) verbal persuasion, encouragement and feedback; and (d) attention to psychological and emotional state (Bandura, 1977). In research conducted on teacher self-efficacy, Labone (2004) found that overall self-efficacy is enriched through a combination of these four identified sources as each source contributes in a unique way to an individual’s sense of confidence in their ability to complete a task.

According to Bandura, *performance outcomes*, or enactive mastery experience, is the most powerful source of self-efficacy. Enactive mastery experience is defined as the “experience overcoming obstacles through perseverant effort” (Bandura, 1997, p. 80). Both positive and negative experiences can impact an individual’s self-efficacy, however if tasks are viewed as futile or insignificant, the impact on self-efficacy is often minimal.
There is a fine balance between complex tasks which appear impossible and those thought to be authentic, achievable challenges. The greatest gain in self-efficacy exists when an individual overcomes obstacles in order to successfully complete a complex task. The perception that one’s performance is a success can increase self-efficacy, while the perception of failure can lessen self-efficacy in a task (Bandura, 1986). This conscious evaluation of performance based on various factors related to challenge and success greatly influences future beliefs in similar tasks.

_Vicarious experience_ is defined as “learning mediated through modeled attainments” (Bandura, 1997, p. 86). By watching others attempt to complete a task, individuals can develop their own high or low beliefs in their ability to be successful. There are many factors which go into this source of self-efficacy. One factor is an individual’s perception of how similar he/she is to the person modeling the task. If an individual observes someone similar to them succeed, it can positively affect his/her efficacy. Similarly, if an individual views someone similar fail, this can lower self-efficacy in that their thinking becomes “if they can’t do it, then I surely will fail as well” (Bandura, 1977). This social comparison is a powerful factor influencing vicarious experiences in that attributes such as age, gender, ethnicity, education, and socioeconomic level can have a strong influence on those observing a modeled task. Without the risk of failure, vicarious learning allows individuals to process and code what they might find success doing in the future based on the results of others. In a case study conducted following the 2008 election, researchers found that seven out of eight young, African American males believed that President Obama’s election increased their likelihood of success in the future (Vaughn, 2015). This observation by the young men
provided an opportunity to symbolically establish their own beliefs of their abilities to be successful based on the performance of another individual deemed similar to themselves.

*Verbal persuasion,* in the form of interpersonal support provided by peers, supervisors, and the community, can impact self-efficacy beliefs whereas individuals are led to believe they are capable of achieving success on a given task (Tschannen-Moran & Hoy, 2007). When feedback in the form of encouragement or coaching is given, individuals feel they are more capable of achieving success than originally thought possible; hence, increased self-efficacy (Paglis & Green, 2002). Bandura warned of three conditions which impact the effectiveness of verbal persuasion as a means to increasing self-efficacy. First, statements of encouragement and feedback must express faith that the individual can accomplish the task successfully in an overall positive way. Second, encouragement and feedback must be specific and realistic in order for the individual to find it useful in reaching success. Third, encouragement and feedback is generally interpreted more positively when provided by an individual from a higher status versus one of equal or lower status (Bandura, 1997). Verbal persuasion is the most highly utilized, of the four sources, in schools for both teachers and students, yet it is statistically the least effective with gains of efficacy beliefs being “weak and short-lived” (Bandura, 1994, p. 82).

The last source of self-efficacy identified by Bandura is attention to *psychological or emotional state.* As individuals experience emotional arousal such as agitation, anxiety, and/or excitement, their interpretation of these psychological states can influence their efficacy beliefs (Bandura, 1977). This in turn can impact the actions of the individuals based on their perception of efficacy. In educational settings, learning is
enhanced when the mood of the individuals (students, teachers, etc.) correlates with their psychological state. This is evident for both increasing and decreasing efficacy beliefs. When an individual experiences excitement, this can be energizing and motivating (Bandura, 1997). Negative moods are usually linked back to previous failures or unpleasant experiences. An individual’s mood affects the way he/she interprets and evaluates events and information (Kavanagh & Bower, 1985). This understanding of the psychological and emotional role as a source of self-efficacy can be useful in coordinating learning experiences where individuals feel more at ease and have the opportunity to attain higher self-efficacy beliefs.

Examining the four sources of self-efficacy individually provides a picture of how beliefs regarding one’s abilities can be constructed or changed. Though each source is valuable in isolation and in combination with the others, there may not be equity in the availability of each source for every circumstance or task. For example, in a rural school setting, a new administrator may have minimal opportunities to learn vicariously with or from a fellow school leader namely because he/she may be the only building-level administrator. Additionally, the availability of each source is not expected in all circumstances. Often there is a need to gather a more holistic approach through an examination of any and all available sources to provide a clearer picture of how self-efficacy beliefs can be developed over time.

The construct of self-efficacy is a cornerstone of the Social Cognitive Theory and prominent in research spanning across many disciplines and organizational structures. Self-efficacy beliefs are highly influential on an individual’s actions, perseverance, and level of success based on situationally-specific tasks. With national attention on
organizational leadership in order to improve performance, researchers have begun to investigate the role of self-efficacy in leaders, and more specifically in an educational environment, school administrators.

**Self-efficacy & leadership**

After examining aspects of the Social Cognitive Theory, the following section of research will focus on the relationship between self-efficacy and leadership. Particular emphasis will be on the educational implications of self-efficacy on building-level administrators, also known as principals.

The purpose of leadership is to increase efficiency and to facilitate the achievement of organizational goals through a process of social influence (Hemphill & Coons, 1957; Rauch & Behling, 1984; Yukl, 1998). Successful leadership requires using social influence processes in multiple functions to motivate others (McCormick, 2001). To achieve organizational goals in a complex setting, leaders must have a strong sense of efficacy as it influences the initiation and intensity of their effort devoted to a task (Wood & Bandura, 1989). In a study by Paglis and Green (2002), 150 real estate and industrial chemical firm employees were surveyed along with 415 of their subordinates in order to link leadership self-efficacy (LSE) to “leadership attempts”. Leadership attempts referred to the number of times a leader would directly engage with his/her subordinates in order to bring a desired change in thinking or behavior. This study found empirical evidence which significantly related the level LSE to factors such direction setting ($r=0.21$, $p<0.05$) and follower’s commitment ($r=0.20$, $p<0.05$). LSE and overcoming obstacles during change were not significantly related. Further research in the area of leadership self-efficacy found significant links of LSE to performance evaluations by objective
observers, peers, and superiors (Chemers et al., 2000). LSE has also been linked to employee engagement at work (Luthans & Peterson, 2002). Since self-efficacy varies based on different goals or tasks, minimal empirical studies have been done on general LSE. This point further addresses the need to examine specific leadership roles and their potential relationship with self-efficacy in order to find meaningful measures of self-efficacy and its impact on behavior.

**School administrator- The educational leader**

An important aspect of leadership development is helping leaders understand who they are, what they believe, and how their actions affect others and their organization’s environment as a whole. Self-efficacy plays a large part in this realization. In schools, administrator self-efficacy is the judgement of his or her abilities to produce a desired result in the school in which he or she leads (Bandura, 1997). Self-efficacy is an important factor to consider in the development of foundational leadership strategies for administrators as they pertain to their actions in establishing a school’s vision, adapting and implementing change, and persisting despite obstacles (Bandura, 1986; Gist & Mitchell, 1992; McCormick, 2001). As building-level leaders, school administrators are responsible for numerous decisions and actions impacting teachers and students each day. Administrators are asked to organize, manage, and motivate the actions of others. This requires persistence, knowledge of effective strategies, and thoughtful implementation through strong interpersonal and technical skills (McCormick, 2001). Administrator self-efficacy plays a critical role in aiding administrators in meeting the demands and expectations of their complex role (Tschannen-Moran & Garies, 2004). For example while having numerous roles threatens their overall sense of efficacy, studies have found
that administrators with a strong sense of efficacy as instructional leaders positively impacted their engagement in schools (Federici & Skaalvik, 2011, 2012). Even though school improvement efforts are addressed from various levels within an organization, the success of an individual school or district initiative depends on the drive and ability of school administrators (Leithwood et al., 2004). This idea becomes especially important for administrators because even for tasks in which individuals feel they know how to do, with low self-efficacy, they tend to behave inefficiently or indecisively (Bandura, 1986). With considerable implications of how high and low self-efficacy impacts the actions of school administrators, the next section will discuss studies conducted in order to evaluate the impact of self-efficacy on leaders in school environments.

**Studies related to administrator self-efficacy**

The majority of research conducted in school environments pertaining to self-efficacy has been directed towards teachers and students with very few studies focusing on school administrators (Airola, Bengtson, Davis, & Peer, 2014; Smith, Guarino, Strom, & Adams, 2006; Tschannen-Moran & Gareis, 2004). With school administrators covering a variety of roles, the availability of both general and leadership specific self-efficacy measures are thin. The studies mentioned below account for milestone research conducted in the field of administrator/principal self-efficacy as well as more recent studies.

Tschannen-Moran & Gareis’ (2004) study not only provided a landmark look on the construct of administrator/principal self-efficacy, but critically analyzed the attempts to measure collective school leadership efficacy prior to their work in order to develop a more scientifically valid and reliable instrument. After finding disappointing results from
instrumentation analysis in studies such as Dimmock & Hattie (1996) and Goddard, Hoy, and Woolfolk Hoy (2000), their study sampled 544 principals across Virginia utilizing their Principal Sense of Efficacy Survey (PSES). In this study, they examined the correlation between principal self-efficacy and demographic characteristics such as gender, race, years of experience, etc. Through this study, the survey was found to be a reasonably valid and reliable measurement to capture the previously elusive theory of collective administrator/principal self-efficacy.

Another study featuring the relationship between administrators and self-efficacy was conducted by McCullers and Bozeman (2010). Their results yielded a positive relationship between school leaders with high self-efficacy and their actions and strategies for reaching their educational goals utilizing Tchannen-Moran & Gareis’ PSES survey (2004). Additionally, their study found that administrators were more successful at achieving the goals set forth by their school or district leaders when they had higher self-efficacy in their beliefs as school leaders. These findings and observations by McCullers and Bozeman (2010) align with Bandura’s foundational works stating that highly self-efficacious individuals are more likely to persist longer in the face of difficulty and achieve their goals through their motivation to do so (Bandura, 1982, 1997).

Airola et al. (2014) utilized Tschannen-Moran & Gareis’ (2004) PSES instrument in order to examine administrator/principal self-efficacy in low performing schools in the following areas: (1) Management, (2) Instructional Leadership, and (3) Moral Leadership. The study was conducted over a three-year period with three cohorts of administrators involved in professional development in order to build their leadership
capacity. At the time of the study, cohort one was starting its third year of training, cohort two was starting its second year of training, and cohort three was just beginning the training. The greatest impact of the professional development training on administrator self-efficacy was found in instructional leadership and significant findings were found between administrators who received three years of professional training compared to administrators with only one year of training. Administrators provided the following rationale for their increased self-efficacy: (1) personal involvement and presence of professional development leaders in their buildings, (2) shared leadership among professional developers, administrators, and teachers, and (3) support to focus on instructional and learning.

More recently, an empirical study by Fisher (2014) examined the experience level of administrators in relation to their self-efficacy beliefs as school principals. A survey based on the previous work of Brama and Freidman (2007) was utilized to measure managerial tasks of principals including organizational management, interpersonal relationships, parent/community involvement, pedagogy, and personal capabilities. A statistically significant relationship was found between years of experience and levels of self-efficacy, however, the conditions and circumstances of their findings were perhaps the most interesting outcome of their study. Potentially surprising, administrator self-efficacy was highest during their first year in the role compared to all other years of experience. Moreover, although self-efficacy beliefs in leadership dropped from years two to six of experience, after ten years, self-efficacy levels rose again but never to the level of administrators first year (Fisher, 2014). These findings were supported by a study by Holleb (2016) who also found high self-efficacy levels in first year administrators.
regardless of the complexity of the professional role. Both studies support Bandura’s (1997) emphasis on a common misconception that self-efficacy and outcome expectancy are not the same construct. An individual may have high self-efficacy, but this does not guarantee success. Likewise, low-self efficacy beliefs in accomplishing a task does not necessarily mean failure. Both studies emphasized that high self-efficacy beliefs would encourage administrators to understand and persevere through career challenges and Holleb (2016) concluded that administrators needed continuous support beyond their first year in their roles as challenges would continue throughout their career and self-efficacy would be an important factor for leading their schools confidently.

The previously mentioned studies involving administrators and their self-efficacy beliefs provide samples of empirical evidence relating these two factors. While keeping a pulse on self-efficacy beliefs as a measure which impacts individuals, leaders, and more specifically building level administrators, this study seeks to utilize self-efficacy data as a way to examine more closely two other educational factors: instructional leadership and professional development. The next section will focus on leadership, change, and administrators as instructional leaders both generally and in the subject-specific area of mathematics.

Leadership Theories

The concept of leadership is not new. For centuries, discussions on leadership have been found in works by Plato and others, and have revealed numerous theories from trait to environmental theory. Regardless of the theory, leadership has been labeled as a critical component in an organization’s function and success (Bass, 1981; Marzano et al, 2005). Leadership as a construct spans across cultures, disciplines and even time;
however, the foundation of school leadership are similar to those of other organizations and institutions. James Burns (1978), considered the founder of modern leadership theory, defined general leadership as:

Leaders inducing followers to act for certain goals that represent the values and the motivation—the wants and the needs, the aspirations and expectations—of both leaders and followers. And the genius of leadership lies in the manner in which leaders see and act on their own and their follower’s values and motivations (p. 19).

Embedded in Burns’ (1978) definition of leadership is a distinction between two leadership forms which he called transactional and transformational leadership. Broadly, transactional and transformative leadership are fundamentally different in their approach to management, motivation and the relationship between leaders and followers. Whereas transactional leadership primarily describes the exchange of rewards and punishments or one thing for another (quid pro quo), transformational leadership emphasizes leaders and followers working together to create change and create better results for the good of all in the organization (Bass, 1985). In reality, leadership required of individuals spans across a spectrum of knowledge, skills, and dispositions and therefore, one theory could oversimplify this complex construct. In Let’s Act Like Professionals, Elmore (2007) details that the knowledge of leaders is in part technical (instructional expertise and understanding of practices which promote adult learning), managerial (organizational design and systems understanding), and sociopolitical (sustainability through institutional connections and knowledge).
To address the multifaceted aspects of leadership, the following sections will present leadership theories which have influenced K-12 educational practices in the 21st century. Special emphasis is placed on transformational, distributed, and instructional leadership. Each leadership theory chosen serves a specific purpose in this study. Transformational leadership relates to the study’s setting during a time of curricular change. Distributed leadership relates to the various educational leaders involved in implementing curricular change and professional development. Lastly, instructional leadership represents the focus of administrator’s beliefs on their ability to lead teachers through instructional changes.

**Transformational leadership and change**

Improving organizations requires change. Technological advances of recent decades have changed the way we live and function in the United States and education is not excluded from the evolution. Often slow and uncomfortable, change is a major piece of school improvement processes driven by educational reform movements. With a plethora of research on different leadership qualities, principles and practices, one leadership theory highly utilized in education, as well as the corporate world, during times of change is transformational leadership.

Transformational leadership was a vastly new concept in leadership theory in the 1970s and 1980s as it was a concept which did not place leadership under an overarching umbrella of management techniques. Instead, transformational leadership concentrated on core competencies and the overall goals of organizations as well as the intermingling and acknowledgement of various complex factors in order to improve performance through change. Increased emphasis on substance and underlying values of an organization took
precedence over process for transformational leaders. In other words, leading for change became thought of as more of an art rather than a science (Evans, 1996).

**Transformational leadership’s Four I’s**

With the core of transformational leadership revolving around the moral dimension of change, Burns (1978) emphasized that the focus of leaders is not only on what works, but what is good for the people and organization as a whole as change occurs. He emphasized four factors, known as the four I’s, of transformational leadership in order to highlight the moral dimension (see Figure 2.3): (a) idealized influence; (b) inspirational motivation; (c) intellectual stimulation; and (d) individual consideration.

![Four I's of transformational leadership diagram](image)

*Figure 2.3. Four I’s of transformational leadership. Burns (1978) identified the four I’s as essential characteristics of a moral and transformational leader.*

**Idealized influence** refers to a leader’s ability to model and exemplify the behaviors he/she desires from the individuals in the organization. Through this process, a
leader is able to develop and enact a strategic vision within the organization which serves as a roadmap others are more willing to follow (Marzano et al., 2005). For example, teachers may be more willing to enact a school-wide behavior management program if their administrator provides a vision, models the fundamental practices, and follows through on executing the practices while interacting with students as well.

**Inspirational motivation** is related to a leader’s ability to communicate high expectations and motivate others in the organization. Individuals with the ability to make others feel that even the most challenging issues can be tackled productively and successfully are the most effective leaders. Often people would prefer to competently and confidently do the “wrong” thing rather than assuming the risk of doing the “right” thing incompetently (Black & Gregersen, 2002). For this reason, leaders must motivate others in their organization to help them overcome the anxieties that come along with change. Change is difficult to manage or be controlled, but it can be understood and led with careful planning (Fullan, 2004).

**Intellectual stimulation** is a leader’s ability to reframe old problems in new ways in order to provide a moral purpose. Change is nonlinear, highly complex, and often messy (Fullan, 2004). Egan (1988) forged the discussion of the inherent “messiness” of organizations and called for key stakeholders to creatively lead the brainstorming of individuals in the organization to make decisions based on broad considerations such as practicality, organizational culture, possibilities, and consequences.

**Individual consideration** is the final cornerstone in the transformational leadership theory and represents a leader’s ability to recognize and appreciate the human and interpersonal aspects of change. Leaders who are able to listen, respect, and empathize
with their followers as relational leaders are two-thirds more likely to impact performance and organizational change (Goleman, Boyatzis, & McKee, 2002). Leaders must have a pulse on the individual investments of those within the group, with special attention to those who may seem removed from the change (Marzano et al., 2005).

Although the macro-level considerations of change with regards to systems and policy are important, successful change begins and ends with individuals.

**Change**

Transformational leadership is about change, and in school environments, administrators play a vital role in the successful planning and implementation of educational change (Fullan, 2002; Leithwood & Day, 2010; Murphy & Datnow, 2002). As a bureaucratic organization, buildings often do not respond well to change. This makes the role of the administrator as a transformational “change agent” even more important. The *Professional Standards for Educational Leaders 2015* identified that transformational educational leaders have the ability to identify when a change is needed, establish and convey a shared vision for change, and support and empower others in the school system in order to develop their leadership capacity for change (NPBEA, 2015).

There are conditions, however, which need to be in place for administrators to successfully enact change. First, school administrators must be fully engaged in reform efforts as the building level change agent in order to create sustainable change (Elmore, 2004; McLaughlin & Talbert, 2002). Second, in preparing for change, administrators must consider the values, fears, and goals of the organization to build capacity in the individuals for continuous change/growth and persistence through obstacles (Senge et al., 1999). Third, administrators must anticipate the varying levels of individual’s acceptance
and implementation rates related to change in order to plan appropriate protocols and interventions (Hall & Hord, 2011). While these conditions in no way are an exhaustive list, they serve as initial considerations for administrators to examine their own readiness to introduce change within their school.

Planning for change is vital, however enacting a philosophical change creates challenges when beliefs are deeply rooted, especially in organizations like schools. Transformational leaders must be aware of these challenges in order to successfully implement new ideas or practices. In an educational setting, Feldman (2000) suggested a model for how leaders can best address instructional change related to teachers’ knowledge and long-standing beliefs. In his work, Feldman suggested that three conditions must be met in order for individuals to risk change for the hope of improvement.

First, the individual must become displeased with their current performance (for teachers, their instructional practices) because he/she recognizes them to be ineffective, unethical, or simply unsuccessful. To aide individuals, structures and support should be put into place to critically examine how new ideas might be incorporated into their current constructs. Second, individuals must have access to opportunities to deepen their understanding of content knowledge and its applications. Without expanding their depth of content knowledge, it is difficult for individuals to learn and apply new strategies. For example, a best practice for math teachers is their ability to use and breakdown mathematical vocabulary to accurately represent algebraic and graphical representations. District or school leadership would mostly likely need to provide teachers with more than a list of literacy strategies for mathematics. Teacher themselves would require a deeper
understanding of math vocabulary as it could possibly is a major mind shift in their mathematics teaching and learning practices. When implementing this kind of change, individuals must be involved in the process, experiencing change in a way that explicitly models the knowledge and skills that reformers are hoping will come to be. Third, Feldman (2000) found that in order to successfully implement change, support in the form of professional development was imperative. This included a structure of support for reflection, collaboration, and continued learning with sufficient time and resources for implementation. In order to create a mindset change towards new and innovative practices, transformational leaders must equip individuals with the knowledge and skills to risk change (Borko & Putnam, 1996).

Whether planning or implementing change, research findings suggest that infrastructures at the district and school levels are important to the success of school improvement and reform (Datnow, Park, & Kennedy-Lewis, 2013; Spillane, Mesler Parise, & Sherer, 2011). The section below will focus on distributive leadership as a critical concept in the complexities of school-based leadership.

**Distributed leadership**

Distributed leadership theory emerged in the early 21st century as a systematic tool for understanding complex organizations (Spillane, Halverson, & Diamond, 2001, 2003, 2004; Bennett, Wise, Woods, & Harvey, 2003). Beyond simply a distribution of tasks in an organization, organizations are dynamic webs of individuals who lead and follow as circumstances allow and require. This involves the flexibility of different leadership arrangements such as collaborative distribution, collective distribution, and coordinated distribution of tasks led by different individuals (Marzano et al., 2005).
Spillane and colleagues’ (Spillane et al., 2001) qualitative analysis of these three arrangements found that leadership practices must be considered on a task-by-task basis in order to create the conditions necessary socially and situationally to improve schools. Organizations, schools in this instance, are called to collect artifacts to monitor improvement. From a school leadership perspective, artifacts are defined as data on programs (curricular, behavioral, intervention), procedures, and policies intended to shape or reform existing organizational practices (Halverson, 2003; Halverson & Zoltners, 2001). With a broad scope of data points, this “network” of information can better tell an organization’s story in order to establish a system of practice (Halverson, 2003). Having the ability to trace these networks and data can inform leaders and other stakeholders, both collectively and independently, of strengths and areas of improvement to better inform practice. In schools, this artifact collection for leadership analysis can not only happen at the building level with administrators and teachers, but also with district leaders as they work with colleagues and building administrators to examine more macro-level data driven decisions. With greater capacity and understanding how to impact change in schools based on data, administrators also are called to ensure that theory of change translates into classroom practice for student achievement. For this reason, instructional leadership becomes an important leadership theory to investigate as it pertains to the school improvement process.

**Instructional leadership**

School administrators have numerous responsibilities and roles as building-level leaders and one overarching category of their work is related instruction. Administrators are responsible for not only offering PD, but holding teachers and other staff members
accountable to integrating what was learned in PD as ongoing instructional practices. Similarly, district leaders must support administrator’s knowledge and skills to hold them accountable in a reasonable way. Given administrators’ position in this nested, distributed leadership community, they possess a great deal of influence during systematic efforts to improve instruction (Stein & Nelson, 2003).

Research is clear that school administrators’ capabilities to create and support conditions for quality teaching and learning is the bedrock of effective school leadership for improved educational outcomes (e.g. Gurr and Drysdale, 2010; Hallinger & Heck, 2011; Hauserman & Stick, 2014; Leithwood & Day, 2010; Mulford, 2010). This attention by administrators to the improvement of teaching and learning in schools is broadly termed as *instructional leadership*. Louis et al. (2010) defined instructional leadership as leadership focused on improving classroom practices of teaching, or pedagogy, whereas others define instructional leadership as increasing the “school’s capacity for improving teachers’ instructional capacity” (Heck & Hallinger, 2014, p. 658). Horng et al. (2010) summarized instructional leaders as “hands-on leaders, engaged with curriculum and instruction issues, unafraid to work directly with teachers, and often present in classrooms” (p. 66).

In a review of literature, Leithwood, Jantzi, and Steinbach (1999) stated that although instructional leadership is one of the most prominent educational leadership theories, the concept is often ill-defined. On a daily basis, it is challenging to know all of the ways administrators enact instructional leadership in their buildings (Burch & Spillane, 2003). There are decades of research literature which demonstrate the ongoing pursuit to define instructional leadership theoretically and practically (e.g., Fenton, 2016;
In collaboration with the Wallace Foundation, districts and states were directly involved in the establishment of a national consortium of educational leaders, community stakeholders, and other national organizations in order to update educational leadership standards. In November of 2015, The Council of Chief State Schools Officers (CCSSO) and the National Policy Board for Education Administration (NPBEA) published an updated *Professional Standards for Educational Leaders 2015* [previously the Interstate School Leadership Licensure Consortium Standards (ISLLC)] to be student-centered standards outlining the fundamental principles of educational leaders (NPBEA, 2015). When addressing the complex role of a school administrator as an instructional leader, the establishment of these standards serve as a common benchmark to help administrators meet the challenges and opportunities of impacting students today as well as advancing and transforming their schools to positive influence the future.

The new standards acknowledge the accountability of educational leaders in the current climate stating that “the performance of principals is under scrutiny like never before, as society places higher expectations on principals to be instructional leaders who improve student learning and achievement” (CCSSO, 2015, p. 1). In response, clearly defining instructional leadership for administrators as a construct was an important task for the consortium as they layered it throughout the standards. Utilizing a traditional
definition from educational researcher Wynn DeBevoise (1984), instructional leadership involves actions taken on by an administrator, or delegates to others, which aim to increase student learning. Whereas this definition, and many since, speak to the duties of an administrator which include observations, teacher evaluations, and providing feedback to teachers, it does not accurately describe the wide range of leadership activities and responsibilities required of a school administrator. Therefore, the consortium established a list of broad instructional leadership responsibilities which are embedded more specifically throughout the ten *Professional Standards for Educational Leaders 2015.* The instructional leadership responsibilities are:

- Model learning for others—reflection, personal growth, ethical practice and a focus on improvement
- Willingly confront issues of equity that impede student learning
- Recognize and respond to the diverse cultural and learning needs of students
- Develop staff to increase their capacities for improving student learning
- Make decisions based on how they will affect student success
- Understand how all systems affect student success
- Share and distribute responsibilities for student learning (CCSSO, 2015)

**Instructional leadership challenges and opportunities**

Empirical evidence has proven instructional leadership to be a significant factor to school improvement and student achievement, yet the implementation of administrative instructional leadership actions remains a challenge. A longitudinal study analyzing administrator observations in over 94 schools over a three-year period found that on average, school administrators spend only 12.7 percent of their time on instructionally
related tasks. Although providing instructional leadership is viewed as an essential function of an administrator’s job, only a small fraction of time is available for administrators to enact these important tasks. The time spent on instructional leadership tasks such as coaching and evaluation of mathematics showed higher achievement gains than other tasks like walk-through observations (Grissom et al., 2013). Knowing the importance of instructional leadership and also the confines of time and resources, administrators must be knowledgeable on what tasks maximize their instructional leadership efforts.

Along with limited instructional leadership time, another challenge facing school administrators is often a lack of specific subject-area expertise. There are significant differences related to the knowledge, skills, and dispositions of teachers across content areas and grade levels. These differences can create subcultures within schools and school administration must be able to work within and across the subcultures in order to improve instruction (Grossman & Stodolsky, 1995). For example, an administrator’s prior experience and beliefs about teaching mathematics may be far different from how they are expected to lead mathematics teaching and learning as a leader. With potentially limited experience teaching under current standards or expectations, an administrator may have limited content understanding to anticipate and promote teachers instructionally. School administrators must strive to be effective instructional leaders by expanding their knowledge in their school’s content areas and curriculum. This also comes with the understanding that as a single administrator, he/she cannot fully understand every content area with equal depth or breadth (Stein & Nelson, 2003).
Further discussion on this topic will continue in the next section related to subject-specific instructional leadership.

At times, administrators face instructional leadership duties which may present themselves as both challenges and opportunities. With a vast amount of responsibilities, administrators are not alone in their efforts of improving teaching and learning within their buildings. There are many aspects of instructional leadership which must be distributed throughout a school building and/or system. (Heck & Hallinger, 2014; Robinson, Lloyd, & Rowe, 2008; Neumerski, 2013). In fact, much of the difficulty in isolating the definition of instructional leadership, as mentioned previously, is because instructional leadership activities and tasks are often distributed to various layers of educational organizations. They are not purely placed on the shoulders of building administrators, but can be viewed as an opportunity to develop and rely on the contributions of others in their organization. This is sometimes referred to as “capacity-building”.

Newmann, King, and Youngs (2000) defined school capacity as “the collective power of the full staff to improve student achievement schoolwide” (p. 261). The development of school capacity is a vital role administrator’s play in fostering the conditions for effective teaching and learning within schools (Lai, 2015). In general and through a meta-analysis of school capacity studies, Lai (2015) found that school capacity can best be defined through a combination of observable practices on the part of administrators. They are (a) fostering teacher learning in communities of practice and teacher participation in decision making, (b) promoting school-community connections to facilitate student learning through participation, and (c) aligning external demands on
schools’ internal circumstances. These practices require not only leadership skills, but also management skills on the part of administrators.

While leadership and management responsibilities are often thought to be separate, with regards to instruction, there is a necessity to blend these administrative roles to properly support teachers and students with effective instruction (Grønn, 2003). In a study conducted by Marks and Printy (2003), school performance (based on pedagogy and student achievement scores) were more likely to increase if administrators built on the capacity of others by sharing instructional leadership with teachers and acted as transformational leaders. The leadership task of building capacity in their staff can be viewed as both a challenge and an opportunity. Although affording administrators the opportunity to “divide-and-conquer” instructional leadership duties while simultaneously developing the knowledge, skills, and dispositions of others is valued, this also adds another responsibility to the very full plates of building-level administrators.

The aforementioned research on general leadership theories such as transformational, distributive, and instructional leadership, provide some insight to the expectations, knowledge, and skills required of administrators. While a general investigation of leadership is warranted, the construct of self-efficacy requires a more narrow focus on task-specific beliefs. Therefore, the following section will discuss mathematics education leadership including best practices for school administrators.

**Mathematics education leadership**

Mathematics Education has seen its fair share of debate in American over the last two hundred years. From as far back as the work of Nicholas Pike in 1788 emphasizing procedural mathematical understanding to Warren Colburn in the mid-1800s focusing on
the use of manipulatives to understand mathematical concepts. The pendulum of beliefs on what quality mathematics teaching and learning looks like have continued to sway back and forth between the concepts of “drill and kill” and conceptual reasoning and understanding. In the middle of this debate has always been the students, teachers, and administrators navigating tradition, curriculum, research, and practice in order to improve students’ understanding and appreciation of mathematics.

Globally, the United States has maintained mediocre scores compared to other industrialized countries since 2000. The Programme for International Student Assessment (PISA) examines cohorts of 15-year olds from 34 countries, and in 2012, U.S. students ranked 26th in mathematics. Needless to say, schools are continuously being asked to do better. School administrators occupy an exclusive position in their ability to influence school improvement via classroom instruction and systematic organization and therefore, face increasing pressure to improve student achievement in mathematics in particular. Although the focus on mathematics leadership is not new, the demands of our technological society show the stakes are exceptionally high now. Recent analyses yield that by 2018, three million technical careers will go unfilled and career opportunities in mathematics and science will increase by 17 percent over the next decade (Langdon, Mckittrick, Beede, Khan, & Dorns, 2011).

The National Council of Supervisors of Mathematics stated that “mathematics programs will only get better when leaders open themselves and other teachers to new ideas, risk imaginatively, and enthusiastically inspire those they lead with a desire to learn and grow together” (NCSM, 2008, p. 56). Often instructional leadership is viewed as a generic task where good practice is universal from subject to subject. Stein and
Nelson’s (2003) conception of leadership content knowledge recognized that instructional leadership could not be disconnected from the subject area. Subject-area leadership provides an important context for administrator’s work especially in times of reform (Burch, 2007; Spillane et al., 2001). For elementary administrators in particular, leadership activities in areas like mathematics and literacy are very different. Administrators were more likely to identify school-developed activities, programs, and curriculum as critical to improving literacy instruction. For mathematics however, administrators were much less likely to emphasize teacher participation and attributed improvement more to the textbook/curriculum or external expertise (Burch & Spillane, 2003). The result can be feelings of helplessness when quality mathematics instruction is viewed as an external factor out of teachers’ or administrators’ control. With a well-established and shared vision for what high-quality mathematics instruction should be and how to get there, administrators are better equipped to influence effective practices as a building-level issue (Coburn, 2005; Nelson & Sassi, 2003; Spillane, 2000). However, when an administrator’s subject-specific goals and knowledge are lacking, in areas like mathematics, his/her ability to enact and support initiatives are hindered (Cobb, McClain, Lamberg, & Dean, 2003; Nelson & Sassi, 2003). Nelson (1999) emphasized that for mathematics instruction to improve at a systematic level, passive leadership would not suffice in the face of a philosophical change of culture and practices. Supervision of classroom teaching and learning is considered a core administrative leadership behavior (Hallinger & Heck, 1996; Leithwood & Louis, 2012; Wahlstrom & Louis, 2008); however, for supervision of mathematics to be effective, administrators must have a basic understanding of (a) the content area, (b) how teachers teach and learn about
mathematics, and (c) how students learn mathematics (Stein & Nelson, 2003). Perhaps a
dramatic shift in the supervisory practices and philosophies of current administrators, the
emphasis on a more rigorous, engaging, and meaningful experience for teachers and
students is necessary to alter the flat-lined mathematics achievement. Administrators
cannot be experts in every aspect of every subject area. However, “as they move away
from the classroom, knowledge of subject matter does not disappear, and what
administrators need to know does not become more generic” (Stein & Nelson, 2003, p. 442).

**Best practices for leaders of mathematics**

Considering that many administrators learned (as students), taught (as teachers),
and now lead (as administrators) mathematics in potentially vastly different ways,
establishing a basis for best practices in mathematics education leadership is vital.
Administrators require opportunities to reflect on their prior experiences and their
existing beliefs and practices so they can create new understandings based on current best
practices related to mathematics teaching and learning (Nelson, 1999). While the
importance of school leadership and subject matter knowledge in isolation have been
studied widely, there is minimal literature with respect to practices where subject matter
differences influence instructional leadership practice or beliefs (Burch, 2007; Elliott,
Kazemi, Lesseig, Mumme, Carroll, & Kelley-Petersen, 2009; Schifter & Lester, 2005).
Through an examination of literature and isolated studies, certain actions have surfaced
for administrators with regards to their leadership practices for mathematics instruction in
particular. The best practices include:
• identifying and supplying resources within schools to support powerful and
equitable instructional improvements based high-leverage teaching practices for
mathematics;

• establishing, in collaboration with teachers, a compelling vision for effective
mathematics instruction; and

• increasing the instructional capacity of teachers of mathematics through subject-
specific feedback.

The below sections will attempt to discuss these often intersected actions, or best
practices, by administrators in the area of mathematics education leadership.

Identifying and supplying resources based on mathematical knowledge

Research has found that subject knowledge and knowledge of how students learn
subjects provides administrators with a significant advantage as instructional leaders
(Stein & Nelson, 2003). As the primary evaluators of school-based instruction, it is
important for administrators to have research-based, subject-area credibility in knowing
the foundational best practices in mathematics teaching and learning. Defining “effective
teaching” is often convoluted, but in 2014, the National Council of Teachers of
Mathematics (NCTM) released a framework called Principles to Actions: Ensuring
Mathematics Success for All (PtA) (Appendix D) to concisely define quality mathematics
teaching and learning. PtA identified eight high-leverage, research-grounded instructional
practices (Principles to actions, 2014). “High-leverage” refers to “those practices at the
heart of the work of teaching that are most likely to affect student learning” (Ball &
Forzani, 2010, p. 45).
The primary purpose of the PtA practices is to create a common language to aid in the successful implementation of research-based teaching practices, policies, and programs in a time of rigorous standards-based curricula adoptions. PtA practices serve as a framework for quality instruction regardless of the adopted curricula, demographics of schools, or other unique organizational structures. For all educational stakeholders, including school administrators, PtA practices provides an opportunity to gain important knowledge and a specific, common language of best practices. The eight PtA practices are intended to be realistic and manageable for all parties to best prepare 21st century teachers and students. For example, one of the PtA practices is facilitate meaningful mathematical discourse, which refers to the level in which a teacher creates opportunities for and facilitates discussion among students about mathematics. With knowledge of this best practice, an elementary administrator observing various levels of proficiency among his/her staff may make different professional development choices in comparison to more general training. Rather than bring in a regional/national speaker, an elementary principal may choose to introduce teachers to a mathematical discourse usage rubric for teachers to self-evaluate their teaching. The rubric can serve as a tangible resource for teachers and administrators to set goals and reflect on practice. Through professional learning discussions, teachers and administrators could also plan for how mathematical discourse could better be embedded in their daily curriculum and teaching practices.

As discussed previously, unlike literacy instruction, mathematics instructional improvements are more likely to seek external sources. Allowing building-level expertise, with the use of quality resources as guides, to take on instructional improvement tasks can create a more sustainable improvement climate within a school.
In one particular study examining administrator practices and mathematics, Nelson and Sassi (2005) found that administrators made significant indirect impact through math-specific leadership practices such as supporting teachers’ use of high quality mathematics tasks and posing purposeful questions to allow students to make connections. These two practices are included in the PtA framework and highlight how administrators can lead mathematics instruction with the practices in mind (Principles to actions, 2014). The high-leverage PtA practices honor both teachers and students of mathematics and provide administrators with a link for how to best impact both. Without this specific mathematical pedagogical knowledge, administrators will struggle to challenge the instructional practices of teachers in order to push for change and improvement (Nelson & Sassi, 2003). However, with this knowledge administrators may be more equipped to lead teachers with specific goals and utilize appropriate and useful resources. Although an important first step for administrators as leaders of mathematics, sharing the vision for effective teaching and learning is an important next step.

Establishing a shared vision for effective mathematics instruction

Teaching mathematics is a cultural activity where traditional practices and experiences continue to dominate schools. Obstacles exist in mathematics reform efforts and the utilization of what is known to be effective teaching and learning practices in mathematics as traditional practices continue to dominate (Philipp, 2007). Deal and Peterson’s (2009) quote, “Culture is the way we do things around here” has been widely quoted and explains the power that culture, or a shared vision, can do in an organization. Administrators face an important task of not only being knowledgeable about effective
mathematics practices, but creating an environment where “the way we do things around here” is aligned with research-based best practices in mathematics.

Policy research has identified that defining a school’s vision and setting clear academic goals can influence school outcomes positively (Hallinger & Heck, 1998; Murphy, 1990; Supovitz, Sirindes, & Mary, 2010). Effective administrators build school capacity by empowering others to take ownership in the success of their teaching, student learning, and overall building culture. Ownership refers to a sustained commitment to school improvement based on a shared vision and core values (Blasé & Blasé, 2003). An administrator’s own vision for high-quality mathematics instruction not only matters, but influences his/her leadership (Nelson & Sassi, 2003; Spillane, 2000; Spillane et al., 2001). Administrators with well-developed, subject-specific goals based on high-quality mathematical standards and practices matters and enables them to more effectively lead change and reach goals.

Conversely, when administrators are lacking vision or reform understanding, their ability to effectively lead change is hindered (Cobb, McClain, Lamberg, & Dean, 2003; Nelson & Sassi, 2003). For example, when administrators are vague in their vision for mathematics instruction they may give general instructional suggestions such as increased group work or class discussion which may be more easily observed. Without justification, teachers may lack a purpose for this instructional modification and resist change. This is also the case for administrators with rich mathematics teaching backgrounds. If a not effectively communicated, teachers perceive these administrator’s base their vision for effective math (or science) instruction solely on their past experiences and not necessarily sound practices (Lochmiller, 2016).
Teachers believe that administrators are instrumental in shaping a clear vision for effective mathematical instruction (Elfers, Plecki, Knapp, Yeo, & McGowan, 2007). Katterfield (2013) stressed that an administrator’s vision for mathematics was a key factor in predicting standards-based expectations. In her study, the majority of teachers stated that while administrators expected to see changes in the structure of mathematics classrooms such as increased group work and use of manipulatives, they did not expect to see changes in the function of instruction such as encouraging students to collaboratively reason on solution strategies or represent mathematical ideas through multiple means. While well-intended, the administrator’s instructional emphasis and expectations on structure versus learning in the mathematics classrooms limited the capacity for improvement and sustainable growth for students and teachers mathematically. Though having a clear vision for mathematics teaching and learning is important as a leader, sharing that vision through action is critical.

Administrators are called to work collaboratively with and between teachers and so establishing a shared vision becomes increasingly important (Crow, Hausman, & Scribner, 2002). Although administrators attend to the more broad goals and purposes of instruction generally, recent literature suggests that administrators need to more frequently experience professional development with teachers to enhance the shared vision within their schools (Louis, Dratzke, et al., 2010). Administrators need to work alongside others who have more depth on subject-area teaching (in particular with math and science) so they are better able to understand what is happening instructionally, and where teachers can still grow. When administrators are considered knowledgeable and authentically collaborate with teachers, they are better able to challenge the existing
culture of mathematics instruction and enhance it with a solid and compelling vision for improving instruction (Nelson & Sassi, 2003). Without collaboration and up-to-date research justification, administrator’s considered to be math experts are disregarded if teachers believe they are purely acting on their own beliefs (Lochmiller, 2015). With a clear vision and commonly shared beliefs of what effective mathematics teaching and learning is, administrators can make more informed decisions in areas such as professional development, curriculum adoption, and selection of resources and materials for teachers and students.

**Increasing instructional capacity through subject-specific feedback**

A significant component of an administrator’s role as supervisors of instruction is their ability to provide quality feedback (Blasé & Blasé, 2003; Danielson, 2007; Danielson & McGreal, 2000; Kimball, 2002; Stein & Nelson, 2003). Especially when changes to instruction are expected, administrators must provide instructional feedback based on observations so that teachers can productively reflect and connect their practice to student learning (Stuhlman, Hamre, Downer, & Pinta, 2012). Teachers have reported that they perceived feedback should be based on observable classroom practices (Blasé & Blasé, 1999). While one use of feedback may be to help assess present competency and skill levels, a primary aim for feedback is to promote learning and growth (Reeves, 2010). When experiencing change in particular, it is important that feedback actively supports reform in an active and assertive way. John Hattie (2013) explained that feedback thrives in times of uncertainty or error. The greatest opportunity for feedback to have a substantial impact does not occur when everything is perceived to be done correctly, but when challenges are introduced. In times of reform, such as with
mathematics education currently, the opportunity is prime for feedback to be used as a catalyst for change.

In a study examining the instructional leadership of administrators in mathematics and science, administrators’ and teachers’ perspectives on feedback as a means to improve instruction differed greatly (Lochmiller, 2016). Administrators made comments such as “I think good teaching is universal and it does not matter what subject area I supervise” and generally minimized the importance of subject-specific feedback. Their focus on feedback emphasized basic pedagogical strategies. In contrast, teachers highlighted the desire to be empowered by feedback (particularly in math and science) and that administrators needed substantial subject-area understanding in order to provide meaningful feedback.

In reality, the desire for feedback to be subject-specific to mathematics goes back to the fundamental beliefs of what defines “effective feedback”. Wiggins (2012) stated that one pillar of effective feedback is that it must be goal-oriented. Therefore, effective feedback “requires that a person has a goal, takes action to achieve the goal, and receives goal-related information about his or her actions” (p. 13). When observing or evaluating mathematics instruction, providing feedback is an opportunity for an administrator to improve instruction. In order to see improvements in mathematics achievement, a goal would most likely need tied to math-specific practices rather than “just good teaching”. In order for teachers to grow in their successful use of research-based mathematical teaching practices (e.g. the goal), teachers and administrators must clearly acknowledge the goal, take actionable mathematical steps towards the goal, AND the information (feedback) must be math-related based on the teacher’s actions. Another pillar of effective feedback
is that the goal is actionable; meaning concrete, specific, and useful (Wiggins, 2012). Feedback that is untimely, shallow, vague, and/or unrelated to student learning can lack effectiveness and have negative impacts on teacher capacity (Feeney, 2007). When teachers are left to interpret how general feedback can be applied to different contexts, the actionable-nature of the feedback may be diluted.

Leadership theory has been a frequently studied phenomena for decades. With numerous styles of leadership proposed both in and out of education, universally no particular style has surfaced atop its peers. Whether transformational, distributed, instructional, subject-specific or any number of other theories not mentioned in this review of literature, familiarity with prominent and relevant leadership theories related to education provides insight to educational stakeholders for how leaders can best guide, motivate, and support continued improvement. School leadership is complex and therefore often requires a combination of leadership skills depending on the audience, task, role, etc. For this reason, continued learning on the part of school administrators is necessary in school environments where the day-to-day business of teaching and learning is constantly evolving. The final section of this literature review will focus on the continued learning process through the lens of professional development for administrators.

**Professional Development**

The National Staff Development Council (2006) defined professional development (PD) in education as professional training that is a comprehensive, substantiated, and intensive approach to improving teachers’ and administrators’ effectiveness in raising student achievement. Generally speaking, PD is on-going learning
opportunities provided to enhance the knowledge and skills specific to one’s occupation. As the demands of our 21st-century world place more emphasis on high-knowledge workers and technology, schools are continuously being asked to rise to the challenge in producing the next generation of competent and capable adults. It is reported that the U.S. spends an estimated $20 billion annually in total federal, state, and local funds for educational PD for various roles (Guskey & Yoon, 2009). With substantial investments in the training of educational professions, the expectations of school quality is not just to survive, but thrive in preparing students for the global world. To meet the increasing challenges of schools today, educators must continue to learn and grow. For this reason, PD is highly studied in educational research as a means to advance towards school improvement goals.

Richard Elmore stated that “one thing is clear about the stages of systematic school improvement efforts—a body of expert knowledge is required to pull them off” (Elmore, 2007, p. 32). School reform efforts have often assumed that common standards, newer curriculum, better teachers, increased funding, and more time (just to name a few), will certainly increase student achievement. The American Association of School Administrators provided a rationale for why these factors have often had disappointing results; the lack of acknowledgement of the PD needs of school leaders and their capabilities and capacities (Wallace Foundation, 2011). Without a commitment to the development of school administrators at the forefront of school change and improvement efforts, many obstacles faced by schools will remain challenges of the future. As stated in the following sections, educational leadership research and now Federal policy support the value of intense job-embedded PD for school administrators and therefore continued
evaluation is warranted (Honig, 2012). The upcoming review of literature will present a
general background on effective PD design for professionals, the role of school districts
in supporting school improvement through PD, and more specifically, PD for school
administrators.

**Effective professional development design**

PD is a critical component of schooling. Along with enhancing student and
teacher learning, PD also has impact on the organizational structure of school
environments and its leadership (Fullan & Miles, 1992; Guskey, 2000; Loucks-Horsley,
Love, Stiles, Mundry, & Hewson, 2003). When created intentionally, PD can also lead to
higher levels of student achievement in schools (Good, Grouws, & Ebmeier, 1983; Hill,
2007). Creating PD opportunities for educators which are sustainable and scalable help
schools implement change with integrity. Additionally, innovative PD can take a one-
size-fits-all concept and adapt it to meet the core principles of the local contexts of the
school (Koellner, Jacobs, & Borko, 2011). In education, the majority of research on PD
has been focused on teacher training. Although PD offers a wide-array of options from
one-day workshops to job-embedded, long-term training, consensus has been found on
some of the components vital for creating effective PD experiences (Bransford, Brown, &
Cocking, 2000; Elmore, 2000; Loucks-Horsley et al., 2003; Sparks & Hirsch, 1997).
National Comprehensive Center for Teacher Quality (2007) narrowed the comprehensive
list of components of high-quality professional development for teachers down to the
following five:

1) Aligns with school goals, state and district standards and assessments, and
other professional learning activities
2) Focuses on core content and modeling of teaching strategies for the content
3) Includes opportunities for active learning of new teaching and learning strategies
4) Provides teachers with an opportunity to collaborate
5) Includes follow-up on learning and continuous feedback

(Archibald, Coggshall, Croft, & Goe, 2011)

High quality PD for educators is not incredibly different from what we expect of quality teaching and learning for students. Understanding what educators already know and maximizing their talents to improve their teaching is more than pushing large amounts of PD at them and expecting immediate results (DeMonte, 2013). Examining the above best practices of PD for teachers has implications for administrators as school administrators are being asked to take a more active role in today’s classrooms as not only general instructional leaders, but subject-specific leaders as well. Some suggest that teachers and administrators would benefit from collaborative PD learning opportunities (ShepNelson, 2010). Additionally, school administrators are often responsible for selecting and implementing quality PD opportunities for their staff as well (Feldman, 2000). When professional learning is designed with the responsibilities of the individuals in mind, the relevance, and therefore, usefulness of the material can increase implementation of new learning. The potential outcomes of quality PD include increased instructional capacity, improved practice, and overall school improvement (Cohen & Hill, 2001).

Where PD programs, and reform movements as a whole, often fall short is not considering the diverse backgrounds, experiences, skills, beliefs, and needs of
individuals. It becomes important that PD supports environments where adult professionals are able to combine prior knowledge, skills, and experiences to new learning. This concept is central to the theory of adult learning. In his work in business management, Edward Lawler (2003) stated that PD could be defined by key elements which detailed the essence of its purpose. The key elements find professional development is: adult education, learner-centered, transformative learning, motivation-driven, and technology related. Some of these topics will be addressed in the following discussion about adult learning theory.

Adult learning

The concept of adult learning has been found in literature for nearly half of a century. Malcolm Knowles (1980) first coined the term andragogy in the late 1960s as the art and science of helping adults learn. Knowles believed that adult learners were highly neglected in research and that the traditional construct of pedagogy lacked attention to the prior experiences of the learner (Knowles, 1980). Andragogy views the “instructor” of new learning as more of a facilitator. Instead of purely managing coursework/new learning, the facilitator guides learners through a process of understanding and interpreting information based on prior experiences and knowledge (McGrath, 2009). The primary purpose of the theory was to ensure that the designer of adult learning, or professional development activities for education, would include learners in as many aspects of their training as possible to maximize learning potential. To more clearly illustrate this purpose, principles were developed for those looking to design, implement and evaluate adult learning. The principles are:

- Involve adults in the planning and execution of their instruction
- Provide experiences as the basis for learning activities (including opportunities for mistakes)
- Focus on subjects/topics that have immediate relevance to adult’s job or personal life
- Focus on problem-centered instruction rather than content-oriented instruction. (Merriam, 2001)

Further research has continued on the construct of andragogy and adult learning theory. Merriam, Caffarella, and Baumgartner (2006) further simplified Knowles’s concept of andragogy into three points: experience, critical reflection, and development. The factor of experience, corresponding to the second principle of andragogy, points to the importance of considering the impact of prior experiences on adult learners in how they create, retain, and transfer new learning (Argote, McEvily, & Reagans, 2003). Critical reflection highlights how adult learners must be able to self-direct and have time for reflection and analysis to connect prior understanding to new ideas. This allows adults to consider the implications on how their new learning fits into their existing schema. Development, corresponding to the third principle of andragogy, explains how adults must be provided with the opportunity to think critically in order to make decisions about their own understanding. This then becomes developmental (Merriam, Caffarella, & Baumgartner, 2006).

The previous points of experience, critical reflection, and development all fall under a larger concept conceived by Jack Mezirow called the transformative learning theory (1978, 1991). This theory helps to describe a major difference between the way adults and children learn. Although children’s learning is often formative (through
socialization or sources of authority), adult learning is considered transformative.

“Transformative” in this case refers to an adult’s ability to use prior experiences to create a new or modified interpretation of a situation to guide future action (Mezirow, 1991). In essence, transformative learning is about the continuous process of discovery and has implications on the process of creating positive change for adults both personally and professionally (Vygotsky, 1978).

This brief snapshot of seminal research on adult learning provides professional developers with tools to create effective PD. In education, this knowledge along with what is known about quality PD for teachers could help to create environments where school administrators are also provided with opportunities to develop their knowledge and skills. Although the specific PD needs may vary from the corporate to education worlds or job-title to job-title, themes emerged about what quality career training requires. The PD of individuals should be continuous, job-embedded training that is relevant to daily work. PD should also be active, actionable, and collaborative in solving individualized, real-world or real-school problems.

**Professional development for school administrators**

Research on the importance of providing PD for administrators, especially in the area of instructional leadership is vital. A 2014 report from School Leaders Network, reported that $1 billion of federal funding was provided to school districts annually to support training programs with 91 percent going to teacher training and 9 percent going to administrators. With PD for administrators often controlled by local districts, evaluating the quality and quantity they receive is a challenge; however, it is a useful and needed investigation (Mitgang, Gill, Cummins, 2013).
Clearly understanding what types of PD work for the needs of the administrators is an important factor when deciding how to best support learning and growth. Continuous, job-embedded training helps administrators to build their capacities to drive quality teaching and learning in their schools (Blasé & Blasé, 2003; Fink & Resnick, 2001; Leithwood et al., 2004; Peterson, 2002). When districts provide administrators with job-embedded PD, there is a significant relationship between their time spent on instructional leadership tasks and their ability to engage their teachers outside of the classroom to improve instruction (Augustine et al., 2009). Another study found that when administrators from one medium-sized urban school district received six or more days of district-provided PD, over 90 percent agreed or strongly agreed that the support was useful and provided opportunities to improve their work (Spillane, Healey, & Mesler Parise, 2009). Whereas these findings support the idea of district-provided PD, other studies found that not all PD increases administrator effectiveness. For example, Grissom and Harrington (2010) conducted a nationwide analysis of administrator PD and found that there was a negative relationship between university-based courses and administrator effectiveness. Many successful district instead favor in-house leadership PD to licensure-oriented administrative training programs (Togneri & Anderson, 2003). These findings show empirical evidence that formal, district-provided and administrator-specific PD was viewed most useful for development by administrators.

Even though research supports the use of district-provided PD for administrators, access to professional development is often inequitable. A recent report by RAND Education surveyed a nationally representative sample of administrators about the supports they receive from their school districts (Johnston, Kaufman, & Thompson,
These supports include how they are mentored and supervised and what professional development is available for them as building-level administrators. Almost all respondents reported that at least some sort of support (supervision, mentoring, PD) was available for them as school leaders regardless of school size or poverty level. In terms of PD, 88 percent of administrators reported that they received some sort of district-provided training specific to their role. Additionally, administrators (50 percent) and assistant administrators (36 percent) reported that administrator-centered, district-provided PD was available at least once a month. While the supervision and mentoring supports focused primarily on instruction, PD covered a larger range of leadership and managerial duties overall.

Whereas a majority of school administrators have opportunities for PD, there is limited consistency on the quantity of support administrators receive when comparing school districts by size. In terms of PD, administrators from larger districts reported having greater availability to administrator-focused, job-embedded opportunities than their small or midsized district peers. These findings align with other research examining large district’s increased access to on-the-job PD (Mitgang, Gill, & Cummins, 2013). Large districts also place a greater overall focus on effective instructional practices which may be explained by the increased support from central office personnel and the level of supervisory support for instruction (Honig, 2012).

A plethora of research suggests that effective school administrators are vital to school improvement in the United States. Furthermore, with the increasing challenge and complexity of school administrators’ work, the need for quality job-embedded PD is a focus of school improvement planning. District leadership’s role in creating an
infrastructure and opportunities for administrators to improve their knowledge and skills has implications in the advancement of student achievement. The last section will present the role of district leadership in supporting administrators with PD, and in particular, during times of immense change.

**District-led professional development for administrators**

The ability of school districts to engage people at various levels of their organization in instruction is an important factor of school improvement (Elmore, 2000). In today’s climate of standards-based reform and systematic accountability, the district’s involvement in educational leadership and change is a point of interest. As key providers of administrator support in the area of leadership and management, district leadership has been highly visible in educational research since the early 1990s (e.g., Elmore & Burney, 1997; Fuhrman & Elmore, 1990; Fullan, 2001; Marsh, 2002; Spillane, 1996, 1998). District leaders have been found to have powerful influence on instructional practices exhibited by administrators and later teachers (Spillane, 1996, 1998). For this reason, district leadership has dedicated increased time and resources to provide PD for administrators to indirectly improve student learning (Burch, 2007; Fink & Resnick, 2001).

District leaders are defined as central office personnel including roles such as curriculum directors and specialists and district supervisors. In small districts, the district leaders involved in curriculum, teaching, and learning may also include superintendents. In terms of strengthening systems of support for classroom instruction, district leadership have the opportunity to create formats and structures for administrators to collaboratively assess current practices and reflect on reform opportunities for their buildings (Glickman,
systematically aligned PD in order to help administrators effectively respond to change (Leithwood et al., 2004). With numerous responsibilities as building-level administrators, district leaders are able to use PD opportunities to refocus and emphasize district-wide goals and initiatives. District leadership and administrators would then have the ability to assess and evaluate progress towards both district and school goals aligned with standards (Leithwood et al., 2004)

**District leadership support and administrator self-efficacy**

Along with providing PD that emphasizes district goals, district leadership support has other implications on administrator beliefs and actions. Administrators perceive that district leaders can strongly influence their self-efficacy as leaders by creating supportive environments and enhanced work conditions. According to Leithwood and Jantzi (2008), “The efficacy of school leaders, it would seem, arises less from direction and inspiration and more from the aligned and supportive nature of their working conditions” (p. 521). They explain that administrators’ self-efficacy can be influenced positively when district leaders provide PD opportunities where administrators can collaborate with peers on how to best manage and lead instruction in their buildings (Leithwood & Jantzi, 2008). From what is known about self-efficacy, high self-efficacious individuals persist when faced with adversity and experience more success and resiliency than individuals with low self-efficacy (Bandura, 1982; Mitchell et al., 1994). With increased beliefs in their own abilities, these district-provided PD experiences could increase administrators’ own leadership capacity through collaboration, a common vision and clear direction for school improvement. Successful
district leaders, from the superintendent to building-level administrators, “convey a strong belief in the capacity of school system personnel to achieve high standards for learning” by identifying areas where improvement is necessary and take responsibility for pursuing solutions through PD (Leithwood et al., 2004, p. 41).

**Curriculum adoption process**

School districts play a critical role in employing various mechanisms that allow administrators to productively lead their schools through change (Datnow, Park, & Kennedy-Lewis, 2013; Spillane et al., 2011). These mechanisms include PD (Garet, Porter, Desimone, Birman, & Yoon, 2001), curriculum adoption (Ball & Cohen, 1999), and teacher evaluation systems (Figlio & Kenny, 2005). While the intention of each of these mechanisms is to help schools progress and evolve for the better, curriculum adoption and PD introduce a complex two-way relationship for district leaders to navigate.

One perspective is that reform curriculum can serve as a context for long-term PD (Russell, 1996). In becoming familiar with new curriculum, teachers, administrators, and district leaders alike have an authentic and relevant opportunity to collaboratively reflect on teaching and learning. For this perspective, a critical component to consider in PD design is to consciously avoid simply training on “how to do” the curriculum. Russell (1996) paid particular attention to this idea of PD related to elementary mathematics curriculum reform. In her findings related to teacher development, she suggested that curriculum leaders facilitate teacher’s mathematical understanding so they are better able to comprehend the demands of the curriculum changes on student thinking and development. Allowing those receiving PD to be students of the new curriculum provides
experiential learning opportunities which can be extremely powerful. This process of critically thinking about best practices, local contexts, and school achievement data serves as a model for growth and PD related to curriculum change.

Another perspective is that PD serves as a context for curriculum implementation. District leaders have numerous considerations during the stages of curriculum change which include identifying the background and need for change, refining the nature of the change, designing and developing a plan for change, and lastly, implementing and evaluating the curriculum change (Walkington, 2002). Through a synthesis of literature, Walkington (2002) outlined principles which could be used by district leaders in order to successfully implement curricular change. They are:

1. Change is a journey, not a blueprint. It is non-linear, loaded with uncertainty.
2. Both individualism and collectivism have their place within the process.
3. Both ‘top-down’ and ‘bottom-up’ strategies of organization are required.
4. Sustained success is obtainable only through connection with a wide community.
5. Every person involved is a change agent with a variety of contributions.
6. Curriculum changes require contextual change for them to be accepted and sustained.
7. Evaluation is a necessary component of change. (p. 134)

With the principles as a guide, district leaders may be better equipped to plan for effective curriculum implementation PD for the purpose of communicating clear expectations systematically. Fullan (2007) defined “effective curriculum implementation” as the ability to achieve most of the curriculum intentions with fidelity, or consistency
throughout a district. In essence, district leaders are challenged to reduce, if not close, the
gap between the curriculum-as-implemented and curriculum-as-intended by proactively
attending to factors which might impede change (Lai, 2015).

Summary

As building-level leaders, administrators have great influence on the quality of
their schools and in the facilitation of the school improvement process. An
administrator’s beliefs about his/her ability (self-efficacy) to navigate their complex role
is a factor in the leadership behaviors and actions they will take, and therefore, have
implication to their ability to lead in various outlets. In order to support administrators in
their challenging professional role, the United States federal government, along with
states, have allocated funding for the professional development of school leaders as they
seek to increase teacher, and hence, student achievement. This review of literature in the
areas of self-efficacy, leadership, and professional development serve to form a
foundation in which this study rests. With a plethora of educational research in these
three areas individually, there is limited literature examining the constructs in
combination. Chapter Three will detail the conditions of this particular study with the
hopes of better understanding the synergy of these three educational foci as they relate to
elementary school administrators.
Chapter 3
Methodology

The purpose of this study was to investigate the impact of professional development on the instructional leadership beliefs of school administrators. A mixed-methods study was developed to utilize survey results from administrators regarding their self-efficacy perceptions in both general and subject-specific instructional leadership as well as field notes and document analysis to tell the professional development journey from the lens of self-efficacy sources. The methodology chapter will review the problem and purpose of the study and reiterate the research questions. As the study is guided by the research questions, this chapter includes pertinent information regarding the research participants, instrumentation, data collection and analysis and summary.

Overview of the Problem and Purpose

Administrator’s capabilities to create and support a variety of conditions in schools for quality teaching and learning is critical (e.g. Gurr & Drysdale, 2010; Hallinger & Heck, 2011; Hauserman & Stick, 2014; Leithwood & Day, 2010; Mulford, 2010). With a plethora of knowledge and skills required to perform this important role in schools, school districts are devoting increased resources and time into the professional development of administrators in order for them to effectively lead advances in student achievement (Burch, 2007; Fink & Resnick, 2001). An important aspect of leadership development is helping administrators understand who they are, what they believe, and how their actions affect others and their school environment as a whole. During times of change especially, careful consideration of an administrator’s beliefs, or self-efficacy, in relation to a task such as instructional leadership are important because of the substantial
influence they can have on how they behave (Bandura, 1997). Empirical research has found that self-efficacy perceptions can be changed and applying the theory of self-efficacy to professional learning situations could be an extremely useful practice for developing all employees by focusing on the four primary sources (Bandura, 1977; Gist & Mitchell, 1992). Therefore, as districts aim to support administrators in their instructional leadership knowledge, skills, and dispositions, employing the theory of self-efficacy as bedrock for professional development is a worthwhile investigation. This explanatory research was important to study because districts are asking administrators to lead differently in today’s culture of systematic accountability, and in order to support this change, professional development must be thoughtfully and systematically organized and analyzed in order to continuously improve through reflection and revision.

**Research Questions**

The over-arching mission of this study was to investigate one school district’s professional development journey during a time of curriculum reform and its impact on administrators’ beliefs in their ability to be instructional leaders. Therefore, the main research question is: How does school administrators’ professional development for mathematics instructional leadership impact their own self-efficacy? The researcher designed four sub-research questions to gather and analyze both qualitative and quantitative data related to the main research question. The next section gives a brief synopsis of the format and data collection methods for each sub-research question.

**Sub-research question 1 (SRQ1)**: What opportunities have administrators had to develop their self-efficacy in mathematics instructional leadership?
SRQ1 addressed the PD opportunities available to administrators to develop their beliefs in their abilities to be instructional leaders for elementary mathematics. This question was analyzed in two-ways during this study. First, administrators listed all PD activities they recalled during the preparation and implementation phases of the new mathematics curriculum adoption on the final open-ended responses item on the inde survey. The collective list of administrator-identified PD was then compared to the district-provided PD documentation. The researcher collected, analyzed, and compared both sets of listed PD opportunities to find potential gaps or missing PD activities during the mathematics curriculum adoption process.

The researcher collected a second data aspect of SRQ1 through document analysis. The researcher gathered field observation notes using naturalistic inquiry and analyzed documentation that aligned with observed PD. Field observation notes and PD documents collected from district leaders were then described in detail and coded based on Bandura’s four self-efficacy sources (Bandura, 1977). A timeline of PD opportunities documented milestones identified by administrators, district leaders, and the researcher (see figure 3.1). After all milestone PD opportunities were described and coded based on document analysis and researcher perspective, three PD phases and coinciding significant outcomes were identified. District leaders were asked to

Figure 3.1. General format of PD timeline phases. The model provides a template of qualitative data organization in Chapter Four.
review documentation and coding to ensure district PD was accurately represented by the researcher (member checking protocol).

The phases and timelines served to tell the district’s PD story over time in developing their elementary administrator’s beliefs in their abilities to be instructional leaders through this massive curricular and instructional change process.

**Sub-research question 2 (SRQ2):** Did district-provided professional development change administrators’ general instructional leadership self-efficacy?

SRQ2 addressed the general instructional leadership beliefs of the administrators surveyed (see Figure 3.2). This data served as a baseline for the impact of professional development in the overall construct of instructional leadership. Data analysis included descriptive statistics and independent samples t-tests both by factor and also using a holistic, collapsed result for the population in general.

![Figure 3.2](image.png)

*Figure 3.2. General instructional leadership data. SRQ2 data was collected by comparing pre- and post-data results from the ASES-M survey questions 1-10.*
Sub-research question 3 (SRQ3): Did district-provided professional development change administrators’ mathematics instructional leadership self-efficacy?

SRQ3 addressed the mathematics instructional leadership beliefs of the administrators surveyed. This data was analyzed using descriptive statistics and an independent samples t-test analysis both by factor and also using a holistic, collapsed result for the population in general in relation to mathematics.

![Diagram of IL Self-Efficacy Pre-Survey and Post-Survey](image)

**Figure 3.3.** Mathematics instructional leadership data. SRQ3 data will be collected by comparing pre- and post-data results from the ASES-M survey questions 11-28.

Sub-research question 4 (SRQ4): How does administrators’ general instructional leadership self-efficacy compare to their mathematics instructional leadership self-efficacy before and after district-provided professional development?

SRQ4 addressed the overall differences, if any, in general and mathematical instructional leadership beliefs of administrators at two different points in time (see
Figure 3.4). Studying the sample as a whole, descriptive statistics and paired t-tests were compared and analyzed for differences to see if professional development lessened, maintained, or widened the gap in administrator beliefs as an instructional leaders, both generally and mathematically.

**Design & Procedures**

The research design for this study was a concurrent transformative mixed-methods design (Creswell, 2014). By definition, mixed-methods is a procedure for collecting and analyzing data by integrating both quantitative and qualitative processes within a single study in order to gain greater insight on the research problem (Tashakkori & Teddlie, 2003; Creswell, 2005). Mixed-methods designs are grounded in the idea that for some research studies, the problem or phenomena cannot be fully described using qualitative or quantitative methods in isolation. A complex model in structure, a transformative mixed-method design is becoming more popular in social science research.
(Creswell & Plano Clark, 2007). In a concurrent transformative design, the researcher simultaneously collects two sets of data, qualitative and quantitative. Data is then integrated during the analysis or interpretation phase in order to best answer the research questions outlined by the researcher. A strength of this design is that it is value-based and conceptual, however, a weakness is how to best organize the concurrent design in the most effective way in order to maintain validity in results (Greene, 2007). While concurrent designs are often two-step designs, this study has multiple mixed-methods phases occurring simultaneously. For example, though naturalistic inquiry and document analysis qualitative methods occurred months prior to pre-survey administration, continued collection of professional development activities were gathered and analyzed up to the post-survey administration. Because multiphase mixed-methods research is often difficult to comprehend, the utilization of a visual model has been deemed a best practice for expressing complex mixed-methods procedures (Creswell, 2005; Ivankova, Creswell, & Stick, 2006; Morse, 1991; Tashakkori & Teddlie, 1998). Table 1, on the next page, represents the design model of this study.
Table 1: 
Procedures for Concurrent Transformative Mixed-Methods Design

<table>
<thead>
<tr>
<th>Phase</th>
<th>Procedure</th>
<th>Product</th>
</tr>
</thead>
<tbody>
<tr>
<td>Qualitative Data Collection &amp; Analysis</td>
<td>• Collect milestone PD opportunities</td>
<td>• Timeline of PD opportunities for administrators coded with four sources of self-efficacy</td>
</tr>
<tr>
<td></td>
<td>• Document &amp; organize chronologically</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Code PD documents with four sources of self-efficacy</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Seek district leadership feedback on PD document coding</td>
<td></td>
</tr>
<tr>
<td>Quantitative Data Collection &amp; Analysis</td>
<td>• Pre-ASES-M Survey (n=38)</td>
<td>• Numeric Data</td>
</tr>
<tr>
<td></td>
<td>• Data Screening (univariate, multivariate)</td>
<td>• Descriptive Statistics, missing data, linearity, normality, multivariate outliers</td>
</tr>
<tr>
<td></td>
<td>• General to Mathematics IL collapsed data comparison (sub-RQ 4)</td>
<td>• Paired T-test &amp; Correlation</td>
</tr>
<tr>
<td></td>
<td>• SPSS Quan. Software v.11</td>
<td></td>
</tr>
<tr>
<td>Connective Quantitative &amp; Qualitative Phases</td>
<td>• Analysis of any common trends and themes with high or low self-efficacy for general and content specific Instructional Leadership</td>
<td>• Pre-ASES-M summary presented to district leaders</td>
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<tr>
<td></td>
<td>• Inform district leadership of PD trends</td>
<td>• PD opportunities designed for self-efficacy</td>
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<td></td>
<td>• Consult on PD implications</td>
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<tr>
<td></td>
<td>• Collect milestone PD opportunities</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Document &amp; organize chronologically into PD phases</td>
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<tr>
<td></td>
<td>• Identify significant outcomes of PD phases</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Code significant outcomes with relevant sources of self-efficacy</td>
<td></td>
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<tr>
<td></td>
<td>• &quot;Member checking&quot; by district leadership feedback on PD timeline, significant outcomes, and coding</td>
<td></td>
</tr>
<tr>
<td>Continued Qualitative Data Collection &amp; Analysis</td>
<td>• Post-ASES-M Survey (n=38)</td>
<td>• Numeric data</td>
</tr>
<tr>
<td></td>
<td>• Data Screening (univariate, multivariate)</td>
<td>• Descriptive Statistics, missing data, linearity, normality, multivariate outliers</td>
</tr>
<tr>
<td></td>
<td>• General to Mathematics IL collapsed data comparison</td>
<td>• Pre-Post Statistical Analysis (sub-RQ 2, 3, 4)</td>
</tr>
<tr>
<td></td>
<td>• Pre-Post Statistical Analysis</td>
<td>• Independent samples and paired t-test &amp; Cronbach Alpha Correlation</td>
</tr>
<tr>
<td></td>
<td>• SPSS Quan. Software v.11</td>
<td></td>
</tr>
<tr>
<td>Connective Quantitative and Qualitative Phases</td>
<td>• Analyze self-efficacy changes in pre/post- data, if any.</td>
<td>• Discussion, conclusions, and implications based on mixed-methods results</td>
</tr>
<tr>
<td></td>
<td>• Triangulate qualitative and quantitative findings</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Discussion of PD opportunities linked to self-efficacy sources</td>
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</tr>
</tbody>
</table>
Participants

Elementary administrators

The participants for this research study included current elementary school building administrators (principals, assistant principals, and principal interns) in a Midwestern, suburban school district. The district is the third largest in the state with a student membership of over 23,700 students, with over 11,000 of those students filling K-5 classrooms in 25 different elementary school buildings. The elementary administrators had varying years of both teaching and administrative experience and were in the first year of a curriculum adoption change in elementary mathematics. With a total elementary administrator population of 38, the entire group was invited to participate in the survey, and therefore was a convenience sample. Demographic information requested included: gender, age, years in current position, years in current district, prior educational leadership positions, years in prior leadership positions and years as a classroom teacher. Race, ethnicity and other additional demographic options were purposefully omitted in order to maintain confidentiality of responses within the population. The participants were informed of the purpose of the study and forthcoming survey approximately three months prior to the survey’s administration at a curriculum meeting. Administrators were reassured that the study was focused on the district’s school improvement process and the role of district leadership in providing PD during a curriculum change. Their participation was voluntary and their answers were not identifiable.

District leaders

Additional district participation with the researcher included the Director of Elementary Education (DEE) and the K-5 Mathematics Curriculum Facilitator of
Elementary Education (MCF). These two district leaders were in charge of designing and implementing professional development for elementary building-level school administrators. They were directly engaged with the researcher and served as the “gatekeepers” (Bodgan & Biklen, 1992) of all district professional development opportunities and information for the study. This process included connecting the researcher to school district research requirements, obtaining district sponsorship in this study, and receiving school administrator approval. This involved these district leaders laying the groundwork for this study by clearly explaining the purpose and rationale for the researcher’s presence at district-sponsored professional development opportunities. This included emphasis on professional development and school improvement processes and deemphasizing individual self-efficacy levels with mathematics leadership or comments shared during their administrator meetings and activities. The role of district leadership in this groundwork created a positive environment where administrators accepted the researcher and what she was doing (Bogdan & Biklen, 1992).

Data Collection- Quantitative

Instrumentation

The survey used in this study, Administrator Self-Efficacy Survey for Mathematics (ASES-M), is a derivative survey developed by the researcher based on the Principal Self-Efficacy Survey (PSES), developed and validated by Smith and Guarino (2005). There were three distinct pieces of the ASES-M survey comprised of 28 Likert scale items and three open-ended response questions. The first 10-questions, from Smith and Guarino’s original PSES survey, were related to administrator’s general instructional leadership self-efficacy beliefs. Questions 11-20, created by the researcher in parallel
construction to PSES items 1-10, emphasized mathematics instructional leadership. The final eight Likert scale items were created with a mathematics leadership perspective and were specific to the local context and curriculum development process experienced by the school district of study. The survey concluded with three open-ended questions followed by a participant demographic request. Open-ended questions provided participants with the opportunity to explain what they believed to be PD experiences rather than merely PD experiences identified by researcher (Neuman, 2000).

**Validity**

Validity refers to the ability to measure what is intended to be measured. There are three areas to address in order to establish validity. First, construct validity is the creation of questions which research the proposed concept without excluding related subjects (Mora, 2011). Second, internal validity is the ability of the questions to accurately explain the results of the research in order to draw cause and effect inferences from the independent and dependent variables (Creswell, 2014). Third, external validity is when the research results can be generalized to a target population (Mora, 2011). The following sections will address the construct and internal validity of the data collected for this study.

**Principal self-efficacy survey (PSES)**

Smith and Guarino’s Principal Self-Efficacy Survey (PSES), survey questions 1-10, was created to mimic the work of Tschannen-Moran, Hoy, and Hoy (1998) and their Teacher Self-Efficacy Survey (TSES). Teacher self-efficacy, in working with students, is well represented in literature in relation to teaching and learning beliefs and student achievement (e.g., Pajares, 1996; Tschannen-Moran, Hoy, & Hoy, 1998). Administrator
self-efficacy has considerably less presence in academic literature even with rising interest in previous decades. The original PSES survey was comprised of 14 Likert scale items assessing instructional leadership and management items and was administered to two hundred and eighty-four principals (administrators) (n=284). Items were scored on a 1-4 Likert-type scale. Confirmatory analysis using AMOS version 5.0 measured construct validity on a variety of fit measures including absolute, relative, parsimonious, and population discrepancy. The measure of absolute fit was executed using a chi-square test and the relative fit measured used the Comparative Fit Index (CFI) (Bentler, 1990) and the Tucker-Lewis Index (TLI) (Bentler & Bonett, 1980). These fit measures were used to assess the interrelationships among variables and how the hypothesized model fit the null model respectively. Measures of parsimonious fit attempt to over-fit the data in order to determine if the overall data fit the model itself. This was accomplished by dividing the chi-square by the degrees of freedom (n=284). The population discrepancy estimated the survey coefficients to the population coefficients. For this study, the researchers utilized the Root Mean Square Error of Approximation (RMSEA) (Browne & Cudeck, 1993). The chi-square correlated two-factor model yielded high goodness of fit for both CFI and TLI (e.g., >.99). The RMSEA showed a close fit between the sample and population coefficients with a value of .049. The correlation between the two factors was .69 indicating discriminant validity. The study provided empirical evidence that PSES operationalized instructional leadership and management with respect to principals (administrators). Internal consistency was also measured for Instructional Leadership on questions 1-9 using Cronbach’s alpha with a coefficient of .86 (Smith & Guarino, 2006).
Permission was requested and granted from Smith and Guarino (2005), PSES authors, to use their copyrighted instrument, in part, for this study (Appendix C).

*Administrators’ self-efficacy scale for mathematics (ASES-M)*

Based on the foundational work of Smith and Guarino (2006), the researcher developed a derivative survey, ASES-M, where items were constructed (questions 11-20) in parallel form and intended function to the PSES survey for general Instructional Leadership (questions 1-10). Lastly, there were three open-ended questions written to inform other quantitative and qualitative data collected through the sequential transformative study.

The ASES-M pilot 1.0 was distributed by email to 17 educational professionals with various experiences related to school administration, higher education, educational leadership coursework, and classroom teaching. Feedback was requested related to question clarity, word choice, jargon, overall structure and any distracting or overlapping questions. Twelve written responses were returned to the researcher through email. Based on pilot testing feedback, the following modifications were made: (1) re-organization with demographics placed at the end of the survey, (2) minor grammatical and spelling errors, (3) word choice modifications were made only to non-PSES items to retain validity of pre-established survey instrument, (4) consolidation of five ranking open-ended questions, and (5) re-wording of two open-ended questions. No pilot participants were elementary administrators in the participating district.

A second pilot test, ASES-M pilot 2.0, was administered in an Educational Leadership class at a Midwestern university. The pilot 2.0 participants were educational leaders not employed as elementary administrators in the school district of study.
Fourteen responses were collected electronically and verbal feedback was also provided following the survey. Based on pilot testing 2.0 feedback, two modifications were made to the ASES-M survey. First, the open-ended questions were re-formatted for consolidated ranking. Second, a minor spelling error was corrected.

The researcher also analyzed survey data using SPSS, version 11. Descriptive statistics and independent sample t-tests were analyzed. Internal consistency was also measured using Cronbach’s alpha on the pilot 2.0 survey over Instructional Leadership (questions 1-10) and Mathematics Instructional Leadership (questions 11-28) with coefficients of .806 and .962 respectively. These reliability statistics indicate a high level of internal consistency for our scale with this specific sample. Additionally, the researcher evaluated open-ended responses and found responses two-open ended questions which were not clearly articulated or aligned with intended research questions. For example, respondents were asked what areas of mathematics instruction were areas of strength/weakness for teachers. Responses varied from instructional strategies to mathematical content areas such as Geometry and Statistics. The researcher omitted both open-ended items in question due to the vague responses and lack of alignment with purpose or identified research questions within the study.

**Survey administration**

The ASES-M survey was administered to school district administrators using Google Forms, a familiar and commonly used platform for the target population. Administrators were sent the ASES-M and requested to complete the survey within one week (seven calendar days) of distribution. Administrators met formally three days after the initial survey Google link was sent and district leaders provided an additional
reminder to complete the survey in order to gain feedback on their PD practices. A reminder email was sent to the administrators after one week and an additional three days were given to provide time for increased participation. The pre- and post- surveys required approximately 10-15 minutes to complete.

Quantitative data analysis

Research sub-questions two through four were analyzed using a quantitative method or survey. Analysis pertaining to these questions focused on descriptive statistics (means and standard deviations) and independent samples t-tests. The reliability measures of the Likert scale for the ASES-M survey were computed using Cronbach Alpha. Cronbach’s Alpha is a measure of internal consistency where respondents complete a survey on a Likert-type scale. Alpha range measurements are between 0 and 1.0. Survey scales with an alpha level above .70 are considered internally consistent (Nunley, 1978). With two distinct parts to the survey, general Instructional Leadership and Mathematics Instructional Leadership, two sub-Alpha values were collected.

Data Collection- Qualitative

Naturalistic inquiry

Naturalistic inquiry is research that is focused on the natural actions and interactions of people during genuine life or work experiences (Frey, Botan, Kreps, 2000). This approach is important when researchers are interested in the participant’s perspectives in order to better understand the environment or potential change occurring (Bogdan & Biklen, 1982). In this case where the self-efficacy of administrators is being analyzed based on the role of district-led professional development, the observation and
analysis of administrator perceptions, comments, and opportunities helped to provide additional data to the researcher beyond the quantitative survey results.

The four sections below provide explanations for important aspects and/or considerations applied in this study by the researcher pertaining to the use of naturalistic inquiry for qualitative data collection and analysis.

**Natural setting**

An important aspect of naturalistic inquiry is for the researcher to carry out all observation and interactions with participants in their own environment in order to achieve fullest understanding of their behavior (Lincoln & Guba, 1985). This naturalistic research took place at the school district’s support services center where all professional development and training for district employees occurs. Additional professional development opportunities for administrators were offered at individual elementary school buildings. The researcher also attended these activities on site.

**Human instrument**

Another important aspect of naturalistic research studies is the researcher’s use of him- or herself as the primary data-gathering instrument (Erlandson, Harris, Skipper, & Allen, 1993). Although the researcher attempts to view a situation from a point of view of participants, it is impossible to completely escape from providing a personal interpretation of the observations. This is called interpretive nature (Frey, Botan, & Kreps, 2000). The researcher for this study was the primary data gatherer and took steps to ensure data collection and analysis limited bias and accurately documented professional development activities and self-efficacy sources.
One step the researcher took was to establish relationships with the district leadership team. The naturalistic inquiry approach suggests researchers attempt to establish relationships with participants in order to guard and interpret distortions of bias or prejudice (Lightfoot, 1983). The researcher must be on guard against misinformation. By gaining insight to the processes, common practices, and underlying motivation behind the district school improvement plan, the researcher was better able to interpret and analyze professional development efforts and activities.

Another step taken by the researcher was to gather information from a variety of sources. Capturing a complete picture of the professional development opportunities offered to administrators during this mathematics curriculum adoption year was important. Being that the researcher was not a school district employee, professional development opportunities were accessed by district leaderships at their planning stages, through open-ended questions to administrators on the quantitative survey, and through observations and inquiry to all mentioned activities related to administrators. For example, the researcher was included on common district communication with district leaders where often individualized invitations for guidance or support were offered through more information communication. This access helped the researcher have a more holistic picture of all levels of district support offered to administrators as instructional leaders for mathematics.

**Emergent design**

Naturalistic research allows the research design to emerge during the study. When working in the natural setting of the participants, it is nearly impossible to predict the interactions and even opportunities which will present themselves through the course of a
year of observations and analysis. Emergent design provides permission to the researcher to let the qualitative study unfold rather than prescriptively planning in advance (Moulden, 2009). In this study, the researcher first observed professional development administrative meetings broadly based on the research questions established previously. As the study progressed, the researcher was able to narrow the scope of the study as the emergent theory began to surface.

**Reliability and validity for trustworthiness**

The traditional criteria for internal and external validity (i.e.: reliability and objectivity) are inconsistent with a naturalistic inquiry design. Instead, the trustworthiness of inquiry is established through four standards (Morrow, 2005).

The first standard of trustworthiness is credibility. Credibility is achieved when the results of the study are seen as believable by the participants involved in the research. Therefore, participants decide the credibility. This is achieved through prolonged engagement and persistent observation to name a few. Through prolonged engagement and persistent observation, the researcher is able to ensure a greater depth of experience and understanding of the culture of the participants and in this case, district (Williams, 1988). The researcher has established a relationship with the district leaders and invited two leaders in particular to examine the professional development timeline, observation notes, administrator comments, and self-efficacy coding in order to find consensus or address credibility of findings.

The second standard of trustworthiness is transferability. Transferability exists when results can be applied to other contexts. This is achieved by clearly describing the context and underlying assumptions of the study as to explain possibility of
transferability by the researcher. While transferability should be possible through the use of a “thick description”, it is assumed that the person doing the transfer is responsible for applying the research in their context and particular setting. With this study being conducted in one Midwestern, suburban school district, the professional development organization, activities, and procedures would not be one-size fits all program of implementation during a time of curricular change. Instead, the significant outcomes described could serve as a platform for planning of professional development practices which could be transferred in various settings.

The third standard of trustworthiness is dependability. Dependability emphasizes the stability of the data over time. The researcher needs to understand and address that change is always happening. For this study, the significant outcomes identified were described to be imperfect practices which will continue to evolve and improve with further reflection and iterations. Additionally, the district piloted some of the professional development activities during this math curriculum change with the hope of later being able to implement (with variations) to other subject areas or grade levels based on findings and feedback.

The fourth standard of trustworthiness is confirmability. Confirmability is the checkpoint that the inquiry is free of bias, values, and prejudice and that the data interpretations and outcomes can be agreed upon by others in the educational community and elsewhere. In short, the researcher cannot be viewed as the sole believer of this research or findings. Lincoln and Guba (1985) found that member checking” was an essential step in establishing credibility and confirmability. Member checking is a step when members of the setting (participants) are given the chance to respond to researcher
identified themes. This is also an opportunity for these members to ask questions, raise concerns, and make suggestions. This is done continuously, in both formal and informal ways.

Additionally, the researcher also analyzed her own researcher bias in order to address the variable of being the primary qualitative data collector in this study. Creswell (2014) stated two strategies for avoiding researcher bias: reflexivity and journaling. Reflexivity is researcher self-awareness and self-reflection. This concept will be addressed in more detail in the next section. Journaling is another strategy to avoid researcher bias and is suggested that it is detailed and timely documentation of the researcher’s thoughts. The researcher embedded perceptions and feelings within field notes at each observation. Additionally, the researcher was often able to debrief with district leadership on observations to check for common themes or perceptions on administrator motivation, participation, comments, or findings. This would once again qualify itself to be member checking.

**The researcher’s role**

Marshall and Rossman (2011) found that meaningful qualitative researcher was dependent upon the relationship (namely, rapport and trust) established between the researcher and study participants. The researcher of this study had a unique perspective on the topics of this study based on her previous career as a classroom teacher, current role as a university faculty member in Teacher Education, and research agenda in Educational Leadership. At the onset of the researcher/district relationship, the researcher’s role was as a consultant. The researcher offered a broad perspective on best practices in mathematics teaching and learning. With the upcoming mathematics
curriculum reform, the district-wide initiatives were aimed at mathematics, however leaders did not want to lose focus on the broader vision of quality mathematics education for all of their students. The role of the researcher, at that point consultant, was to offer support for leadership as they focused deeply on new curriculum though also keeping national and global perspectives. It was soon clear that district leaders desired a way to not only analyze if their administrative and/or leadership focus during district-curriculum adoption was effective, but also document and review their processes. This is where the research study and role of researcher began.

All researchers are affected by bias regardless of qualitative or quantitative design methods. Bias could occur in how observations are documented or how survey questions are constructed. To minimize the impact of bias, researchers have a responsibility to introspectively examine their own biases and methods address them (Bogdan & Biklen, 1992). Researcher bias in qualitative research can be addressed by the aforementioned statement of the researcher’s position and communicating how that might impact the constructivist lens from which the data was collected.

*Note: The following section on researcher reflexivity is written in first person. The researcher chose to depict this aspect through a more personal writing style to more clearly depict the lens from which this study was developed and executed.*

**Researcher Reflexivity**

As the primary researcher of this study, it is important that I provide evidence of self-awareness and self-reflection (researcher reflectivity) in my perspectives and experiences related to this study (Creswell, 2014). As a doctoral student and university faculty member in a Teacher Education department, I am constantly questioning what
practices are effective in education and more importantly, why or how they are effective.
The collaboration between this Midwestern, suburban school district and I began with a question. Walking out from my last night of doctorate classes with a classmate (an employee of the district eventually studied), we were sharing our research and dissertation interests. Knowing that my background was in mathematics, he shared that while his district’s mathematics scores were relatively high by state and national standards, scores had flattened out over the last ten years. He further explained that his district often starts reform of any kind by providing professional development and training to building-level leaders. With a district focus on mathematics for the next two academic schools years, he anticipated increased efforts to support administrators in the area of mathematics reform. I instantly wondered what elementary administrators would consider to be ‘effective mathematics instruction? Would their answers be consistent if I asked? How familiar are administrators to research-based best practices in mathematics education? How much of what they observe and provide feedback on is focused on general teaching practices? How often do they give feedback that is mathematics specific? How comfortable are administrators with leading completely new mathematics initiatives in their buildings with very little experience learning or teaching in that manner?

Driving home that evening, I could not help but wonder about these mathematics leadership questions. When I arrived home, I immediately posed a variety of questions to my administrator husband. After hearing his responses, I questioned whether other administrators would have responded the same way? Should they? Is this a problem if they do not? With what seemed like a bottomless amount of questions to ponder, it
certainly seemed like a worthwhile topic to investigate further. Within three days, I was in communication with district leaders and our collaboration began to investigate the role of professional development in the instructional leadership of administrators.

In reflecting about my experiences and perspectives which impact the lens in which I conduct this study, I feel that I have three experiences which provide insight to how I view and interpret the qualitative and quantitative aspects of this study. These include my perspectives on professional development and adult learning, mathematics teaching and learning, and educational leadership. These three perspectives will be briefly discussed in the following sections.

*My lens - professional development and adult learning*

I have been a part of professional development and adult learning as either a participant or provider for nearly fifteen years. Education is a field in which the titles “life-long learner” and “reflective practitioner” require educators to continuously examine their practice and desire to acquire new skills and knowledge. As a teacher, I earned two masters’ degrees before my fifth year of teaching. I became addicted to learning about my craft. I sought out any opportunity that I could to live out my mantra from Maya Angelou that “When you know better, you do better.” In my experience with professional development and adult learning, I found that environments which were collaborative and created authentic and relevant experiences were most impactful for my practice. Through discourse with fellow educators, I have learned that together we are truly better and that having actionable take-aways is key for change. These as a learner have only been solidified as I have become a teacher educator and researcher.
Educational literature defines the qualities of effective professional development which empirical evidence and also my experiences have supported.

*My lens- mathematics teaching and learning*

I have had a love/hate relationship with mathematics learning my entire life. I often joke that mathematics has made me cry more than any boy. Teaching mathematics and mathematics education has been a different story. Since the day I considered the idea of being a mathematics teacher, I knew I had a lot to learn. I knew that there had to be a better way to learn mathematics which included joy and that did not have to be defined by isolation, frustration, and disconnection. I am a firm believer of our current “mathematics reform” movement which places a balanced emphasis on procedural fluency and conceptual understanding through collaboration, communication, reasoning, and problem solving. This required a substantial learning and unlearning process for me as a teacher and student of mathematics as I had years of experiences that did not reflect this balanced approach I hoped to exhibit through modeling and instruction. I now have a passion for sharing what research says is best practices for what mathematics education should look like from the teacher and student perspectives in order to cultivate a generation of students who are not afraid of mathematics and see the value of learning it. I often must reflect on the idea that not everyone has a deficit vision of early mathematics education like I have. Although some educators may have experienced mathematics teaching and learning practices that are now considered ineffective, they may have positive perceptions of their instruction and learning depending on their learning style. With my background knowledge on the diverse ways that students (and also adults) learn mathematics, I must also honor the fact that for many students today, the “traditional”
mathematics classroom could still be a very effective model for their type of learning style.

*My lens*—*educational leadership*

My perception of educational leadership has been greatly influenced by those I have viewed as leaders, either formally or informally, in my professional experiences as an educator. In the sample of leaders I recalled during this study, each had vastly different leadership styles. However, I viewed each leader as “effective” due to their attention to individuals and how they respected what individuals in their organization could bring to the team. In one leader, this was evident in her willingness to delegate tasks and responsibilities to others. Some might consider this a deficit, however I viewed this as distributed leadership as a way that she was able to develop those around her and trust their abilities to accomplish important tasks. Although I have had other strong educational leaders which were much more task-oriented and detailed in their leadership, they always exhibited a genuine concern for the individuals even when leading in challenging circumstances.

I have been fortunate that my perception of educational leadership has not been framed on a deficit model. In my 12 years in education, I have had positive, proactive, and professional examples of educational leaders through massive change at both the K-12 and post-secondary environments. My own experiences in education afford me a very positive and uplifting attitude. I know that many leaders are in extremely trying circumstances where the theory and practice of educational leadership have enormous gaps based on tremendous challenges. This “blind-spot” in my experiences could
interfere with my observation of experiences, however, my reflection of this lack of perspective also makes me very aware of how I perceive interactions and experiences.

**Summary**

This chapter has described the methodology that was used in this concurrent transformative mixed-methods research study. Along with descriptions of the participants and the procedural organization of this study, an additional examination of the trustworthiness of the qualitative collection and analysis of data required the inclusion of researcher reflexivity. The data was collected through pre- and post-surveys, observations, and document collections in an effort to address and answer the four research questions identified in this study. From these methods, the data was gathered in the form of statistical analysis, field notes, district documents, and reflective interactions. The data was then organized, analyzed, compared, and interpreted for meaning. Chapter Four introduces the qualitative aspects of this study to chronicle the journey of one school district’s professional development journey through curricular change in elementary mathematics from the perspective of administrators and district leaders. Chapter Five will further detail the perspectives of school administrators in the analysis of quantitative survey data in conjunction with the qualitative analysis from Chapter Four. A discussion of this mixed-methods research study including conclusions and implications will be presented in Chapter Six.
Chapter 4

Qualitative Analysis & Findings

This chapter chronicles the details of one school district’s professional development (PD) journey for elementary administrators during a time of elementary mathematics curricular change. Also discussed is an analysis and interpretation of the qualitative data identified as significant outcomes of the administrative PD experiences. Specifically, Chapter Four attends to the first sub-research question of the study: *What opportunities have administrators had to develop their self-efficacy in mathematics instructional leadership?*

The purpose of the study was to investigate the impact of PD on the self-efficacy of school administrators during reform. In review, this study defined the following participants: *school administrators* as elementary building-level principals, assistant principals, or principal interns; *district leaders* as central office personnel such as curriculum directors, specialists, and supervisors.

As a part of this concurrent transformative mixed-methods study, the researcher conducted a naturalistic, descriptive analysis to produce a collection of field notes and document analysis data. The chosen methodology hoped to share a more complete picture of the professional development opportunities administrators experienced before and between pre-and post-survey administration to increase their instructional leadership. In accordance with the qualitative aspects of this study and the small, specific audience surveyed, the results are not assumed to be applicable to all outside audiences or school district models. The qualitative data were strategically analyzed and presented prior to quantitative post-survey data collection and analysis (Chapter Five). Data analysis
sequencing decisions were made consciously to provide a narrative baseline prior to quantitative data result analysis.

One District’s Journey

Schools are expected to continuously improve despite growing challenges. School districts faced with stagnant or declining test scores are called to progress to meet the needs of our evolving world. The following section provides context to the PD journey traveled by one district as they adopted a vastly different curriculum and instructional approach to K-5 mathematics teaching and learning.

A District Mathematics Framework

The mathematics reform process in the district began with the year-long creation of a PK-12 Mathematics Framework (MPS, 2015). Stakeholder input was gathered from various levels of district personnel as well as community and parental viewpoints to inform the future direction of the district’s mathematics teaching and learning processes. Within the 84-page document, consisting of content standards alignment and college-to-career readiness initiatives, the district detailed their philosophical beliefs and mission. The document served as a framework for change and research-based improvements. Grounded in research, the district framed their mathematical instructional beliefs on eight research-based, national guidelines introduced by the National Council of Teachers of Mathematics (NCTM) called the Principles to Actions Effective Mathematics Teaching Practices (Principles to actions, 2014) (Appendix D). These eight practices clearly define the teacher and student actions the district hoped would not only drive long-range planning, but curriculum choices and PD structures for the years to come. The Executive Summary for Principles to Actions specifically addressed the need for principals and
school leaders to take actions in making the eight practices schoolwide foci for all teachers through PD, training, and/or coaching. Additionally, they called for a schoolwide culture of high expectations and emphasis on a growth mindset. According to the Executive Summary, the actions of school and building leaders regarding the guidance and structure provided in the *Principles to Actions* practices are vital for impact.

Philosophically, the district stated that their dedicated, professional educators believe students must be “collaborative, life-long learners in the field of mathematics” and “engage in productive struggle, justify ideas, and proficiently use math tools to critically think about, make sense of, and provide solutions to problems in a global society” (MPS, 2015, p. 3). Furthermore, the district outlined eight belief statements particularly aimed at mathematics. They are

- Change is a necessity
- Students cultivate productive mathematics dispositions and growth mindsets through positive adult and peer models, opportunities to constructively struggle, and appropriate supports.
- Students must be able to use mathematical tools (e.g. technology, models) as an aid to demonstrate proficiency.
- Students must be able to communicate and justify mathematical ideas with precise vocabulary and representations.
- High expectations and rigorous instruction will be established and maintained in order to support individual student growth.
- Engaging and involving all stakeholders expands students’ understanding of mathematics and makes learning mathematics relevant.
• Effective mathematics teaching and learning involves developing conceptual understanding and procedural fluency in a student-centered learning environment

• Equipping teaching professionals with the instructional tools and learning experiences to foster rigorous, effective mathematics learning is worth the investment. (MPS, 2015, p. 3)

This study examines elementary administrators as instructional mathematics leaders. From the list above, the researcher identified that the first and last beliefs, focused on change and investing resources into professionals, were evident from the first interactions with district leaders. The framework is an important aspect of this district’s journey as it serves as the roadmap for PD and curriculum adoption processes in the coming years.

“Change is a necessity”

In preparation for the 2016-2017 K-5 mathematics curriculum adoption, the district curriculum planning committee organized in January 2015. Their discussions revolved around then current data, education trends, and opinions from expert members related to mathematics teaching and learning. Change was coming. Their mathematics scores had flat-lined and data revealed that students were not growing in their mathematics proficiency district-wide (NDE, 2016). Examining the state mathematics testing data over the past five school-years, many would commend this particularly large, Midwestern, suburban school district for their student achievement scores. For K-5 elementary grades serving over 11,000 students, the district percentages for student proficiency in mathematics were hovering above 80% for tested grades three, four, and
five. In the 2014-2015 State of the Schools Report (NDE, 2016), the district’s elementary mathematics mean scores were higher than the state mean, a consistent trend for this district in relation to the state mean scores.

While district leadership and schools were not being scrutinized for “failing” mathematics achievement scores, they did notice a trend that required attention. In the years leading up to the current mathematics curriculum adoption, mathematics teaching and learning in the district had been heavily influenced by K-5 literacy practices. The Director of Elementary Education (DEE) for the district discussed in a preliminary conversation on August 19, 2016, that the district was not seeing gains using guided math as they did in guided reading. The emphasis on small group instruction had created a culture where students were grouped homogeneously by ability level and teachers had limited time to include depth or discourse through systematic and explicit instruction. In their examination of mathematics curriculum and practices, district leaders recognized that both of these literacy practices contradicted empirical research findings by NCTM regarding equitable and effective instructional practices for mathematics (Effective strategies for teaching students with difficulties in mathematics, 2007). Through research and analysis of student achievement data, a change in curriculum was on the horizon and vital in driving the future mathematics work in the future. In anticipation for a massive curricular shift in K-5 mathematics, the district began organizing professional development structures to effectively implement change in both philosophy and practice.

**Investing in Administrators**

A core belief of the district is investing in teaching professionals so that they have the knowledge and tools to implement effective mathematics instruction (MPS, 2015).
Knowing that building administrators are second only to teachers in their influence on student achievement (Leithwood, Louis, Anderson, & Walstrom, 2010; Marzano et al., 2003; Wallace Foundation, 2011), the district identified that administrators would be an integral aspect of their professional development journey through immense curricular change in mathematics. The DEE described administrators as “vital for establishing a culture of continuous learning and leading the implementation/change process.”

The district published a Leadership Framework handbook (MPS, 2013) which outlined the domains and standards that would define effective leadership in their district. Doug Reeves’ book *The Learning Leader* (2006) influenced the district’s Leadership Framework. In his book, and ultimately the district’s Leadership Framework, is a focus on instructional leadership as a means to impact student achievement. Building administrators are expected to lead, and not just manage, school improvement plans in curriculum, instruction, and learning through educating others on research-based best practices. Additionally, administrators are expected to evaluate and integrate research-based best practice to instill a culture of continuous learning within their buildings (MPS, 2013, pg. 11). The general district-wide beliefs include statements such as “our greatest resource is people”, “all people can learn”, and “responsible risk taking is essential for growth”. These principles were explicitly or implicitly stated by district leadership throughout this study as engrained cultural beliefs. The DEE commented in September 2016 that the school district needed to “reflect, refine, and review” how they supported administrators through PD as instructional leaders. District leaders had high expectations for administrators during the curriculum reform process. They also understood that support would be necessary to handle the complexities and challenges ahead.
Adoption considerations and anticipated challenges for administrators

Tackling a large-scale curricular change across 25 elementary school buildings is no easy task. District leaders voiced three main considerations or anticipated challenges they felt would impact building-level administrators during the early curriculum adoption phase. With a district focus on mathematics for 2016-2017 and 2017-2018 school years, thoughtfully addressing these potential obstacles would become a vital aspect in professional development planning for district leaders.

Management vs. instructional leadership

District leaders wanted more than management from administrators. They wanted them to lead the change. District leaders did anticipate, however, that administrators could lose focus on instructional leadership practices as they worked to manage change in their schools.

With new lesson design structures, increased focus on mathematical student discourse, and decreased emphasis on immediate mastery, the mindset of mathematics education was going to have to change. Not only was this a change in curriculum resources, but a fundamentally different perspective on teaching and learning mathematics. When investing in new curriculum, the importance of consistency through fidelity of program is important. Lack of focus, on the part of the district, to provide knowledge, training, and tools for administrators during change could discount an essential building-level structure in the implementation plan. Building administrators are tasked with communicating district goals and systematic school improvement efforts. With various responsibilities as building-level administrators, district leaders knew that without a strong emphasis on instructional leadership PD opportunities, the systems and
managerial responsibilities of administrators would surely trump instructional leadership activities. In their view, administrators with prior experience, comfort with mathematics, and/or a disposition for easily adapting to change would also push for change in their buildings. Conversely, administrators with a vague understanding of the new curriculum and mathematical research justifications might resist change and lead at very different levels. District leaders believed that by investing in administrators as mathematical instructional leaders, their would bring positive instructional changes and systematic reform to the district.

**Simultaneous learning**

The second consideration or challenge the district anticipated administrators would face during this reform process was the concept they termed as “simultaneous learning”. The DEE explained the uncomfortable nature of change when the individuals who are expected to do the leading know little more than the ones they are being asked to lead. Early into the school year, teachers would have real experiences implementing the curriculum and its instructional components. Their experiences would quickly begin developing opinions on the curriculum’s effectiveness. Administrators, without access to daily classroom interactions, would need support to anticipate the instructional needs and challenges that teachers might encounter during early adoption. In such a drastic shift in curriculum and mathematical instructional practice, most teachers and administrators would be aware of the lack of administrative expertise as they attempt to lead instructionally. After summer curriculum training, district leaders isolated three observations from teachers regarding the curriculum change process. The first concern was explicitly shared with administrators at a monthly curriculum meeting. District teachers
wondered, “Does my principal know about small group instruction and how it looks different? How will I be supported?” District leaders listened to these concerns and they became the driving force in PD planning for administrators as building-level leaders. District-led professional development needed to support administrators in order to ensure teachers and staff could trust their administrators’ readiness to lead change in mathematics. This power-sharing during simultaneous learning further justified the need for district leaders to build capacity in administrators’ mathematics reform knowledge through professional development.

**Listening, yet pushing for change**

The third consideration of district leaders was how to equip administrators with the tools to acknowledge concerns or issues from their teachers regarding the curriculum reform, yet continue to push forward for change. Teachers and administrators had worked diligently for years developing guided math activities utilizing a station teaching approach. These practices were not supported by research or district data to be effective. With the new curriculum adoption, many teachers (and administrators as well) might question if these “old practices” could still have a place within their K-5 classrooms. The new curriculum would have a much different feel than the old with increased whole group instruction. District leaders needed to have a stance on the combination of new and old practices they would allow otherwise their efforts to promote change would be hindered. They pondered what supports and communication would be necessary for administrators to ensure that old practices and routines were not continuing to be used in the new curriculum. This potential push-back could be challenging for administrators as it would require administrators to have a strong rationale for abandoning their formerly
supported practices from just one year before. Administrators would need to confidently ask for patience and trust in order to create sustainable change. Throughout this process, administrators would need to be the face of advocacy for the curriculum and new way of approaching mathematics teaching and learning to teachers and parents which they may or may not fully understand. All of these factors and requests would require an immense amount of organizational trust and buy-in from administrators. District leaders aimed to create PD opportunities to arm administrators with accurate information and confident responses to questions or concerns from any educational stakeholder.

District leaders reflected on the considerations and anticipated challenges building elementary administrators could face during the mathematics curriculum reform process. They knew that clear vision and specific goals were important during any change process and especially during the forthcoming professional development plan.

**PD for Administrators- One District’s Mathematics Curriculum Reform Plan**

Before formally planning specific professional development opportunities for administrators, district leaders first approached their planning from a more broad perspective. Three professional development phases were identified as significant by the researcher in examining the district’s professional development journey with administrators. The three professional development phases were the pre-adoption phase (2014-July 2016), the early adoption phase (August 2016-November 2016), and the instructional leadership phase (December 2016-May 2016). Figure 4.1 models the key foci for each of the professional development phases as determined by the researcher through document analysis, naturalistic observation, and conversations with district leaders.
Many professional development opportunities were available to administrators within each of the three phases. The timeline in the upcoming section will document particular milestone district-led activities which aligned to Bandura’s four sources of self-efficacy, the theoretical basis of this study.

**Theoretical Framework Connections to Timeline**

The overarching research question for this study is to examine how professional development for administrator’s impacted their mathematics instructional leadership self-efficacy. Sub-research question 1, “What opportunities have administrators had to develop their self-efficacy in mathematics instructional leadership?” served a unique purpose related to the other sub-research questions in this study in attempting to answer the overarching question qualitatively. The researcher determined that along with quantitative survey data of administrator’s self-efficacy beliefs (sub-research questions 2-4), a timeline of milestone professional development opportunities might also aide in telling the district’s and administrator’s journey through mathematics curriculum reform.
Triangulation is used in this study to increase credibility and validity and to tell a more cohesive story of this district’s professional development journey. Cohen and Manion (1986) define triangulation in educational and social science research as “an attempt to map out, or explain more fully, the richness and complexity of human behavior by studying it from more than one standpoint” (p. 254). If there were indeed a change in self-efficacy beliefs for administrators, what were some of the PD opportunities that may have impacted that change? In order to triangulate the qualitative and quantitative data effectively, the researcher created a common thread throughout all aspects of the study. The common thread of this study is Albert Bandura’s theory of self-efficacy which can be found throughout the literature, quantitative survey, and professional development opportunity data and analysis.

In review, self-efficacy examines the perceptions of individuals in their belief to accomplish a task (1986). A noteworthy aspect of self-efficacy is that it is not considered to be a personality trait, but a situation-specific construct. The implications for this study reveal that with careful attention to the sources of self-efficacy, it may be possible to positively impact administrator self-efficacy beliefs in the particular area of mathematics instructional leadership. The four sources of self-efficacy are: (a) performance outcomes (enactive mastery experience); (b) watching others (vicarious experiences); (c) verbal persuasion, encouragement and feedback; and (d) attention to psychological and emotional state (Bandura, 1977). These sources helped to group and analyze the various PD opportunities administrators had access to prior to and during the first year of curriculum adoption for elementary mathematics.
Pre-Adoption Phase PD Timeline

| 2014-2015 | Book Study- NCTM Principles to Actions: Ensuring Mathematics Success for All  
Description: Elementary Administrators (Principals and Principal Interns) reviewed research-based best practices of mathematics instruction during monthly curriculum meetings.  
Self-efficacy source(s): PE |
|---|---|
| Summer 2015 | Summer Mathematics Institute- NCTM President Matt Larson  
Description: District-wide PD for teachers, teacher leaders, administrators, and district leaders. Featured speakers included NCTM President Matt Larson, NE Teacher of the Year Shelby Aeborg, and UNL/NSF rep. Jim Lewis.  
Self-efficacy source(s): PE and VP |
| School Year 2015-2016 | Book Study- Beyond the Common Core: Mathematics in a PLC at Work (Math Solutions) ; Math Talk, and Facilitating Mathematics Discourse Book Studies  
Description: Intentional district-led PD over changes to mathematics standards, introduction of the new curriculum, Mathematics Expressions (MX), and sharing the math vision for 2016-2017  
Self-efficacy source(s): PE |
| Summer 2016 | Summer Mathematics Institute- Elementary MX Curriculum Training  
Description: Teachers and administrators took part in a 3-hour curriculum materials training by Mathematics Expressions (MX) trainers.  
Self-efficacy source(s): WO and PE |

Figure 4.2. Pre-adoption phase PD timeline. The timeline of district-led PD occurred between 2014 and fall of 2016. The researcher did not observe pre-adoption phase PD. Therefore, all timeline events were collected through document analysis, PD opportunities by administrators on the ASES-M survey, and through conversations with district leaders. The pre-adoption PD timeline was approved by the DEE and the K-5 MCF.

Note: Performance Outcomes (Enactive Mastery Experience) = PO; Watching Others/Vicarious Experiences= WO; Verbal Persuasion/Encouragement/Feedback = VP; and (d) Psychological/Emotional state = PE

Description of pre-adoption phase PD

In review of the pre-adoption PD opportunities, district leaders anticipated that the elementary mathematics curriculum adoption in 2016 would be a highly complex, organizational change. Professional development activities were strategically
implemented starting in 2014 to “plant the seed” of change into the minds of administrators. From book studies to curriculum materials training for administrators, district leaders aimed to positively influence the mindset of administrators by preparing them for both philosophical and practical change in the area of mathematics education.

**Significant outcome(s) of pre-adoption phase PD related to self-efficacy**

*Mindset for change.*

A common self-efficacy source found during the pre-adoption phase of curriculum reform was attention to psychological and emotional state. Whether the opportunities involved bringing in speakers, offering book studies, or formal curriculum training, each of the opportunities were intended to help the administrators see the background, purpose, and direction of mathematics changes coming to the district. The DEE mentioned how at the time of these PD opportunities, administrators may not have been aware of the importance. He stated in reflection on September 26, 2016 that “we have been doing this (“planting the seed”) for three years with number sense, books, and resources, but there wasn’t a sense of urgency.”

The researcher noted that early adoption concepts from professional development (e.g. process standards, math talk, facilitating mathematical discourse) continued to be used by district leaders and administrators as they discussed what they were seeing in the classrooms. Additionally at the time of these pre-adoption PD opportunities, the structures of math talk and discourse, for example, were not integrated aspects of the former curriculum. Administrators commented at a later curriculum meeting that pre-adoption topics appeared important at the time they were introduced, but were underutilized. Topics like math talk and discourse were extensions of the curriculum and
therefore, not a requirement for their teacher’s mathematical practice. In contrast, now these mathematical practices were embedded aspects of the new curriculum. District leaders were not only asking teachers to show evidence of effective, curriculum embedded practices, but also asking administrators to observe and expect these best practices as well.

Bandura (1994) explained that when attention is placed on the psychological and emotional state of individuals, people’s judgment of their abilities are influenced. In other words, mood affects individual’s judgments of their personal efficacy. Providing opportunities to proactively reduce stress or anxiety can deter negative emotions and therefore, reactions. By front loading perspectives, concepts, and upcoming reform mathematics practices, district leader’s hoped to equip administrators with the background knowledge necessary to lessen the stress of a new curriculum adoptions and implementation. Did they anticipate the process would be easy? Absolutely not, but district leaders believed that if they invested in administrators and their readiness to promote the elementary mathematics changes ahead, everyone could benefit. A key to impacting administrator’s self-efficacy of instructional leadership through the psychological and emotional state source is being proactive. The district’s attention to pre-adoption PD had the potential to proactively influence the perceptions and interpretations of change for their administrator’s even years later. Research shows that individuals with high self-efficacy in their abilities to lead use their emotions, whether excitement or stress, as a motivator of performance. On the other hand, individuals with lower self-efficacy interpret their emotions as a debilitating (Bandura, 1994).
Early Adoption Phase PD Timeline

### September 2016
- **September Administrator Curriculum Meeting**
- Description: District leaders facilitate administrator conversations, review 2nd grade observation homework, problem solve management and implementation concerns regarding curriculum, & watch and reflect on recorded classroom instruction.
- Self-efficacy source(s): WO, VP, and PE

### October 2016
- **October Administrator Curriculum Meeting**
- Description: District leaders facilitate administrator conversations, review 5th grade observation homework, focus on structures versus mathematical practices and remove/lessen barriers to continued adoption momentum.
- Self-efficacy source(s): PO, VP, PE

### November 2016
- **November Administrator Curriculum Meeting**
- Description: District leaders facilitate administrator conversations, review 1st grade observation homework, practice using mathematics observation tool with district recorded instructional videos, and reflect on next steps as instructional leaders.
- Self-efficacy source(s): PO, WO, VP

### Additional PD
- Lunch & Learn- Mastery Learning Loop (Oct.) & Mathematics Observational Tool Introduction (Nov.)
- District leadership invitations to administrators for individualized discussion/building visit
- Description: Optional district-led opportunities for administrators to learn more about curriculum structures and provide feedback for upcoming administrative resources or tools.
- Self-efficacy source(s): VP

**Figure 4.3.** Early adoption phase PD timeline. The early adoption phase timeline of district-led PD occurred between September 2016 and December 2016. Naturalistic inquiry and document analysis were utilized to collect and interpret qualitative data.

**Note:** Performance Outcomes (Enactive Mastery Experience) = PO; Watching Others/Vicarious Experiences = WO; Verbal Persuasion/Encouragement/Feedback = VP; and (d) Psychological/Emotional state = PE

### September 2016

Prior to the first observation of a monthly elementary curriculum meeting, the researcher sat down with the DEE and the K-5 MCF for a pre-observation discussion. In discussion, these district leaders shared that the upcoming curriculum adoption and corresponding PD sequence for building-level leaders was a completely new approach.
from previous district-led initiatives. The teaching and learning practices rooted within the new curriculum would be a vast change for teachers, administrators, and all other support staff involved in classroom instruction. The DEE used the terminology “simultaneous learning” to describe the dynamic that would exist for all involved in the curriculum adoption process. Knowing this would be a challenging transition, district leaders believed that a focused investment in administrators as instructional leaders was important to the successful implementation of the new curriculum and structure of learning elementary mathematics within the district. These building-level leaders would have to balance need to “push for change” while also being receptive to teachers’ concerns and building-level needs.

As administrators entered the large meeting room, table tents strategically placed administrators at tables with diverse school demographics. The meeting started with making administrators aware of the work math teacher leaders had been working on to support all elementary teachers in the district. They ensure that administrators were aware of the one-page curriculum resource that had been created by teachers. These documents contained consistent components for teachers and administrators were asked to communicate their availability and usefulness.

Administrators were then asked to walk around the room to discuss their “homework”. Each month administrators were given an assignment to complete a particular grade-level mathematics observation (see Figure 4.4). Along with their observation, administrators were expected to reflect on guiding questions provided by district leaders and bring back an artifact of their experience or observation.
The observation prompts were chosen by district leaders intentionally to streamline administrators’ focus on three key areas of their mathematics adoption process (see Figure 4.5). Since the early adoption phases, administrators had been receiving PD over the mathematical content standards (what math was being taught and expected by the state) and also the mathematical process standards (how math should be taught) based on a state-wide framework highly influenced by the National Council of Teachers of Mathematics (NCTM). Along with the mathematical process and content standards, the district-led PD was especially focused on familiarizing the administrators with the new structures of the curriculum.
The previous curriculum was largely based on repeated small-group instruction to homogeneously “able” students. The new curriculum looked structurally very different. District leaders felt that administrators needed designated time to digest, reflect, and share their perceptions and observations of instruction.

Figure 4.6 represents the consistent directions administrators were given at all monthly meetings. Time was provided so that administrators could dialogue with peers about their mathematics observation homework insights, challenges, and opportunities.

Figure 4.5. Administrators’ observation focus areas. Each month administrators were assigned to observe a specific grade-level mathematics lesson. All observations were focused on the three areas represented in this figure.
The researcher gathered administrator comments and perceptions from a variety of areas throughout the room. Some overarching themes discussed throughout the room and later in whole group discussion included:

- There is not as much kid-to-kid talk (mathematical discourse), but math talk. Teachers were incorporating math talk, but it was not student generated.

- There is increased use of real-world examples with visuals, artifacts, and manipulatives to support the mathematics.

- Teachers are struggling to balance small and large group instruction and administrators are challenged to insist teachers abandon old teaching ways in order to implement the new curriculum with fidelity.

These three overarching themes identified by administrators after this initial homework observation were interesting in that they represent two of the three district mathematics focus areas. The first two themes related to math talk and representation of
mathematics directly align to the mathematical process standards. The last theme regarding the change in structure relates to the new look of the curriculum that administrators and teachers were all becoming familiar with.

During the whole group debriefing, one administrator offered to share her experience using a specific “Look For” document she received from an optional curriculum training. The document, which she received from a trainer from the adopted curriculum, was directly aligned to the new curriculum and provided specific student and teacher actions to focus her observation. She shared that with the curriculum being new, the pressure of evaluation was a struggle. In trying this document, it seemed to take the evaluation aspect out for both her teacher and herself as the observer and it became a learning experience for them both. She stated that “the tool really helped me learn more about the curriculum” and that she “liked how explicit the tool was”. She also stated that while she did not see the entire lesson, it still offered a way to provide valuable feedback on the math she did see in the hopes that if “we reinforce those things, we will see that repetition.”

Listening to this administrator share her experience utilizing the “Look For” tool during her observation created a buzz in the room. Her excitement about how the “Look For” tool had helped her provide quality mathematics feedback and also helped her to better understand the curriculum herself hit a nerve in the room. District leader and the researcher took note of this as a potential for future PD.

After allowing administrators to share their observation homework experiences in small and whole group settings, a video recorded from a 1st grade elementary classroom within the district was played to demonstrate a new facet of the curriculum, student-led daily math routines. The K-5 Mathematics Curriculum Facilitator prefaced the video by
stating that the teacher in the classroom had previously used the new curriculum in her old district and therefore, was more comfortable and confident than the average teacher in releasing the instruction to students. After watching a video of this young child leading her class confidently through the daily math routine, administrators conversed with their tables about their impressions. Common themes from their discussion included:

- Most of their teachers were not comfortable enough to be at this point.
- Video was impactful in that it was from a district, Title I school.
- Administrators requested to use the video back in their schools as a model.

The video served as a model for administrators to see just how student-led the daily math routine was designed to be and how they could encourage and lead teachers back in their buildings. Administrators seemed surprised to see the high level of student leadership at 1st grade and also observed how the teacher’s voice was only heard briefly at one point. This appeared to be very different from what most were experiencing in their own buildings. Observing this exemplar in September to share with staff had the potential to make early interventions and cues for teachers and administrators on the level of student-led instruction that was expected structurally from the new curriculum.

Near the end of the meeting, administrators were asked to walk around the room to analyze survey data the district collected from teachers in August pertaining to the three focus areas (content standards, process standards, and curriculum structures) and other district initiative topics needed for the upcoming school year. After completing the gallery walk activity, administrators isolated their findings to two key points 1) teachers were more confident on the surveys on the key areas than they are in real-life, and 2) differentiation is a concern for meeting the needs of all students. With regards to the
differentiation point, teachers were concerned with what resources were available within the curriculum to help those struggling and gifted students and how and when to make them fit into the new curriculum structures.

To close the September administrator curriculum meeting, district leaders assigned the next month’s observation homework assignment to observe 5th grade. Not only were administrators asked to conduct a classroom observation with the same protocols and foci as last month, but they were also encouraged to co-teach or teach a math lesson themselves.

After the curriculum meeting, the district leaders sat down with the researcher to debrief. The DEE stated that there were various levels of instructional leadership at this point in the curriculum adoption process. Although some were “digging in”, others act like it is any other adoption. The DEE continued on that this is the superintendent’s focus. “Math is our FOCUS” for the next two years, so “how can we leverage the time differently to hear more and learn more from others (during PD)?” “I could sense excitement in the administrator’s conversations. Also hesitation and being uncomfortable with instructional leadership.” As the district leaders and the researchers continued, we discussed how much of the small group discussions were management based (length of instruction, master schedule, use of materials). The district leaders discussed how it would be a challenge for administrators to focus on instructional leadership of mathematical best practices and curriculum fidelity if the management and organizational pieces were not addressed first. They discussed that although the homework discussions and the time to talk and reflect seemed valuable, they would spend a bit more time at the next meeting addressing the concerns brought up regarding scheduling, differentiation,
and training. By removing barriers early in the process, they hoped this would expedite their ability to incorporate more mathematically focused instructional leadership as soon as possible.

**October 2016**

District leaders and the researcher once again met prior to the October 2016 administrator curriculum meeting to discuss any administrative PD opportunities which occurred since the September meeting. The district offers intermittent “Lunch & Learn” (L&L) discussions for administrators to attend. Note: These opportunities were not explicitly observed by the researcher. L&L sessions were available to all elementary administrators. They were voluntary and hence, not always attended by the entire population. The district leaders shared that 11 out of 25 head elementary administrators attended the October L&L discussing the Mastery Learning Loop concept of the new curriculum. They described the administrators who chose to attend as “invested in math, but maybe not your top 1/3 of leaders (in power)”. Some of the take-aways they had from the L&L were that a) much of the concerns were not about mathematical practice; but more about the curriculum structures themselves; b) there is a sense of “trust the process” push back from administrators and teachers, but also acceptance; c) administrators (like district leaders) are currently trying to clear away barriers in their buildings regarding the schedule and training; and d) administrators are trying to perpetuate a growth mindset and the continuation of conversations in order to better understand where the staff and teachers are regarding mathematics.

Based on their reflection from the September meeting, district leaders hoped to better leverage conversations from the administrators about their perceptions and
progress during the October meeting. Administrators were seated intentionally by district leaders based on their assessment of their level of implementation level (heterogeneously). They also planned this meeting around more whole group discussion verses small group discussion to hear more comments from the large group.

The K-5 Mathematics Curriculum Facilitator (MCF) led the initial discussion during this meeting. He began by referencing some of the anchor professional development activities from the pre-adoption phase. This included watching a Mathematical Mindset video and referencing their previous book study *Mathematics and the PLC at Work* (Math Solutions). In addition, the MCF reviewed the Mastery Learning Loop covered in the L&L to briefly ensure that all administrators were aware of the philosophy behind not teaching to mastery in each lesson. He reinforced that the program was designed with this structure in mind in order to help administrators, and in turn translate to teachers, to trust that the curriculum would loop back to concepts over and over in diverse, mathematical ways.

From the initial opening topics of the meeting, the topics to be discussed for the majority of the meeting were based on administrator feedback of management challenges of the new mathematics program that they are facing in their buildings. The first of these is the master schedule logistics. Administrators and teachers were feeling the pressure of being behind in the curriculum and struggling. Teachers were complaining that the lessons could not be taught in the curriculum-recommended time frames. District leaders continued to reinforce the Mastery Learning Loop concept and following the suggested pacing. Some administrators did voice that as they were also reinforcing this concept and observed good things coming from conversations with their teachers. The MCF gave
further research based justifications that they administrators could take back to their buildings about the construction of the curricular program. One administrator supported the MCF by stating that the pacing was helping teachers refine their objectives and teach more concisely. Another administrator shared that in the beginning, she allowed teachers to use 75-minutes versus the recommended 60-minute block, but that as time has gone on, they are getting closer to the 60-minute mark on most lessons. A third administrator shared her experience co-teaching a math lesson paying particular attention to the pacing concerns and that she looked forward to teaching another lesson soon. In response to hearing that an administrator had co-taught, another administrator spoke up confessing to the whole group that his pacing had been way off and that he had “spent 20 minutes on something that should have been 5 minutes.” As more administrator’s opened up about their personal experiences with some of their teachers’ concerns, it created more and more dialogue throughout the room.

The MCF elaborated further about insights from district teachers to provide further perspectives of the curriculum change process. First, he shared the advice of a teacher with prior experience with the new curriculum. She stated that there would be a tendency to skip ahead, but to hold tight and do it right and it will be a successful program. Second, the MCF shared how the reflections of the elementary mathematics teacher leadership team within the district. As the bridge between district professional development in mathematics and training teachers at the building level, these teachers provided an important perspective on the curriculum change process at the implementation level. Their group shared that the teachers and buildings seemed to be “getting into a groove” with the new curriculum. Additionally, they shared the
importance of communicating with teachers about the pacing concerns with the new curriculum. They shared that sharing the expectation that students were not expected to master concepts all in one lesson had provided relief to teachers.

The major curricular shift required early accommodation to help teachers get acclimated to the curriculum, however district leaders also communicated to administrators that “guaranteed viable curriculum” was important. At this meeting a John Wooden quote was shared, “The best schools are fundamentally sound.” Teachers have had to reorganize and unlearn many of their prior practices under the direction of administrators emphasizing that the listed curriculum time should be used as a maximum. One administrator stated that teachers are recognizing that “this is system-wide and if I don’t play my part, then it is an issue.”

Lastly, administrators shared their homework experiences observing 5th grade classrooms. They focused their whole group conversation on the organization that district leaders had set forth in the beginning: curriculum structures, mathematical practices, and what areas they needed further information about. Administrators shared that structurally, teachers were struggling with time to prepare and read the 200+ pages of information before chapters. The amount of learning required for teachers as they were teaching in a new way was intense. The researcher noted that administrators were cognizant of the enormity of learning for teachers in preparation, but that they were still representing on surveys that they were confident in their understanding of the curriculum structures. Administrators also commented that they were seeing a variety of mathematics representations, but that in 5th grade the instruction was still very teacher centered. Their main questions for district leaders were regarding differentiation and the role of small
groups in the curriculum and also how teachers were supposed to use quick quizzes. These follow-up topics helped to guide further planning for district leaders in terms of what teachers and leaders were seeking guidance on.

In reflection of the October meeting, the MCF and the DEE shared that after a couple months of being in the curriculum implementation phases, they were starting to get more questions and concerns from administrators. Now that the district elementary schools were fully engulfed in mathematical change, they were beginning to analyze the structures and their perceived effectiveness in district classrooms. The DEE questioned, “How can we figure out what we want to do, and not focus on what we can’t, so that we know what we NEED?” He continued by stating that “we’ve never been asked to lead like this” describing how this curriculum again was unlike others. As a district, there was never such a concentrated focus and investment in one curriculum adoption and change. With mathematics being a continued focus for the following year, we discussed some of the themes of the meeting and what next steps would be.

To start, district leaders reflected back on their broad goal. They wanted these elementary administrators to lead the change and not purely manage. Unfortunately, they recognized that there was a great variety in administrators’ practices in managing change versus leading change. As an example, the DEE shared that one administrator had privately provided kick-back on the suggestion that administrators co-teach the new mathematics curriculum. In contrast, another administrator shared that she felt it was important for her to experience what her teachers were experiencing so that she could help provide more effective feedback. District leaders hoped that by providing opportunities to share insights from different layers of the organization (either vicariously
or personal examples brought up in the meeting), they would be able to help support administrators in their conversations back at their buildings. Looking forward, they wanted to provide more structured practices and opportunities for all administrators to experience which required total participation in instructional leadership for change. Management concerns continued throughout the year, however, district administrators focused future PD on putting structures into place for administrators to more carefully reflect on their leadership of the mathematics change rather than purely the management.

November 2016

November 2016 was a busy month for district mathematics leadership. There were various PD opportunities and invitations to administrators to aid in their leadership of the curriculum adoption change. They included an administrator panel to gather feedback on a mathematics-specific observation tool, an invitation to administrators for individual math discussions/building visits regarding the curriculum implementation, and the regular monthly administrator curriculum meeting. The sections below will detail each of these PD opportunities.

Administrator panel

In early November 2016, district leaders invited a small group of five elementary administrators to serve as a panel to provide feedback on a math-specific observation tool. Based on feedback from an administrator at the September meeting, the use of a math-specific observation tool aligned with the curriculum had not only helped her provide specific feedback, but herself learn more about the curriculum through the process. After hearing that testimony, the MCF and district mathematics teacher leaders began working on a multi-use document to improve elementary mathematics teaching
and learning. For administrators, this document would be used for mathematics observation and not for evaluating teachers. District leaders communicated that the purpose of the meeting was to (1) provide feedback on the tool while still in the design phase (formatting suggestions); (2) brainstorm possible uses for administrators; and (3) brainstorm possible uses for teachers.

Administrators shared that they believed the resource would help all stakeholders speak a common language for what quality mathematics teaching and learning should look like in the district’s elementary classrooms. Below are additional comments from administrators after reviewing the district-created mathematics observation tool:

- The observational tool would be a great resource for instructional coaching in providing “specific goals and questions.”
- “Reflective questions will be the most helpful…Am I doing something to make them a better instructor?”
- “What can I really say to push those really good teachers to get better?”
- “Serves a purpose to look intentionally at a particular component of teaching.”
- “It’s easy to get distracted by what’s going on the board if you don’t go in intentionally.”
- “As a new evaluator and with new curriculum, it would help me.”
- “We are all looking for the same things.”
- “Bank of questions to narrow the focus…I’m just going to focus on this tab or category in a tab.”
- “We are struggling with getting our mind around math and mastering it ourselves.”
District leaders and the researcher debriefed about the administrator’s comments and the future use of the observational tool. All parties recognized that the conversation surrounding the observation tool was highly focused on instructional leadership. The conversation was not centered on teachers or implementation struggles, but how the tool would help administrators provide more appropriate, specific, and valuable feedback for teachers and themselves as administrators. Through their comments, they shared the vulnerability that the district leaders anticipated administrators were feeling. What should quality math instruction look like now? When observing, what should we be looking for? Are we looking for and reinforcing the same things? Many of these questions were embedded in their comments and provided insight to the potential of this observation tool to help administrators lead and improve mathematics teaching and learning. District leaders discussed integrating the use of the observational tool into future curriculum meetings and homework assignments to gather additional feedback.

*Individual invitation for building discussion/visit*

On Wednesday, November 16, 2016, the MCF and DEE extended an invitation to all elementary administrators for individual discussions and/or building visits. Knowing that individual administrators and buildings had different needs, district leaders wanted to ensure that common messages were being communicated from the central office and that the individual needs of buildings and administrators were being met pertaining to the new mathematics curriculum adoption. The invitation to participate in either a discussion or building visit with district leaders was emailed to all elementary administrators (Appendix E). Eleven out of twenty-five elementary administrators requested a meeting with district leaders at their building to discuss the new mathematics curriculum. A
screencast was created to debrief main topics of interest covered in building discussions. This step ensured that all administrators had access to pertinent information if they were unable to meet face-to-face with district leaders for the mathematics discussion.

**November administrator curriculum meeting**

The November administrator curriculum meeting began with a video of Matt Larson, current president of NCTM. In this short clip, Dr. Larson discussed the evolution of mathematics education over the last century and the current emphasis on “balancing the equation”. The video stressed the importance of equal emphasis on conceptual understanding and procedural fluency in mathematics. The MCF debriefed the video with emphasis on the line “teaching is a cultural activity” and how changing to the new curriculum has introduced new teaching and learning practices to the district’s elementary mathematics vision. Changing the culture of a discipline is hard work and this introductory video not only explained the rationale, but also the importance of this cultural shift in math education.

After the video discussion, administrators were prompted to collaborate at their tables about their 1st grade observation homework prior to whole group debriefing. Again, prompts related to the structures of the new curriculum, the mathematical practices observed, and a description of the follow-up conversations with teachers. The researcher walked around the room capturing notes from four administrator conversation pairs.

In two of the four conversations, the conversation centered on the curriculum structures. Within the curriculum structures, the administrators mainly brought up concerns about the students’ ability to lead the daily routines as the curriculum stated and
how the physical set-up of the classroom mattered. In the latter example, the administrator had taught the mathematics lesson while the classroom teacher pulled a small group. After teaching, she questioned whether the classroom was set up for mathematics and creating opportunities for movement. She explained that this was a great conversation to have with the teacher and also to consider for her staff. This realization through the experience of teaching mathematics with the new curriculum appeared to be an eye-opening experience for the administrator.

In the other two conversations, the administrators focused more on the mathematical practices related to communication and student discourse. One administrator stated, “I thought that was impressive”, when sharing her experience observing students discussing specific mathematics strategies they are using such as using number pairs to add. Again, another administrator had engaged in teaching a mathematics lesson and found that the curriculum was extremely language-based and that there was a lot of differentiation needed to reach all students.

In small groups the administrators were very willing to discuss and share their observations, experiences, and impressions of the curriculum. As the MCF moved to a whole group discussion, the researcher observed very little participation and willingness to share out. In the small sample of four partner conversations, there were many insights and key learnings shared, but few of those experiences were shared to the larger group. While the pairs observed had shared both positive and negative experiences with the curriculum, in the large group, only positive praise for the curriculum was shared. Topics discussed whole group included that teachers were improving on their skills in facilitating mathematical discourse, story problems looked very different from the traditional
methods used in the past, and that student leadership responsibilities were not consistent from classroom to classroom or kid-to-kid.

After the small and whole group discussion of administrators’ 1st grade observations, district leaders formally introduced and shared a draft version of the Effective Mathematics Practices (EMP) Tool (Appendix F) the district created observation tool for elementary mathematics. Prior to distributing the EMP tool, administrators were directed to divide a sheet of paper into two parts and label them “student actions” and “teacher actions”. Round one consisted of administrators watching a short clip of a district elementary teacher teaching a math lesson. Administrators were instructed to write down observations based on what students and teachers were doing. The researcher joined a group of administrators as they shared what they observed. Their conversation revolved around how the teacher had good control of the lesson, but could improve questioning and getting students involved. The researcher noted that most of the comments were critical and not mathematics specific. One administrator spoke up about how she desired to know more about the curriculum and stated that “there’s nothing like having done it yourself. Maybe I should go in and teach each grade level in January so I’m more comfortable.”

For round two of the video observation, administrators were given the EMP tool and asked to watch the same video clip again, but with a specific lens. They were told to reference one of the seven categories outlined in the document which were related to both general instructional structures (instructional routines, classroom environment, and monitoring learning/assessment) and specific mathematical practices (solves problems/math sense-making, modeling and representing/math drawing,
communication/math explaining, and make connections/math structure). Each of the seven categories had a list of student and teacher look for statements and reflective questions. After having small group discussions on what their table observed in their specifically assigned category, they debriefed whole group. One administrator brought up classroom environment immediately and began discussing the challenges she was observing with intermediate grades and engagement. She expressed the need for teachers in grades 3-5 to utilize more of the movement structures she had observed primary grades. This statement prompted a conversation about more of the general instructional structures. Another administrator spoke up and stated that “we generally look for the same things all the time. It (EMP tool) helped narrow the focus.” From this comment, the MCF further explained that “the purpose of the tool is so that everyone has a common understanding of what good mathematics learning looks like in a (district name) elementary classroom.” This further emphasized that with vast changes in the way teaching and learning was looking in their buildings, administrators needed to have a clear and common understanding of what they should be seeing, supporting, and reinforcing with teachers instructionally. Administrators were asked to utilize this tool (in draft form) to complete their homework for the next meeting. During their 4th grade observations, administrators were to focus on one of the categories from the document and bring an artifact back to share with their peers.

While observing the initial impressions of the EMP tool on the administrators, the researcher noted that many were a bit overwhelmed by the multi-page document. Having the opportunity to work with the resource during the next month as they observed classrooms would be important for district leaders to assess the use and feedback
administrators brought back during the next curriculum meeting. With the first semester of the curriculum adoption nearly complete, district leaders were examining the direction of professional development based on the needs of teachers and administrators in the district. With many of the structural and management aspects of the mathematics curriculum change out in the open and being addressed, district leaders were optimistic about the opportunity to continue to motivate the administrators as instructional leaders during the 2nd semester.

**Significant outcome(s) of early adoption phase PD related to self-efficacy**

*Opportunity for collaborative, honest dialogue*

The first significant outcome identified by the researcher was the opportunity for administrators to collaborate with colleagues during monthly administrative meetings in honest, reflective dialogue about the mathematics curriculum changes in the district. Often the sole administrator in an elementary building, the position could feel isolating. A benefit of professional learning communities (PLCs) is the opportunity to discuss practices, confront challenges, and ask questions. PLCs are most effective when developed as collaborative cultures focused on good ideas, positive results, and gathering the viewpoints of all individuals, including dissenters (McLaughlin & Talbert, 2001). Through various conversations and interactions observed, three sources of self-efficacy surfaced.

First, by discussing scenarios and management strategies with other administrators, individuals benefited from the opportunity to learn vicariously through others experiences. Social comparison can be powerful in changing the beliefs of individuals and their ability to complete a task, such as leadership in this case. When
administrators observe someone with similar experiences, education, and roles, there is a feeling that “if he/she can do it, then maybe I can too.”

This directly leads to a second self-efficacy source evident during opportunities when administrators had time for honest dialogue. As administrators shared ideas, they were able to encourage, provide feedback, and problem solve through situations related to their experiences as instructional leaders. Although this can also backfire if administrators collectively agree that something is not working or possible, overall with the attention and PD the district has invested in growth mindset created a positive culture among administrators. The overall attitude of administrators during monthly meetings was overwhelmingly that of problem solving and not purely complaining during the early adoption phase.

District leaders and the researcher observed trends in administrators’ dialogue during monthly meetings which influenced the organization of the PD meetings as the early adoption phase progressed. Overall administrators were less likely to talk full group and often when they did, they were overwhelmingly positive. Major challenges in leadership were rarely shared whole group unless they were management based. In contrast, administrators were much more critical or negative with regards to the curriculum integration in small groups. As district leaders and the researcher discussed this observation, it created an acute awareness for future PD planning in order to balance conversations in a productive way. Without honest dialogue, district leaders might lack the information necessary to plan for meaningful PD. The purposefully balanced design of PD opportunities in small and large group discussion structures ensured that feedback was as accurate and honest as possible.
This balance also had the potential to impact the third source of self-efficacy of individuals as they work to enact change. Along with learning vicariously from other administrators and receiving encouragement and feedback, the attention to the needs of administrators during the monthly curriculum meetings could impact their emotional state and perceptions of progress and effectiveness. An individual’s mood affects the way he/she interprets and evaluates events and information (Kavanagh & Bower, 1985). By providing a safe environment for honest dialogue, administrators could hear similar experience, challenges, and victories related to the curriculum change which could help them feel less isolated and effective.

**Homework for reflective observation**

The second significant outcome of the early adoption phase was the opportunities for administrators to be reflective observers of the new curriculum and mathematics teaching and learning practices throughout the district. This occurred systematically through the integration of specific observation homework for administrators each month. Early on, district leaders stressed that they wanted to integrate the new curriculum as-intended and with fidelity, they also did not want to “put their heads down” and not keep their perspective on the larger scope of quality mathematics instruction. Their homework prompts and design were intended to not only look at the curricular structures, but also highly emphasis best mathematics practices and processes from both the teacher and student perspectives regardless of curriculum product.

The four self-efficacy sources evident to the researcher throughout the instructional leadership homework/observation process were performance outcomes, vicarious experiences, verbal persuasion/feedback/encouragement, and
psychological/emotional state. This process included both the task of observing and debriefing with teachers and also the reflective conversations that followed with fellow administrators.

The first source self-efficacy, performance outcomes, was observed in the administrator’s opportunity to co-plan, co-teach, or even fully teach a mathematics lesson from the new curriculum. Administrators were hearing and observing instructional challenges from teachers such as pacing, engagement, and misconceptions about some of the new curricular practices. In fact, many administrators voiced their concern about their lack of experience with the curriculum. In response to the question “As an instructional leader during a curriculum reform process, what has been your greatest challenge in leading teachers through this change?” many administrators expressed their discomfort with their background knowledge or familiarity with the curriculum they were expected to encourage, promote, and lead. Some of their responses are below:

- “I have not actually taught this curriculum for a period of time like I had with prior curriculum.”
- “It is new to me as it is new to the teachers.”
- “Not being a step ahead of the learning but more alongside or behind teachers’ learning.”
- “At times, it has felt like the blind leading the blind. My most important job has been to continue to educate myself about the curriculum and the new mathematical processes involved.”

Knowing that these were concerns of the administrators, providing PD opportunities and encouragement for administrators to experience teaching the new
curriculum was imperative. As research has supported, an important aspect of being a transformational leader during a time of change is the ability to have idealized influence where administrators are able to model behaviors and desires of their teachers (Marzano, et al., 2005). In experiencing the challenges of teaching the new math curriculum personally, the hope is that administrators felt more confident leading teachers through the problem solving aspects as they experienced similar struggles. An example of this was shared by an administrator while discussing their experience co-teaching and debriefing with a teacher. After teaching a math lesson and struggling herself on pacing, the administrator offered to help time the teacher during math so that she would stick to the recommended times and adjust on the spot with cues from the administrator.

Administrators also had access to vicarious learning experiences during the homework opportunities offered during their PD experiences. Although co-teaching/teaching a math lesson was encouraged, the researcher still documented pushback from some administrators with statements like “I’m not teaching…Oh God no!” still audible at the January administrator meeting. While some administrators did not have first-hand experiences teaching the new math curriculum, they did have access to conversations about what lessons were learned through the process. As administrators shared their positive and challenging experiences to small groups and the whole group, these became opportunities for all administrators gain a better grasp on the reform taking place in their buildings and provided examples of instructional leadership from peers.

Along with personal experiences and learning from others, administrators were also given encouragement, feedback, and persuaded to “stay-the-course” by their peers and district leaders through the homework PD experiences. Each month, district leaders were
attentive to the administrative concerns and issues they noted from prior curriculum meetings and individual discussions/communication. Being timely about management issues early was a goal for district leaders as they hoped to quickly address questions and concerns so that administrators would progress from managers to leaders in the mathematics reform process. District leaders revisited their previous PD related to Carol Dweck’s growth mindset work (Dweck, 2016) to encourage administrators to model a positive, learner-focused attitude during the curriculum change process.

Lastly, attention to administrator’s psychological and emotional state, the last source of self-efficacy, was evident throughout this entire stage of PD experiences. District leaders wanted administrators to know they were being heard and the reform process was not perceived by the district to be an easy process. They emphasized multiple times that change would take time and that there would be growing pains. Additionally, much of the PD in this first stage was related to the management concerns that seemed to be weighing most heavily on the building administrators. Ignoring the challenges teachers, resource teachers, administrators, and parents were facing during the curriculum reform in order to focus on what the district seemed important might have been an easy option. Instead district leaders planned for intentional fluidity in their monthly administrator meetings. While long term goals and a vision of leading the change was in sight, district leaders like the DEE and MCF adjusted accordingly to meet the needs and concerns of the building-level leaders. Administrators shared verbal and written communication which provided evidence of their appreciation. One administrator thanked the MCF for “the opportunity to contact (him) as needed with questions and
concerns” and for his “willingness to come out to bring materials to our buildings or anything we needed.”

An example of this intentional fluidity was never more visible than with the introduction of the EMP tool as an instructional observational resource for administrators to use specifically for mathematics. The implementation of a district-created resource specific to mathematics was not in the original plans for administrative PD, but for district math coaches, instructional facilitators, and peer-to-peer teacher use. When a curriculum sponsored trainer spoke with teachers and utilized a similar math-specific observation tool, a couple administrators were present. One administrator in particular took it upon herself to try the observation tool out on her own during her initial observational “homework” assignment. In both her small group and then again to the whole group, this administrator advocated for all of her peers to use the resource not only to provide more math-specific feedback, but also to better understand the curriculum through the process. This one conversation at an early administrative curriculum meeting introduced another avenue for district leaders to promote the instructional leadership growth of their administrators in mathematics. The goal was to make the resource, the EMP tool, a multi-use document, however it was never intended to have as large of a role in the instructional leadership phase soon to follow. As yet another significant outcome, the intentional fluidity of administrative PD allowed district leaders to plan based on the needs and concerns of administrators as they developed during this intense year of elementary mathematics curricular change.
Instructional Leadership Phase PD Timeline

Figure 4.7. Instructional leadership phase PD timeline. The instructional leadership phase timeline of district-led PD occurred between January 2017 and April 2017. Naturalistic inquiry and document analysis were utilized to collect and interpret qualitative data.

Note: Performance Outcomes (Enactive Mastery Experience) = PO; Watching Others/Vicarious Experiences = WO; Verbal Persuasion/Encouragement/Feedback = VP; and (d) Psychological/Emotional state = PE

January 2017

The January administrative curriculum meeting was the first time district leaders and elementary administrators were together since late November. District leaders asked building administrators to utilize the new district-developed Effective Mathematics...
Practices (EMP tool) observation resource during their 4th grade observations. District leaders also requested administrators to bring artifacts of their mathematics observations. The meeting opened with small group discussion on their observation homework in 4th grade. One group was selected randomly to gather comments and feedback from administrators. An administrator asked if anyone from her table had tried teaching the new math curriculum yet. Another administrator responded, “I’m not teaching…Oh God no.” A third administrator in the small group shared her observation and how it turned into a co-teaching opportunity. She noticed the classroom teacher was teaching the mathematics content inaccurately, so she stepped in to help teach a geometry concept involving reflections and shifts. In her reflection of the event, she explained how observing the error and co-teaching provided an opportunity to have dialogue with the classroom teacher about preparation time and careful examination of the new mathematics curriculum materials. She stated, “You can’t just pick this program up and teach it.”

The small group then discussed management issues they were still problem solving through. Two issues that were still prominent were curriculum fidelity and pacing. In regards to pacing, one administrator shared how he was encouraging teachers to stay on schedule with standardized testing looming. Teachers expressed concern about the recommendation based on perceptions of student learning challenges. Administrators shared that it was a fundamental issue with teachers still uncomfortable with not teaching mathematics to mastery like traditional practice. One administrator helped pace a teacher’s lesson by timing each section and then reflecting with the teacher about the actual time and suggested time comparisons. They broke down how the time was used
and the administrator shared that she prompted the teacher with questions like, “What is quick practice?” and “What is the purpose?”

Administrators then discussed how they would manage pacing differently for the second year knowing what they know now. They discussed that while an obvious fix may be to make the mathematics block longer, they also discussed how adding more time next year may be unnecessary due to more familiar vocabulary and routines for teachers and students. One administrator suggested that a pacing guide would be helpful in the future.

Related to pacing, administrators also discussed how intermediate students (grades four and five especially) struggled with engagement. New curriculum structures called for more whole group instruction. Administrators observed that both teachers and students were not yet accustomed to this instructional structure. One administrator suggested that increased support was needed for intermediate teachers to get kids “up and moving” like in the primary grades. To this point, an administrator shared her experience co-teaching and added that “whole group teaching was taking too long in 3rd through 5th grade. She shared her reflection on how teachers could shift their instruction for more individualized instruction during the middle of the lesson. As she finished her comment, she also quickly commented that she did not know how that would work with implementing the curriculum-as-intended with fidelity.

Lastly, administrators discussed the overall impression of mathematics observations in their buildings. One shared that teachers were anxious at the beginning of the year to be observed, but now were requesting more math observations. The researcher noted that the EMP tool was not mentioned in this small group discussion among administrators.
When the group came back together whole group, the MCF reviewed the purpose and construction of the observation resource. He emphasized that the EMP tool was created to simultaneously represent the state mathematics standards, adopted curriculum, and what is known to be best practices in mathematics education. The MCF also shared the different district perspectives, including administrators, who co-constructed and reviewed the EMP tool (still in draft form). He emphasized that the EMP tool was to focus attention on specific areas of mathematics instruction and not to be used in its entirety or as a check-list. Additionally, the resources was a “tool to help us all learn the common language of math in our district” and “help to focus in on specific goals”.

Lastly, the MCF then restated that the goal of utilizing a math-specific observation tool was to “narrow the focus on topics to help refine processes”.

District leaders then encouraged whole group feedback from administrators regarding the EMP tool. Briefly administrators commented and non-verbally shared consensus that the document was “really big”. One administrator suggested that an abridged version might be useful.

At this point, the MCF transitioned to the next stage of the meeting. To highlight the purpose and intended use of the EMP tool, district leaders planned an exercise for administrators to observe a 2nd grade lesson. Directions for the exercise were that administrators were to “observe (the video) through one of the lens in the document”. After viewing the clip, a question was posed, “How might this (observation tool) help me as an instructional leader?”

In small groups, administrators shared the following comments:

- “Help spark conversation”
• “Like how it’s specifically about just MATH…not general instruction”
• “That one-page check-list is way easier to use (than this)”
• “I agree…a 1-pager would get utilized more”
• “This resource would be way easier with a video”
• “I can’t hand this whole document to a teacher”
• “Reflective questions would be most helpful”

As a whole group, administrators shared the following comments:
• “Front structures (instructional routines and classroom environment) are baseline before the others could happen”
• “Reflection questions help since we are new to this tool”

In reflection of this meeting and the final exercise the EMP tool, the researcher noted that administrators provided minimal constructive or negative feedback whole group, but were much more critical in their small groups. Following the meeting, the researcher and MCF met to discuss the feedback gathered during the small group discussions. During the meeting/PD debrief, they discussed further opportunities for administrators to experience using the EMP tool as intended. Both the MCF and researcher still observed administrator misconceptions regarding the purpose and use of the document even though the MCF had stated those explicitly during the meeting. The MCF stated that district leaders planned to implement instructional rounds in the coming months and that mathematics might be the right place for that professional development experience for administrators. The MCF shared that the new curriculum and professional development model might be a lot to handle, it may provide an opportunity to further
“drive home” a couple different mathematics initiatives (EMP tool and instructional leadership).

**February 2017**

The February elementary curriculum meeting once again began with small group administrator discussions about observational homework. There was again an expectation that administrators used the EMP tool as a guide for their Kindergarten mathematics observation. The researcher randomly selected a small group of administrators to document their conversation.

The first administrator to share discussed that he focused on the first page of the EMP tool (learning environment) and commented that it was a normal day and he “saw the same thing I see usually”. He also commented that “it (the EMP tool) was a lot of reading.” He continued on that “it felt overwhelming (using the tool) because it was flipping through. Once we get to know it maybe it will be easier”. The researcher noted that this was a misconception of the intended use of the EMP tool.

Another administrator commented, “I think you have to pick one category”. A third administrator followed, “We each took a category and that seemed to work. It’s a good tool. It’s like your evaluation. You don’t look at all of it. You pick a category”.

As the researcher and MCF roamed around the room observing and documenting small group conversations, the researcher shared the notes immediately with the MCF and he agreed he heard similar comments. Due to this, he ended the small group conversation short and brought administrators back to a whole group conversation. The MCF addressed the overwhelming nature of the EMP “observation tool” and the need to focus on a particular category to make it meaningful.
Administrators then shared whole group comments about their experiences using the EMP tool. One administrator stated he liked the reflective questions and used them in a formal evaluation to drive conversation about mathematics instruction. The administrator said his teacher liked the feedback and used it to reflect for the future. Another administrator shared a comment about the overall tone of the EMP document. She reflected, “When I used the questions I realized they all assume that whatever you are looking for is not happening”. She explained that the tool included deficit language and felt as if it were constructed more for below-level teachers. A final comment was made by an administrator stating that “teachers could use this”.

The researcher made an observational note at this point in the meeting. Although the EMP tool was originally composed as a multi-use document throughout the district (teachers, instructional coaches, administrators), administrators made many comments about the usability for teachers. Comments like “teachers could use this” or “I can’t hand this whole document to a teacher” projected their perception that this document was more for teacher use. Given their experiences to that point with the EMP observation tool, many administrators were not yet seeing the instructional leadership possibilities for their own growth.

At this point in the monthly curriculum meeting, the direction shifted to a new professional development model called Instructional Rounds (rounds). District leaders included the DEE and MCF, as well as the district’s Director of Staff Development & Instructional Improvement (DSD) co-facilitated the introduction of rounds to administrators. District leaders projected and explained a collection of slides with the
background, purpose, goals, format, and long-range plans for rounds as PD in the district (Appendix G).

The DEE defined instructional rounds as “an opportunity to learn and apply our knowledge as a community of learners in an effort to systematically enhance the learning experience for students”. The overarching goal of rounds was to “support systems of instructional improvement at scale”. As the DEE elaborated on the use of rounds as PD for administrators, he stated,

_We (district leaders) want to support your learning and help you to support the mathematics back in your building. We want you to learn more about the mathematical instructional practices so that you can increase your capacity to be an instructional leader. We want to be able to speak a common language and learn together so we can have a better idea of what good mathematics teaching and learning looks like collectively. We want everyone learning about the same effective math practices. We want this to be about the instructional leaders learning about the process…this is not about the teacher and the focus is on US as leaders._

The DEE then provided administrators with the long-range plan for rounds as PD in the district. He stressed that this year the focus was to become familiar with the observation tool (EMP tool), develop a deeper understanding of mathematical best practices in tier 1 instruction, and experience rounds. He articulated that a long-term goal is for rounds to be used for teacher professional development, but emphasized that the current goal was on administrators.
The MCF then shared the theoretical foundations of implementing rounds. Marzano’s *Phases of Learning a New Strategy* was shown to further explain how administrators as instructional leaders were the focus of the PD in learning about the rounds process. Then the DSD provided a chart to clearly show what the district envisioned rounds to be and also what they were not intended to be (see Figure 4.8).

![Instructional Rounds chart](image)

*Figure 4.8. District standards on instructional rounds’ purpose and use. At the February 2017 curriculum meeting, district leaders presented and discussed the vision, process, and structure of instructional rounds to elementary administrators.*

The district’s framework and organization of rounds was based on the book *Instructional Rounds in Education* (City, Elmore, Fiarman, & Teitel, 2009). The DSD explained the main components of the rounds process including the “problem of practice”, pre- and post- observation process, and logistics of the experience. For the initial rounds experience, the district chose the problem of practice to be “Communication in Mathematics”. While the DSD explained that the problem of practice
was normally chosen by the participants, district leadership chose the instructional focus so that the process of rounds would be more streamlined for administrators. Along with providing the problem of practice, the district also modified the involvement of teachers in the rounds process. While normally involved in the debriefing process, district leaders chose to exclude the rounds teachers from post-conversations in order to center the focus the PD on instructional leadership practices.

In closing, district leaders reiterated the purpose and goals of the upcoming four rounds opportunities being offered for elementary administrators. The also welcomed any questions or concerns. Administrators did not pose any questions or concerns at that time.

To close the meeting, one elementary administrator was asked to share a new instructional leadership practice being utilized in her building. She explained how her school was utilizing a technological tool called SeeSaw to help her teachers learn and grow from each other. She connected the conversation of instructional rounds for teachers, but discussed the logistical and funding issues related to taking teachers out of classrooms for learning experiences. Her solution was what she called “Instructional Snippets” or “Kidsnippets”. Teachers recorded themselves teaching mathematics and brought the videos to their professional learning community conversations the same week. Using the EMP tool the administrator placed on each table, groups of teachers viewed their videos with grade-level team members. The administrator stressed the importance of teaming the teachers with comfortable teacher-peers for video review and emphasizing that conversations revolve around the robust EMP reflective questions and focus on skills rather than the person.
After watching the videos and having mathematical conversations driven by the EMP tool, administrators then regrouped with other grade level/subject area teachers to reflect on what they learned from the process of “Instructional Snippets”. As a leader, the administrator shared a couple key take-aways. First, she felt that facilitating the structured conversation utilizing the EMP tool introduced teachers to some of the reflective questions they could be asking themselves day-to-day. Second, the administrator learned that as a school, teachers needed and wanted to hear more about whole group engagement strategies. As an instructional leader, she felt this was important for topics of instructional need to surface from authentic experiences verses her guessing what support or guidance her staff needed. Third, while the observation of the skills on the video was not evaluative, she learned as an administrator that the levels of teacher willingness to participate and grow reflected on their professionalism of her staff. This experience gave her the opportunity to observe the individual levels of engagement in professional learning of her teachers and that is an evaluative perspective she needed to observe.

**Instructional rounds- Early March 2017**

The district organized four rounds experiences at district elementary buildings from March 2, 2017 to March 16, 2017. Four administrators volunteered to host the PD experiences and other administrators were given the option to select one of the rounds sites that worked best for their schedules. While the rounds PD experiences were available and recommended to all elementary administrators, participation was not required. 92 percent (35/38) of the district’s elementary administrator population
participated voluntarily in the rounds process. One administrator served as both a host and participant.

The MCF facilitated the overall rounds experience at each building. Additional district leadership personnel, including but not limited to the DEE and DSD, facilitated the smaller breakout groups later used during the observational rotations. The MCF guided administrators through a structured pre-observation conference (Appendix H). The purpose of the pre-observation conference was to set clear, standardized protocols for the experience, reiterate the problem of practice (communication in mathematics), allow time for the host administrator to give context to the classrooms and teachers the group would be observing, and efficiently transition to the rounds rotation. The rounds experience included three 15-minute mathematics observations. Each administrator was given a Instructional Rounds form (Appendix I) with the problem of practice listed at the top, designated areas for document both student and teacher actions related to the problem of practice, and an area for questions and next steps notes. Lastly, administrators were only given the communication/math explaining portion of the EMP tool for use during the observations. District leaders intentionally removed all other EMP tool sections and reflective questions to isolate administrators focus on the problem of practice mathematical practice.

After returning from the classroom observation rotations, the MCF once again led administrators through another structured conference, this time for a post-observation (Appendix J). First, administrators reviewed their own notes to identify key observations or themes among the three classroom visits. Second, administrators were prompted to collaborate with their table group and discuss any common themes or observations.
Third, each small group shared their common theme with the large group and discussed possible next steps for administrators given the common theme(s) discussed.

The researcher observed and documented one of the four rounds experiences. At that rounds session, administrators recognized that student actions were minimal compared to teacher actions. They were challenged to document or identify student actions from the EMP observation tool and that was a significant finding to them as an area of improvement. Overall, administrators felt that instructional strengths were in asking purposeful questions and using mathematical language accurately.

As a group, administrators then brainstormed responses to the question “What would be next steps for you (the principal)?” Administrators from this session organized the following list of next steps as instructional leaders:

1) Question teachers about what strategies they are utilizing to engage students
2) Ask reflective questions about student actions – focus on being “kid-centered”
3) Create challenging sentence frames for teachers to use to promote more student talk
4) Revisit prior mathematics PD (e.g. math moves) to examine places those ideas might fit in the new curriculum

Administrators made two additional comments following this particular rounds which seemed noteworthy. One administrator commented that she liked the observation tool was broken apart. This signified to the researcher that she had not previously used the tool in this way. Another administrator commented on the variety of teaching that could be observed depending on the section of the lesson being taught. “I’m coming to realize that since MX, I have to spend a longer amount of time on walk-
throughs…coming in at different parts of the lesson impacts what you see.” This comment signified a realization that administrator prompts and questioning would be highly dependent on the piece of the lesson observed. Without the structure of rounds, district leaders would likely be unaware of administrator comments and realizations such as these examples.

In reflection of the experience, the researcher noted that administrators were focused on the rounds process and next steps moving forward based on their observations. Rounds were efficiently structured to maximize the experience and also to ensure the four rounds opportunities were similar in organization.

March 2017

Following the rounds PD experiences in early March 2017, administrators and district leaders met to debrief the experience at the next monthly curriculum meeting. The MCF and DSD facilitated and organized the conversation regarding the rounds process. District leaders envisioned rounds would be more broadly introduced to district leaders and teachers. Therefore, leaders wanted the input of the elementary administrator pilot group to enhance the rounds process in the future.

Administrators were seated in small groups and provided the following prompts to consider with their groups related to the rounds process:

1) What did we learn?

2) What were some next steps you walked away with?

3) What are some pieces of information or next steps we need to consider at the district level?

4) If you did not attend a round, what are some things you would like to know?
5) What did you think of the structure?

A group of administrators was chosen at random to observe their experiences and conversation about rounds. The group was made up of three head building administrators who all attended and/or hosted an rounds experience. One administrator both hosted and attended as a participant at another elementary building. One of the administrators quickly asked the host administrator how she chose the teachers in her building who taught during rounds. The host administrator stated that she purposefully did not choose a building-level mathematics teacher leader. She felt that those teachers are often utilized for other observation experiences and so she instead chose teachers she knew would be comfortable having guests come into their classrooms.

Administrators then attended to the first prompt, “What did you learn?” The first administrator stated, “I feel like I learned so much. I was surprised. Math conversations are looking more natural. It’s more natural and comfortable (for teachers) to carry on a conversation.” Another administrator added, “Teachers look more comfortable leading think alouds.” The host administrator stated, “It really helped you see where teachers are still uncomfortable, but they are trying…they are asking safe-questions.”

The second prompt asked for next steps for administrators. One administrator added that she and her administrative intern had already started planning for staff development activities for next year. She added that instructional rounds would be a great way to do baseline data analysis with observations. She gave the example about how rounds provided opportunities to have data-driven conversations with her staff, “Here are the strengths of our building and here is what we need to work on. We saw this (practice) in 75 percent of our math observations.”
One administrator shared a number of ideas that stemmed from the rounds experience and use of the EMP observational tool. First, she stated that using the observational (EMP tool) helped her see how she could break her professional development calendar into sections based on the sections of the resource (mathematical practices). She intended to choose a section of the EMP tool for the end of the year to pilot her idea. Second, she thought adding reflection questions from the EMP tool to her weekly newsletter to teachers would help bring the practices and reflective thinking to the forefront. She went on to brainstorm ways that she could reward teachers trying out practices and reflecting on their own instructional learning.

Another administrator wanted the rounds experience to be available to teachers, but hesitated when thinking about the time and funding constraints. Additionally, “the heart of the experience is in the conversation, not just the observation. Makes me think about having peer observations in pairs versus solo so that they (teachers) can reflect about the experience.”

While this small group of administrators discussed highlights of the rounds model and observational tool, such as how they both fit all of their school models (traditional, Montessori), they also shared concerns. They discussed how they needed to continue looking at what the data was saying for future PD. One administrator commented, “We’ve really committed to math this year and all of our PLCs and PD are about math. I’ve seen guided reading not as strong…what about everything else?” They catch they discussed in supporting their teachers is addressing the instructional challenges earlier rather than later. With different mathematical teaching and learning practices embedded
in the new curriculum, “We don’t want to create bad habits…we want to fix it NOW”,
one administrator boldly stated.

Small groups documented rounds administrative feedback on a Google Document
(Appendix K) so district leaders could revisit each conversation in more depth.
Administrators were also asked to share a few whole group comments for the good of the
group. One administrator spoke up, “They need to provide similar staff development for
teachers.” Knowing that there would be obstacles to implementing this on the teacher
level, administrators started sharing out possible modifications to make rounds concepts
work system-wide. They discussed using technology and recording teaching and also
including teachers in the debriefing process. Final comments by administrators in the
whole group setting included the following:

- “On paper it seemed like a small amount of time, but the problem of
  practice helped. Just the right amount of time for all involved.”
- “Group discussion afterward was REALLY powerful.”
- “I liked having one section of the observational tool…last time I used the
  whole thing!”
- “I liked the teacher action and student action sections.”
- “Admin. Intern like having something to look at…it helped give
  structure.”

Transitioning from the rounds discussion, the MCF concluded the March meeting
with a discussion about district support to help teachers struggling with mathematical
extension activities for high-ability learners. The district had gathered data from building-
level curriculum facilitators, teachers, and administrators and the MCF shared
preliminary plans to address the extension concerns. One administrator shared her experiences with how growth assessment data was prompting her teachers to ask for more district support and resources. She shared, “Data has been discouraging for teachers regarding the top kids. We are not giving them max levels of standards.” She called for a balanced approach of mathematical teaching so that the curriculum could be modified as needed to meet the needs of all students, including those who quickly grasp the spiraling material.

While there were no major solutions to the issues discussed at the end of the March meeting, the attention to the top provided administrators with knowledge that district leaders were being attentive to mathematics and curricular concerns coming from the buildings. Lastly, the MCF invited all administrators to the summer materials training. The district would receive an updated version of the new curriculum for fall 2017. While not required to attend, administrators could attend required teacher material training opportunities to be more informed of the updates and modifications within the new version.

**Significant outcome(s) of instructional leadership phase related to self-efficacy**

*Practice drives purpose*

The first significant outcome identified during the instructional leadership phase was the district’s repeated efforts to drive the district’s mathematics and leadership visions. In terms of mathematics, the district believes that “equipping teaching professionals with the instructional tools and learning experiences to foster rigorous, effective mathematics learning is worth the investment” (MPS, 2015, pg. 3). The district
defines leadership as “the art and science of inspiring others toward a common mission through collaborative relationships characterized by integrity, humility, resiliency, and commitment to empowering others to reach their highest potential” (MPS, 2013, pg. 2). District leadership (including the DEE, MCF, and DSD in particular) were determined to create experiences for administrators that drove the district’s instructional vision for mathematics forward.

The researcher identified two sources of self-efficacy for administrative instructional leadership related to this significant outcome. The first self-efficacy source was the opportunity for administrators to have mastery experiences using the EMP tool. As the professional development of administrators progressed throughout the adoption year, district leaders saw a need for an observation resource to help bridge the theory of mathematical instructional leadership to practice. Administrators who used a mathematics-focused observation tool (prior to the creation of the district’s EMP tool) shared how it not only improved the quality of their feedback to teachers, but also helped their understanding of the curriculum. Translating the vision and intended use of the EMP tool proved to be a challenge for district leaders. Regarding the intended use of the EMP observation tool, district leaders gave explicit directions, provided discussion opportunities, practiced using recorded lessons, assigned observation homework, and invited a peer-administrator to share her experiences utilizing the resource. Throughout these numerous opportunities, administrators still had misconceptions regarding the intended use and purpose of the EMP tool. District leaders utilized the rounds PD, through structured protocol and explicit use of the EMP tool, to not only offer a PD experience, but further solidify other instructional leadership goals as well. After the
rounds experience, administrators had a flood of instructional leadership ideas related to mathematics. They were able to identify numerous next steps for their buildings and teachers to support mathematics teaching and learning.

Through the mastery experiences opportunities using the EMP tool, district leaders were steadily persuading, encouraging, and providing instructional leadership feedback to administrators, a second source of self-efficacy present. District leaders listened carefully to administrator’s experiences and opinions related to the observation tool. They addressed administrative concerns and misconceptions in the hopes the tool would be a driver of instructional change. Through repeated feedback and encouragement, administrators made observable gains in their ability to successfully use the EMP tool for instructional leadership purposes.

‘Voluntary but inevitable’ principle

The second significant outcome of the instructional leadership phase surfaced from the question, “Who is really leading the change anyway?” As the researcher reflected on this idea, the question itself revealed the culture of change that had been established by district leaders throughout the professional development process. Three self-efficacy sources were predominately present in this significant outcome: (a) performance outcomes, (b) verbal persuasion, encouragement, and feedback (c) attention to psychological and emotional state.

District leaders set high expectations for administrators and asked them to lead in a far different way than any other curriculum adoption. However throughout the mathematics curriculum adoption year, administrator feedback, ideas, and challenges drove the PD designed by district leadership. Walkington (2002), outlined that both ‘top-
down’ and ‘bottom-up’ strategies were important for district leaders to consider during curricular change. The district utilized various levels of leadership to support their mathematics vision including district leadership, administrators, mathematics teacher leaders, and classroom teachers. Administrators arrived at curriculum meetings with homework completed, ideas to share, and concerns to address in the hope district leaders had direction and solutions.

The development of this PD culture lends itself to another source of self-efficacy identified throughout this instructional leadership phase. The ability to create a network of leaders all invested in a common goal of improving mathematics teaching and learning had an impact on the psychological and emotional state of all parties involved. The emotional state of individuals impacts their mood and effort in taking action towards a task (Bandura, 1977). When administrators felt heard and supported by district leaders, this led to a more positive emotional state and therefore, increased participation in activities that influenced their instructional leadership abilities.

Administrators were invited to participate and engage in various instructional leadership tasks throughout this PD phase. District leaders offered individual meetings with building administrators to discuss the mathematics adoption process, opportunities to host or attend rounds, and monthly observation homework to become more familiar with the mathematics curriculum structures and practices. Eleven out of twenty-five head building administrators accepted the invitation to meet individually and face-to-face with district leaders to discuss the mathematics curriculum adoption during this phase. The other building administrators elected to view a screencast of pertinent information created by the MCF. Additionally, ninety-two percent of administrators voluntarily participated
in the rounds process. While data was not collected on observation homework participation, administrators were provided with the opportunity to share experiences monthly and they were observed to be actively engaged in those observations conversations.

Change processes are deemed effective when they result in increased capacity and shared ownership (Munby & Fullan, 2016). Administrators are relatively autonomous school leaders. During this time of curricular change in mathematics, their dedication to change was evident in their voluntarism in professional development opportunities. Munby and Fullan (2016) refer to this concept as the ‘voluntary but inevitable’ principle. Effective and enduring change occur with strong leadership expectations for growth and a clear vision. District leaders, alongside building administrators, created and sustained a positive and productive network for change during the curriculum reform process and PD journey.

**Summary**

Chapter Four chronicled one Midwestern, suburban school district’s PD journey during a time of immense change. Designed for elementary administrators experiencing curriculum reform in mathematics, this chapter detailed the district-led PD experiences executed with the purpose of increasing their instructional leadership capacity. This chapter set out to answer the first sub-research question: *What opportunities have administrators had to develop their self-efficacy in mathematics instructional leadership?*

Along with a timeline and description of PD opportunities throughout the adoption year, significant outcomes were subsequently identified and aligned to Albert Bandura’s (1977) four sources of self-efficacy, the theoretical framework of this study.
The qualitative significant outcome findings were: (a) mindset for change; (b) opportunity for collaborative, honest dialogue; (c) homework for reflective observation; (d) practice drives purpose; and (e) ‘voluntary but inevitable’ principle. A mapping of qualitative findings are illustrated below in Figure 4.9.

Based on the mapping above, each source of self-efficacy was addressed throughout the district-led PD at least two times within the five identified significant outcomes of the study. In response to SRQ1 which asked, “What opportunities have administrators had to develop their self-efficacy in mathematics instructional leadership”, data collection and analysis show that through district-led PD, administrators had numerous opportunities to impact their self-efficacy as instructional leaders.
Chapter 5
Quantitative Analysis & Findings

Introduction

In the quantitative aspect of this concurrent transformative mixed-methods study, a pre- and post- survey was given to elementary school administrators to examine their self-efficacy in the areas of general and mathematics instructional leadership during a time of curriculum reform. This chapter begins with an examination of participant demographics and is followed by data analyses of administrator self-efficacy as measured by the Administrator Self-Efficacy Scale for Mathematics (ASES-M). These quantitative analyses were used to address three of the study’s four sub-research questions (SRQ 2, SRQ 3, and SRQ 4). After each question is summarized and synthesized, the chapter will conclude by addressing the qualitative and quantitative connections and implications in order to answer the overarching research question of this study.

Response rates

The Administrator Self-Efficacy Scale for Mathematics (ASES-M) pre-survey was electronically sent to 38 elementary administrators by the Director of Elementary Education (DEE) on January 17, 2017. Administrators were encouraged to participate and informed the survey would be open for seven days. Each administrator received two email reminders after the initial pre-survey email. The pre-survey responses totaled 24, which resulted in a pre-survey response rate of 63%.

At the end of the semester, the ASES-M post-survey was again electronically sent to all elementary administrators by the DEE on May 22, 2017. Administrators were given 8 days (due to a national holiday) to complete the post-survey and again received two
email reminders. The post-survey responses again totaled 24, which resulted in a post-survey response rate of 63%.

The equivalent response rates for the pre- and post- surveys were purely coincidental. The pre- and post-surveys were not paired and while it is probable that some administrators completed both surveys, there is no way to ensure pairing.

Administrators were invited to voluntarily provide feedback on their professional development experiences related to the district’s mathematics curriculum development process. With district leaders’ work being studied, protecting the anonymity of administrators’ feedback was essential to promote honest responses.

**Demographics of samples**

The final section of the ASES-M pre- and post- surveys was a demographic section. Demographic items included age, gender, current administrative role, years in the school district and in current role, and finally years as a classroom teacher. Background information regarding experience and years of service were gathered to provide further information about the respondents. Table 2 represents demographics for both the pre- and post- surveys represented as percentages of the respective non-paired samples.

Table 2

*Frequencies and Percentages of Respondents on ASES-M Surveys*

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<th>Pre-ASES-M</th>
<th>Post-ASES-M</th>
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<table>
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<td>16.7</td>
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<tr>
<td>Female</td>
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Note: DND = Did not disclose

Sub-research Question 2 (SRQ2)

SRQ2: Did district-provided professional development change administrators’ general instructional leadership self-efficacy?

The second sub-research question in this study examines administrators’ general self-efficacy, measured by the first 10 questions of the ASES-M. Administrators’ responses to questions 1-10 were crafted to measure their instructional leadership self-efficacy (ILse) after receiving district-led PD from January 2017 to May 2017. Internal consistency was also measured using Cronbach’s alpha on the ASES survey data for the collective pre-and post- surveys over Instructional Leadership (questions 1-10) and Mathematics Instructional Leadership (questions 11-28) with coefficients of .872 and
.909 respectively. Measures of estimates of reliability are corresponding due to similar variability and mean values. In further analysis, the inter-item correspondence matrix showed all positive values primarily between 0.2 and .05 indicating a high-level of internal consistency between general and mathematics ILse.

The ASES-M survey utilized a 4-point Likert-type scale with responses ranging from Very Weak Beliefs in My Abilities (1) to Very Strong Beliefs in My Abilities. Descriptive analyses were executed for both the pre- and post- ASES-M. Table 3 illustrates the means and standard deviations of survey items used to represent administrators’ perceptions of their general ILse.
<table>
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<th>Administrators’ Beliefs in their ability to…</th>
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<th>Post-ASES-M (n=24)</th>
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<td>$3.30$</td>
<td>$3.50$</td>
</tr>
<tr>
<td>provide effective modeling for teachers regarding effective teaching and learning practices</td>
<td>$2.96$</td>
<td>$3.33$</td>
</tr>
<tr>
<td>use research on teaching and learning practices to guide strategic planning for accomplishment of school goals</td>
<td>$3.13$</td>
<td>$3.37$</td>
</tr>
<tr>
<td>plan effective activities and experiences which impact teachers' beliefs in their abilities to provide effective teaching and learning activities to their students</td>
<td>$3.17$</td>
<td>$3.37$</td>
</tr>
<tr>
<td>use data collected from teacher observations to inform school-wide efforts for improving teaching and learning</td>
<td>$3.30$</td>
<td>$3.54$</td>
</tr>
<tr>
<td>regularly perform effective observations of teachers</td>
<td>$3.13$</td>
<td>$3.42$</td>
</tr>
<tr>
<td>stay abreast of current best practices for facilitating effective teaching and learning</td>
<td>$3.08$</td>
<td>$3.29$</td>
</tr>
<tr>
<td>communicate needs and goals necessary to enhance effective instructional effectiveness to faculty</td>
<td>$3.26$</td>
<td>$3.33$</td>
</tr>
<tr>
<td>provide experiences that foster and facilitate high levels of teacher motivation towards teaching and learning</td>
<td>$3.13$</td>
<td>$3.37$</td>
</tr>
<tr>
<td>protect instructional time so that effective teaching and learning can take place</td>
<td>$3.21$</td>
<td>$3.47$</td>
</tr>
</tbody>
</table>

*Note.* Statistics based on ASES-M questions 1-10
Analysis for each general ILse survey item was calculated using an independent samples t-test to measure for difference of means on each factor. Because pair-ability could not be ensured between respondents from the pre-survey to post-survey, the more conservative t-test (independent) statistic was used to compare means. Table 4 illustrates the independent samples t-test data for general ILse of elementary administrators.

Table 4

<table>
<thead>
<tr>
<th>Administrators’ Beliefs in their ability to…</th>
<th>Df</th>
<th>t</th>
<th>Sig. (2-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>influence teachers to utilize effective teaching and learning practices</td>
<td>46</td>
<td>-1.479</td>
<td>.146</td>
</tr>
<tr>
<td>provide effective modeling for teachers regarding effective teaching and learning practices</td>
<td>46</td>
<td>-2.769</td>
<td>.008**</td>
</tr>
<tr>
<td>use research on teaching and learning practices to guide strategic planning for accomplishment of school goals</td>
<td>46</td>
<td>-1.189</td>
<td>.241</td>
</tr>
<tr>
<td>plan effective activities and experiences which impact teachers’ beliefs in their abilities to provide effective teaching and learning activities to their students</td>
<td>46</td>
<td>-1.266</td>
<td>.212</td>
</tr>
<tr>
<td>use data collected from teacher observations to inform school-wide efforts for improving teaching and learning</td>
<td>46</td>
<td>-1.252</td>
<td>.217</td>
</tr>
<tr>
<td>regularly perform effective observations of teachers</td>
<td>46</td>
<td>-1.515</td>
<td>.137</td>
</tr>
<tr>
<td>stay abreast of current best practices for facilitating effective teaching and learning</td>
<td>46</td>
<td>-0.992</td>
<td>.326</td>
</tr>
<tr>
<td>communicate needs and goals necessary to enhance effective instructional effectiveness to faculty</td>
<td>46</td>
<td>-0.569</td>
<td>.572</td>
</tr>
</tbody>
</table>
provide experiences that foster and facilitate high levels of teacher motivation towards teaching and learning

protect instructional time so that effective teaching and learning can take place

<table>
<thead>
<tr>
<th></th>
<th>Pre-Survey</th>
<th>Post-Survey</th>
<th>t</th>
<th>df</th>
</tr>
</thead>
<tbody>
<tr>
<td>Composite General ILse (Questions 1-10)</td>
<td>31.79</td>
<td>34.00</td>
<td>-1.956</td>
<td>45</td>
</tr>
<tr>
<td></td>
<td>3.72</td>
<td>4.02</td>
<td>(.057)</td>
<td></td>
</tr>
</tbody>
</table>

Note. * = p < .05, **= p <.01. Statistics based on ASES-M questions 1-10

A composite variable comprised of the summation of all survey item values for general ILse (survey questions 1-10) was created in order to address SRQ2 holistically. In order assess whether administrators’ general ILse changed after attending district-led professional development, an independent samples t-test was run between the two general ILse composite score variables. Table 5 illustrates this data.

Table 5

<table>
<thead>
<tr>
<th></th>
<th>M</th>
<th>SD</th>
<th>M</th>
<th>SD</th>
<th>t</th>
<th>df</th>
</tr>
</thead>
<tbody>
<tr>
<td>Composite General ILse (Questions 1-10)</td>
<td>31.79</td>
<td>3.72</td>
<td>34.00</td>
<td>4.02</td>
<td>-1.956</td>
<td>45</td>
</tr>
</tbody>
</table>

Note: 2-tailed significance p-value appears in parentheses below t-score. Statistics based on ASES-M questions 1-10.

The rationale behind SRQ2 was to create a baseline of general ILse in which to compare later with the mathematical ILse which was the emphasis of district-led professional development. Findings revealed that professional development did not make a significant difference in the general ILse of administrators (t(45) = -1.956, p > .05).

With only one individual general ILse factor indicating significance out of 10 (beliefs in their ability to effectively model instruction), it was evident that finding statistically significant findings for the composite general ILse was not probable. The remaining
research questions (SRQ3 & SRQ4) focused on mathematics ILse factors which were constructed on a parallel measure to the general ILse survey questions (1-10).

**Sub-research Question 3 (SRQ3)**

SRQ3: Did district-provided professional development change administrators’ mathematics instructional leadership self-efficacy?

The third sub-research question in this study examines administrators’ mathematical self-efficacy, measured by ASES-M questions 11-28. A subset of the mathematics-related questions, 11-20, were crafted to parallel the general ILse questions, 1-10. Eight additional mathematics ILse questions, 21-28, related to additional goals and perspectives of the school district and were used to measure administrators’ mathematical ILse after receiving district-led PD from January 2017 to May 2017. The ASES-M survey utilized a 4-point Likert-type scale with responses ranging from Very Weak Beliefs in My Abilities (1) to Very Strong Beliefs in My Abilities (5). Descriptive analyses were executed for both the pre- and post- ASES-M. Table 6 illustrates the means and standard deviations of individual instructional leadership survey items used to represent administrators’ perceptions of their mathematical ILse.

Table 6

<table>
<thead>
<tr>
<th>Administrators’ Beliefs in their ability to…</th>
<th>Pre-ASES-M (n=24)</th>
<th>Post-ASES-M (n=24)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>influence teachers to utilize effective mathematics teaching and learning practices</td>
<td>2.96</td>
<td>.47</td>
</tr>
<tr>
<td>provide effective modeling for teachers regarding effective mathematics teaching and learning practices</td>
<td>2.88</td>
<td>.80</td>
</tr>
<tr>
<td>Task</td>
<td>Mean</td>
<td>SD</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>------</td>
<td>-----</td>
</tr>
<tr>
<td>Use research on mathematics teaching and learning practices to guide strategic planning for accomplishment of school goals</td>
<td>2.92</td>
<td>.78</td>
</tr>
<tr>
<td>Plan effective activities and experiences which impact teachers' beliefs in their abilities to provide effective mathematics teaching and learning activities to their students</td>
<td>3.00</td>
<td>.78</td>
</tr>
<tr>
<td>Use data collected from teacher observations to inform school-wide efforts for improving mathematics teaching and learning</td>
<td>3.25</td>
<td>.61</td>
</tr>
<tr>
<td>Regularly perform effective observations of teachers specific to mathematics instruction</td>
<td>3.13</td>
<td>.68</td>
</tr>
<tr>
<td>Stay abreast of current best practices for facilitating effective mathematics teaching and learning</td>
<td>2.79</td>
<td>.66</td>
</tr>
<tr>
<td>Communicate mathematics needs and goals necessary to enhance effective instructional effectiveness to faculty</td>
<td>3.29</td>
<td>.46</td>
</tr>
<tr>
<td>Provide experiences that foster and facilitate high levels of teacher motivation towards teaching and learning mathematics</td>
<td>3.00</td>
<td>.59</td>
</tr>
<tr>
<td>Protect instructional time so that effective mathematics teaching and learning can take place</td>
<td>3.25</td>
<td>.61</td>
</tr>
<tr>
<td>Apply district professional development to instructional leadership practices</td>
<td>3.17</td>
<td>.57</td>
</tr>
<tr>
<td>Provide feedback using consistent mathematics language regarding effective teaching and learning practices</td>
<td>3.04</td>
<td>.55</td>
</tr>
<tr>
<td>Lead mathematics conversations with teachers following instructional observations</td>
<td>3.25</td>
<td>.79</td>
</tr>
<tr>
<td>Lead conversations with teachers about how students learn mathematics</td>
<td>3.04</td>
<td>.69</td>
</tr>
</tbody>
</table>
motivate teachers mathematically to reflect on their knowledge, skills, and dispositions regarding effective mathematics teaching and learning 3.00 .66 3.25 .61
recognize mathematical errors or misconceptions during instruction 3.04 .91 3.38 .58
justify change in mathematics teaching and learning during curriculum reform 3.08 .58 3.46 .59
implement or co-teach a mathematics lesson for students 3.17 .87 3.21 .59

Note. Statistics based on ASES-M questions 11-28

Analysis for each mathematics ILse survey item was calculated using an independent samples t-test to measure for difference of means on each factor. Because pair-ability could not be ensured between respondents from the pre-survey to post-survey, the more conservative t-test (independent) statistic was used to compare means. Table 7 illustrates the independent samples t-test data for general ILse of elementary administrators.

Table 7

<table>
<thead>
<tr>
<th>Administrators’ Beliefs in their ability to…</th>
<th>df</th>
<th>t</th>
<th>Sig. (2-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>influence teachers to utilize effective mathematics teaching and learning practices</td>
<td>46</td>
<td>-2.80</td>
<td>.007**</td>
</tr>
<tr>
<td>provide effective modeling for teachers regarding effective mathematics teaching and learning practices</td>
<td>46</td>
<td>-1.46</td>
<td>.150</td>
</tr>
<tr>
<td>use research on mathematics teaching and learning practices to guide strategic planning for accomplishment of school goals</td>
<td>46</td>
<td>-1.405</td>
<td>.167</td>
</tr>
<tr>
<td>plan effective activities and experiences which impact teachers' beliefs in their abilities to provide</td>
<td>46</td>
<td>-1.621</td>
<td>.112</td>
</tr>
</tbody>
</table>
effective mathematics teaching and learning activities to their students
use data collected from teacher observations to inform school-wide efforts for improving mathematics teaching and learning
regularly perform effective observations of teachers specific to mathematics instruction
stay abreast of current best practices for facilitating effective mathematics teaching and learning
Communicate mathematics needs and goals necessary to enhance effective instructional effectiveness to faculty
provide experiences that foster and facilitate high levels of teacher motivation towards teaching and learning mathematics
protect instructional time so that effective mathematics teaching and learning can take place
apply district professional development to instructional leadership practices
provide feedback using consistent mathematics language regarding effective teaching and learning practices
lead mathematics conversations with teachers following instructional observations
lead conversations with teachers about how students learn mathematics
motivate teachers mathematically to reflect on their knowledge, skills, and dispositions regarding effective mathematics teaching and learning
recognize mathematical errors or misconceptions during instruction

justify change in mathematics teaching and learning during curriculum reform

implement or co-teach a mathematics lesson for students

Note. * = p < .05, ** = p < .01. Statistics based on ASES-M questions 11-28.

A composite variable comprised of the summation of all survey item values for mathematics ILse (survey questions 11-28) was created to address SRQ3 holistically. In order assess whether administrators’ mathematics ILse changed after attending district-led professional development, an independent samples t-test was run between the pre- and post- mathematics ILse composite score variables. Table 8 illustrates this data.

Table 8

<table>
<thead>
<tr>
<th>Mathematics ILse Composite Comparison with Independent Samples T-test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-Survey</td>
</tr>
<tr>
<td>----------------</td>
</tr>
<tr>
<td>Composite Mathematics IL (Questions 11-28)</td>
</tr>
</tbody>
</table>

Note: * = p < .05, 2-tailed significance p-value appears in parentheses below t-score. Statistics based on ASES-M questions 11-28.

The purpose of SRQ3 was to determine if administrators experienced any change in their mathematics ILse after participating in district-led PD. Statistical findings from SRQ3 align strongly with the overarching research question of the study to determine how administrators’ PD for mathematics instructional leadership impacted their own self-efficacy.

Findings reveal that there was a significant difference in mathematics ILse ($t(46) = -2.113, p < .05$) from the pre-survey ($M=55.25, SD = 6.48$) to the post-survey ($M=59.63,$
Along with a statistically significant composite change in mathematics ILse, it may be important to note that administrators showed a significant increase in their self-efficacy from pre- to post- on three individual IL factors. The first significant factor is administrators’ beliefs in their ability to influence teachers to utilize best practices in mathematics teaching and learning \((t(46) = -2.80, p < .01)\). The second significant factor was administrators’ beliefs in their ability to apply district-led PD to their instructional leadership practices \((t(46) = -2.417, p < .05)\). Third, administrators’ noted significant increases in self-efficacy after PD in their ability to justify changes in mathematics teaching and learning during reform \((t(46) = -2.217, p < .05)\).

Referring back to the findings from SRQ2 where PD did not make a statistically significant difference in administrators’ general ILse scores \((t(45) = -1.956, p > .05)\) from pre- and post-survey administration, evidence suggests that mathematics-centered PD did make a positive impact on the beliefs of administrators as instructional leaders in mathematics.

**Sub-research Question 4 (SRQ4)**

SRQ4: How does administrators’ general instructional leadership self-efficacy compare to their mathematics instructional leadership self-efficacy before and after district-provided professional development?

SRQ4 addressed the overall differences, if any, in general and mathematical instructional leadership beliefs of administrators at two different points in time. Studying the sample as a whole, descriptive statistics and paired t-tests were compared and analyzed for differences to see if professional development lessened, maintained, or widened the gap in administrator beliefs as an instructional leaders, both generally and
mathematically. Analyses of SRQ2 and SRQ3 compared across the pre- and post-surveys to examine general ILse and mathematics ILse after district-led PD. The purpose of SRQ4 is to look more closely within each of the pre- and post-survey results for information regarding how the constructs of general and instructional ILse may have changed simultaneously. Paired t-tests are appropriate to compare means for this research question since the results found within each survey can ensure paired data.

Descriptive analyses were executed for both the pre- and post- ASES-M surveys. Table 9 illustrates the means and standard deviations of composite items from the pre- and post-surveys in the areas of general and mathematics ILse.

Table 9

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-Survey Composite</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>General IL</td>
<td>24</td>
<td>31.79</td>
<td>3.72</td>
</tr>
<tr>
<td>Mathematics IL</td>
<td>24</td>
<td>30.46</td>
<td>3.67</td>
</tr>
<tr>
<td>Post-Survey</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Composite General IL</td>
<td>23</td>
<td>34.00</td>
<td>4.02</td>
</tr>
<tr>
<td>Mathematics IL</td>
<td>23</td>
<td>33.17</td>
<td>4.67</td>
</tr>
</tbody>
</table>

*Note.* Statistics based on ASES-M questions 1-10.

The examination of descriptive statistics creates opportunities for general analysis. Descriptive statistics reveal that composite means for mathematics ILse were less than composite means for general ILse. As many might predict, this indicates administrators are more efficacious leading generally compared to mathematically. Post-survey standard deviations for both general ILse and mathematics ILse were higher than those of the pre-survey. This observation implies respondents had greater variability in
their self-efficacy beliefs as the year progressed. Table 10 evaluates where these observable differences are statistically significant based on a paired t-test analysis.

Table 10

**Paired Samples Correlations and T-tests for Pre/Post Composite Scores**

<table>
<thead>
<tr>
<th></th>
<th>R</th>
<th>Sig.</th>
<th>df</th>
<th>T</th>
<th>Sig. (2-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-Survey Composite General IL to Pre-Survey Composite Mathematics IL</td>
<td>.855</td>
<td>.000**</td>
<td>24</td>
<td>3.278</td>
<td>.003**</td>
</tr>
<tr>
<td>Post-Survey Composite General IL to Pre-Survey Composite Mathematics IL</td>
<td>.875</td>
<td>.000**</td>
<td>23</td>
<td>1.746</td>
<td>.095</td>
</tr>
</tbody>
</table>

*Note: ** = p < .01. Statistics based on ASES-M questions 1-10.*

The purpose of SRQ4 was to examine and compare the potential gaps between the general and mathematics ILse on both the pre- and post- ASES-M surveys. The pre-survey was administered in January 2017 following the early-adoption PD phase (referenced in chapter four). Preliminary data analyses was conducted and presented to district leaders to inform their continued PD planning. While to the naked eye the differences between the pre-survey general ILse and mathematics ILse data appeared minimal, a paired sample t-test found a statistically significant outcome ($t(24) = 3.278, p < .01$). Therefore, prior to beginning the instructional leadership PD phases, there was a significant difference in the mathematics ILse and general ILse beliefs of administrators. Additionally, there was a significantly strong and positive correlation ($r = .855, p < .01$) between administrators general and mathematics ILse beliefs.

The post-survey was administered in May 2017 at the conclusion of the initial curriculum adoption year. Unlike the pre-survey comparison, there was not a significant difference of means between administrators’ general and mathematics ILse ($t(23) = 1.746, p > .05$). This indicates the differences in administrator’s general and mathematics
ILse beliefs lessened. SRQ4 considered the gaps between administrators’ general and mathematics ILse. Evidence showed PD was able to narrow the gap.

**Qualitative and Quantitative Connections & Implications**

The research design for this study was a concurrent transformative mixed-methods design (Creswell, 2014). The intention was to cross-validate a variety of data through triangulation to learn more about the process and impact of professional development on administrators’ self-efficacy as instructional leaders in mathematics. The studied employed a mixed-methods design to illustrate if and how professional development played a role in the self-efficacy beliefs of administrators during mathematics reform. Especially given a small sample size, the qualitative component served to support unexpected quantitative results (Tashakkori & Teddlie, 2003; Creswell, 2005).

Bandura’s self-efficacy construct served as a consistent thread throughout this study. Self-efficacy beliefs directly relate to leadership behaviors and how administrators initiate, commit, and persist during times of change (Bandura, 1997; McCormick, 2001; Smith, Guarino, Strom, & Adams, 2006). A factor to consider, especially during reform, is the systematic PD processes in place to support school leaders.

During qualitative analysis, significant administrative PD opportunities were identified and coded with the four self-efficacy sources. The quantitative ASES-M survey used self-efficacy beliefs to measure administrators’ instructional leadership perceptions on all 28 survey items. Through the lens of self-efficacy, qualitative significant outcomes and quantitative statistical findings are illustrated below in Figure 5.1.
Administrators have many roles in today’s schools. As instructional leaders, administrators require the knowledge, skills, and dispositions to maximize the teaching and learning of all content-areas and disciplines. When experiencing curricular change, such as in mathematics, it becomes important to prepare administrators to adjust, learn, and lead. This study investigated a district-led PD initiative aimed at elementary
administrators experiencing mathematics curriculum reform. The Administrator Self-Efficacy Scale for Mathematics (ASES-M) along with naturalistic observation and document analysis were used to answer four sub-research questions aimed at addressing the overarching research question, “How does school administrators’ professional development for mathematics instructional leadership impact their own self-efficacy?”

The first sub-research question served to explain the process and journey of enacting subject-specific professional development for administrators. The final three sub-research questions aimed to measure whether the self-efficacy of administrators as instructional leaders changed. While statistically significant findings were found quantitatively, the data collected and analyzed from the qualitative aspect of this study give further explanation to how administrator self-efficacy was increased.

Chapter Six presents an overview of the study, considerations, and implications. An interpretation of the mixed-methods study results as well as recommendations for future research will be included for continued work aimed at increasing administrator instructional leadership, especially in subject-specific areas such as mathematics.
Chapter 6

Discussion, Considerations, and Implications

Mathematics curriculum reform is changing the content and resources in today’s elementary classrooms as well as the culture of mathematics teaching and learning. Administrators face the challenge of leading large-scale curricular change efforts with limited prior knowledge or experiences with reform curricula structures. Administrators, as the bridge between district and building-level initiatives, are in a unique position to impact and drive change (Stein & Nelson, 2003). However, they face increasing responsibilities in their demanding roles and draw on their beliefs and leadership abilities to take action. Increased beliefs in their abilities as leaders, known as self-efficacy, guide administrators to commit and persevere during times of change and influence their effectiveness. The changing landscape of mathematics education and other curriculum reform environments require administrators to be fully engaged and equipped to lead sustainable change (Elmore, 2004; McLaughlin & Talbert, 2002). When implementing new curriculum and possibly teaching and learning practices as well, ensuring that district initiatives and philosophies equitably translate to teachers often rests on the shoulders of administrators. Literature supports that administrators with a well-established and shared vision of what high-quality mathematics instruction are better equipped to influence effective practices within their buildings (Coburn, 2005; Nelson & Sassi, 2003; Spillane, 2000).

Administrators’ influence on student achievement is second only to teachers (Leithwood, Louis, Anderson, & Walstrom, 2010; Marzano, Waters, & McNulty, 2005; Wallace Foundation, 2011) and strong administrative leadership is essential to
successfully functioning schools (Hauserman & Stick, 2014). With numerous studies supporting the importance of administrators, administrators receive considerably less professional development than classroom teachers.

Administrators’ sense of self-efficacy in their ability to enact change is said to be just as important as any other leadership quality (Daly et al., 2010). Bandura (1977) identified four sources of self-efficacy attainment to accomplish a specific task. The four sources are performance outcomes (enactive mastery experience), watching others (vicarious experiences), verbal persuasion, encouragement and feedback, and attention to psychological and emotional state. Empirical evidence shows increased attention in the four sources increases self-efficacy beliefs (Bandura, 1977). Administrators’ beliefs directly relate to their behaviors and their willingness to initiate, commit, and persist during times of change (Bandura, 1997; McCormick, 2001; Smith, Guarino, Strom, & Adams, 2006). By utilizing Bandura’s four sources of self-efficacy, district leaders have the opportunity to positively influence administrators’ beliefs in their ability to be instructional leaders, and potentially, their actions and impact on student achievement.

**Summary of the Study**

This study examined the professional development (PD) process of elementary administrators from a Midwestern, suburban school district through the lens of instructional leadership self-efficacy. The district provided PD opportunities prior to the curriculum adoption year, however the bulk of this study examined the PD process during the first year of implementation. In late 2015, the district published a new mathematics framework (MPS, 2015) to establish a shared vision for mathematics education based on research-based reform efforts. With a new framework and curriculum motivating
fundamental and philosophical changes in mathematics teaching and learning, district leaders had the opportunity to create formats and structures for administrators to collaboratively assess current practices, reflect on reform opportunities for their buildings, become more familiar with newly adopted curriculum, and build on their beliefs as mathematics instructional leaders (Glickman, 2002; Honig, 2012).

This study was significant because the examination of professional development layers necessary to enact systemic reform through the beliefs and actions of district and building-level leaders is important. Self-efficacy beliefs of administrators is a gap in educational research and is an area where further research has been suggested (Tschannen-Moran & Gareis, 2004; Smith & Guarino, 2006). In areas such as mathematics education, research has shown that an administrator’s vision for high-quality mathematics instruction influences his/her leadership (Nelson & Sassi, 2003; Spillane, 2000, 2001). The intersection of administrative professional development, self-efficacy, and curricular reform in mathematics are all topics with long histories and futures in educational research and practice.

The purpose of this concurrent transformative mixed-methods study was to examine the self-efficacy beliefs of administrators experiencing professional development for mathematics instructional leadership. The overarching research question for the study was, “How does school administrators’ professional development (PD) for mathematics instructional leadership (IL) impact their own self-efficacy?” During the 2016-2017 school year, the researcher utilized naturalistic observation and document analysis to detail the PD journey of the district throughout the mathematics reform process. Along with qualitative data collection, the Administrators Self-Efficacy Scale for
Mathematics (ASES-M) was provided to administrators as a pre-survey (n= 24) in January 2017 and again as a post-survey (n= 24) at the end of May 2017. While sample size for ASES-M surveys were identical, pairing of survey responses from pre- to post- was not guaranteed and accounted for in statistical analysis methods. The ASES-M was comprised of both general and mathematics related instructional leadership items and was created in part with Smith and Guarino’s (2005) Principal Self-Efficacy Survey (PSES). Descriptive statistics along with paired and independent t-test statistical analyses were utilized to answer quantitative sub-research questions two through four.

Sub-research question one (SRQ1) asked what opportunities administrators had during district-led PD to increase their self-efficacy beliefs. District-led PD opportunities for administrators were coded with sources of self-efficacy to reveal a rationale or explanation for administrative changes in self-efficacy in mathematics instructional leadership. Qualitative findings revealed five significant outcomes during the pre-adoption, early adoption, and instructional leadership phases of PD. The significant outcomes were: mindset for change, opportunities for collaborative, honest dialogue, homework for reflective collaboration, practice drives purpose, and ‘voluntary but inevitable’ principle. Throughout the five significant outcomes, the researcher identified multiple opportunities where district-led PD addressed the four sources of self-efficacy. After various PD opportunities documented, the four sources of self-efficacy attainment were coded a total of 13 times. These 13 points indicate that administrators’ self-efficacy had the opportunity to increase throughout the various PD activities. The quantitative results provided further clarity on the qualitative results, as mixed-methods studies are intended to do.
Quantitative findings revealed that district-led PD aimed at administrators’ mathematics instructional leadership increased their self-efficacy during the initial curriculum adoption year. While general and mathematical instructional leadership self-efficacy increased from pre- to post- survey, only mathematics self-efficacy showed statistically significant growth. There was a significant difference in the overall mathematics instructional leadership self-efficacy ($t(46) = -2.113, p < .05$) from the pre-survey ($M=55.25, SD = 6.48$) to the post-survey ($M=59.63, SD = 7.81$). When broken down by mathematical instructional leadership factors, three out of 18 individual factors showed significant increases from pre- to post-survey. Specifically, administrators increased their beliefs in their abilities to influence teachers to utilize best practices in mathematics teaching and learning ($t(46) = -2.80, p < .01$), apply district-led PD to their instructional leadership practices ($t(46) = -2.417, p < .05$), and justify changes in mathematics teaching and learning during reform ($t(46) = -2.217, p < .05$).

Lastly, pre- and post-survey results showed that the gap between administrators’ general and mathematics instructional leadership self-efficacy (ILse) narrowed. While the pre-survey showed that there was a significant difference in administrators’ general and mathematics ILse ($t(24) = 3.278, p < .01$), the post survey did not show a significant difference between the general and mathematics ILse ($t(23) = 1.746, p > .05$). It can be concluded from this study that attention though professional development on mathematics specific instructional leadership benefits not only administrators’ self-efficacy in the subject-specific area, but generally as well. In response to a reflective open-ended question on the post-survey, one administrator shared the following insight:
I have been grateful for the district led professional development opportunities provided throughout the year. Our conversations, observation assignments, and opportunities for reflection via curriculum meetings have benefitted me most. The ongoing structure and time for collaborative conversations with my colleagues helped strengthen my understanding of effective math practices, which allowed me to then share that understanding and enthusiasm with my staff. It would have been difficult to get staff buy in without having authentic buy in myself.

**Considerations for School Districts & Administrators**

Through a mixed-methods design structure, this study not only showed that PD centered on mathematics self-efficacy increased administrators’ beliefs in their ability to be instructional mathematics leaders, but also provided a justification of how those results occurred through qualitative data and analysis. This section will include a discussion of key considerations from this district’s PD experience. For the district of study, results offer evidence and insight on the impact of district-led PD for elementary administrators. With data representing a small sample from one Midwestern, suburban school district, results cannot be generalized to other settings; however, significant outcomes can offer insight to other district leaders and administrators for their own PD planning during times of curricular change.

This study serves as an example of district-led PD focused on the implementation of high-quality PD based on research-based best practices. In a meta-analysis on high-quality PD for teachers, five key characteristics were highlighted (below). All
characteristics can be explicitly found in the PD opportunities detailed within this study and throughout the significant outcomes identified by the researcher.

High-quality PD:

1) Aligns with school goals, state and district standards and assessments, and other professional learning activities
2) Focuses on core content and modeling of teaching strategies for the content
3) Includes opportunities for active learning of new teaching and learning strategies
4) Provides teachers with an opportunity to collaborate
5) Includes follow-up on learning and continuous feedback

(Archibald, Coggshall, Croft, & Goe, 2011)

For the school district of study, the planning and implementation of PD for the elementary mathematics curriculum change began years in advance. As one of the qualitative, significant outcomes found, preparing for a large-scale change involves addressing the mindset of the individuals involved. For school districts and administrators hoping to influence the self-efficacy beliefs of individuals, gradually addressing the psychological and emotional needs of individuals (a self-efficacy source) to prepare them to have a change in beliefs is important. As one administrator reflected:

I have had to really think about my beliefs of math instruction and how that aligned with the new curriculum. I feel that the ‘why’ on my beliefs have grown and that I have a better understanding of the math instruction learning.
A major factor in the success of the PD enacted by district leaders was their ability to balance PD attention on both local contexts (their district culture and vision) and the larger scope of universal mathematics reform. District leaders wanted administrators to speak a common language about what mathematics teaching and learning should look like in the district, and so PD was designed to reinforce a common and consistent message. While the integration of the new curriculum with other district activities and procedures at times challenging, administrators were able to discuss and bring obstacles to monthly meetings to brainstorm solutions with other administrative peers and district leaders. One administrator reflected, “the implementation with fidelity has improved for greater consistency with collaboration and planning and using data to drive instruction.”

The overall structure of the administrative PD phases is noteworthy for review. While district leaders had a vision for PD during the first semester of the mathematics curriculum implementation, part of their planning included efforts to support administrators as they promptly removed curriculum implementation barriers. While the desire to dive into instructional leadership opportunities like instructional rounds existed, district leaders first attended to the managerial duties of administrators to alleviate obstacles from perpetuating into large-scale change issues. Though some might consider this step trivial, by attending to the administrators’ building-level concerns proactively, administrators had more freedom during the second semester of implementation to reflect on their own instructional leadership practices. Prior to that point, administrators were engulfed in the needs and concerns of others and could not focus on their own growth. An important planning consideration for districts is to allow time and structures in the
early stages of curricular change so administrators can attend to their managerial duties and remove barriers. The structured flexibility to allow administrators to problem solve and reflect could provide increased opportunities for introspective and thoughtful work in the future.

Through PD activities such as monthly observation homework and instructional rounds, administrators were given opportunities to actively engage in instructional leadership opportunities and also reflect about their experiences collaboratively. Research on adult learning states that experiences must be provided as a basis for learning that include the opportunity to make mistakes (Merriam, 2001). Along with authentic experiences, adults also must have the opportunity to critically reflect and test out new learning in their environments (Merriam et al., 2006). The literature supports Bandura’s self-efficacy sources such as performance outcomes and vicarious experiences which emphasize experiences for individuals hoping to increase their beliefs in the abilities to accomplish any task.

Monthly homework discussions were an aspect of the district PD that embraced many aspects of high-quality PD design and would be important considerations for other educational leaders enacting PD. Administrators were able to come to meetings with experiences, questions, solutions, and ideas in order to actively contribute to the instructional leadership development of the group. It was advantageous for the district to create these supportive and aligned opportunities as they are proven to positively impact leadership efficacy (Leithwood & Jantzi, 2008). Along with being collaborative, the predictable structure of the observations and discussions further emphasized the vision and focus of the district PD. From the district’s perspective, administrators needed know
about the mathematics content being taught, the expected mathematical processes and practices being utilized, and the new curriculum structures they should be promoting and seeing. Each month the observation prompts and resultant discussions revolved around these three areas which continued to drive a common theme and vision for administrators’ work as instructional leaders.

Another key consideration for school districts and administrators based on this study was the repeated opportunities to refine and reinforce the district vision for elementary mathematics education. With the introduction of new resources tools and instructional leadership practices, there were various opportunities for district leaders to assess that the PD model was being applied as intended. The Effective Mathematics Practices (EMP) tool was a key feature of the district-led PD and not because it was immediately successful. Administrators’ applied the EMP tool to instructional leadership activities during three monthly curriculum meetings and the instructional rounds experience. During each of the activities, the researcher noted administrator misconceptions on the intended use and purpose of the observation tool. Aside from the EMP tool’s observational use, the document ended up being a catalyst for bringing misconceptions and underlying beliefs to the surface. District leaders reflected and made instructional decisions based on the feedback the EMP tool provided. Hattie (2013) stated that feedback thrives during times of uncertainty and change. With so many educators (district leaders, administrators, teachers, etc.) experiencing simultaneous mathematics learning, the opportunity was prime for collecting and distributing providing feedback to support and drive change.
Consistent and frequent feedback became an important aspect of the district’s PD process. Administrators continued to share their differing perspectives regarding the use of the EMP tool, understanding of new curricular structures, and rationale for massive instructional shifts. For each of these commonly discussed topics, PD was designed to allow administrators to experience and discuss key concerns and take actionable steps to solve them. For example, administrators’ ability to use the EMP tool as intended during the instructional rounds experience made a substantial difference in administrators’ comfort and clarity of purpose for the tool. In the end, the EMP tool served as an avenue to put leadership philosophies into practice and also gather and address misconceptions.

Lastly, a key consideration or take-away for school districts and administrators is that subject-specific instructional leadership, in this case mathematics, is different than the general instructional leadership. Often comments are made like “good teaching is good teaching” in education. These comments often downplay the differences and potential needs of particular subject-specific areas. Literacy can dominate the structures of teaching and learning in schools, but best practices in mathematics education require different knowledge, skills, and dispositions, even in leadership (Burch & Spillane, 2003). To see large scale mathematics improvements, passive and disconnected mathematics leadership will not suffice (Nelson, 1997). Providing subject-specific and district-led PD is an opportunity for districts to make real gains in areas where achievement may be lacking. Results from this study show that general instructional self-efficacy was also increased while focused on mathematics. By taking a more specific look at instructional leadership tasks for administrators, districts and administrators may
see more gains verses applying practices that are generalizable to all subject-areas and change initiatives.

**Future Research Implications**

This study was conducted with a small quantitative pre- and post-sample size (non-paired N=24 for each) with a total of 38 elementary administrators involved in the district-led mathematics instructional leadership PD. All participants were elementary administrators located in a Midwestern, suburban school district. The researcher recommends that replicate studies could be done to include more diversity of schools within rural, urban, or suburban schools with an emphasis PD for instructional leaders through the lens of self-efficacy. Further research could also be conducted on the PD model itself and the use of similar formats during curriculum reform initiatives both in and outside of the mathematics content-area. With numerous districts experiencing similar curricular changes in mathematics and sciences currently, there are many opportunities to continue research on the role of self-efficacy as it relates to curriculum reform environments.

The researcher also identifies that there are still many questions to be asked regarding the district in this study as they continue to year two of their curriculum adoption journey. With mathematics remaining a district priority area, the researcher intends to continue work with district leaders to further examine the self-efficacy of administrators and potentially teachers as they continue the implementation process of the new mathematics curriculum. While this study examined the role of PD on administrators’ self-efficacy beliefs as mathematics instructional leaders, self-efficacy theory suggests that increased self-efficacy beliefs impact the actions and behaviors of
individuals (Bandura, 1977). A future research question might address how predictive administrators’ ILse beliefs are of their actual leadership behaviors. In regards to this study, how do the significant outcomes and findings translate to future administrative behaviors and actions related to mathematics instructional leadership. Limited studies have been conducted linking administrator self-efficacy to actual administrative performance. Further studies utilizing the ASES-M survey and examining key concepts of the study are recommended.

Additionally, a comparison study could also be done to examine if the mathematics self-efficacy beliefs of administrators compare to their teachers’ mathematics self-efficacy beliefs. In all, a larger study could be conducted to measure how mathematically self-efficacious a school (administrators, staff, and students) is during mathematical curricular change. This could be a longitudinal study to examine both if and how self-efficacy changes over time and also which group (administrators, teachers, or students) truly change (if any) or drive change in self-efficacy beliefs within a school. All of the potential studies mentioned could also be done outside of the context of mathematics and elementary education and extended to other subject-areas or grade-levels.

Summary

When experiencing great curricular change, how do districts plan for consistent and impactful implementation? On the cusp of a massive cultural shift in mathematics education, how can districts support building-level leaders with the knowledge, skills, and dispositions to successfully manage and lead change? This mixed-methods study detailed the journey and outcomes of one school district’s professional development
journey during a year of mathematics curriculum change. Grounded in Albert Bandura’s construct of self-efficacy, findings indicate that mathematics-specific professional development significantly increased elementary administrators’ self-efficacy as instructional leaders in mathematics. With limited research on the role of professional development and administrators’ self-efficacy as instructional leaders, this study served to provide insight to district leaders hoping to support their administrators through immense curricular change.

With the support of literature related to self-efficacy, leadership, and professional development, a summary of the study and considerations for school districts and administrators were discussed. Additionally, recommendations were made for additional research related to professional development, self-efficacy, and subject-specific curricular change. A follow-up study is expected to examine the trajectory of self-efficacy. Lastly, further research will be conducted to examine if mathematics ILse increases have behavioral implications for administrators. Continued research in these areas may provide viable professional development solutions to aid districts in implementing curricular change in the future.
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doi:10.1080/02671522.2014.880939


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Appendices
APPENDIX A

UNIVERSITY OF NEBRASKA IRB APPROVAL LETTER
December 29, 2016

Kelly Gomez Johnson
Education
UNO - VIA COURIER

IRB # 838-16-EX

TITLE OF PROPOSAL: Preparing Administrators to Lead Differently: One District's Professional Development Journey through the Lens of Self-Efficacy

The Office of Regulatory Affairs (ORA) has reviewed your application for Exempt Educational, Behavioral, and Social Science Research on the above-titled research project. According to the information provided, this project is exempt under 45 CFR 46.101b, category 2. You are therefore authorized to begin the research.

It is understood this project will be conducted in full accordance with all applicable HRPP Policies. It is also understood that the ORA will be immediately notified of any proposed changes for your research project.

Please be advised that this research has a maximum approval period of 5 years from the original date of approval and release.

If the research is completed prior to 5 years, please notify the Office of Regulatory Affairs at ibora@unmc.edu. If this study continues beyond the five year approval period, the project must be resubmitted in order to maintain an active approval status.

Sincerely,

Signed on: 2016-12-29 15:10:00.000

Gail Kotulak, BS, CIP
IRB Administrator III
Office of Regulatory Affairs
APPENDIX B

ADMINISTRATORS SELF-EFFICACY SURVEY FOR MATHEMATICS

(ASES-M)
Administrator's Self-Efficacy Survey-Math (ASES-M)

Thank you for taking the time to assist me in my educational endeavors. The data collected will provide useful information regarding the curriculum reform process and its impact on administrator’s self-efficacy in leading content-specific instructional change.

The Administrator Self-Efficacy Survey-Math (ASES--M) survey asks you to make a series of judgments about your experiences as an administrator or instructional leader for a school or district.

Consent to Participate in Survey
The following questionnaire will require approximately 10-15 minutes to complete. There is no compensation for responding nor is there any known risk. In order to ensure that all information will remain confidential, please do not include your name or any school building affiliations. If you choose to participate in this questionnaire, please answer all questions as honestly as possible and submit the completed questionnaire promptly. Participation is strictly voluntary and you may refuse to participate at any time or on any question. If you require additional information or have questions, please contact the researcher, Kelly Gomez Johnson, at kgomezjohnson@unomaha.edu or at (402)880-8724. If you are not satisfied with the manner in which this study is being conducted, you may report (anonymously if you so choose) any complaints to the department chair of Educational Leadership, Kay Keiser, at kkeiser@unomaha.edu or at (402)554-3443.

By clicking NEXT, you indicate your willingness to participate in this survey.

Skip to question 9.

Demographics of Participants

1. Gender
   Mark only one oval.
   - Male
   - Female
   - Prefer not to say

2. Age
   Mark only one oval.
   - 20-29
   - 30-39
   - 40-49
   - 50-59
   - 60-69
   - 70-79
3. Number of years (including this school year) in current school district or organization

   Mark only one oval.
   
   ○ 1-5 years
   ○ 6-10 years
   ○ 11-15 years
   ○ 15-20 years
   ○ 21-25 years
   ○ 26 years +

4. Current position or job title

   Mark only one oval.
   
   ○ Building Head/Assistant Principal
   ○ Principal Intern
   ○ Curriculum Facilitator
   ○ Other: .................................................................

5. Number of years (including this school year) in current position

   Mark only one oval.
   
   ○ 1-5 years
   ○ 6-10 years
   ○ 11-15 years
   ○ 15-20 years
   ○ 21-25 years
   ○ 26 years +

6. Other administrative position(s) held prior to current position. Please also state the number of year(s) in previous position(s).

   Administrative positions are defined as those where certification is required by the state to supervise and evaluate teachers.

   ........................................................................................................
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7. Number of years as a classroom teacher.
   Please respond NA if you have never been a classroom teacher.

   Mark only one oval.

   - 1-5 years
   - 6-10 years
   - 11-15 years
   - 16-20 years
   - 21-25 years
   - 26 years +
   - NA

Stop filling out this form.

Content-Specific Knowledge & Skills

Only one option can be chosen for each column/row. For example, you may not have two content areas where you are "Most Confident".

8. Please rank order the following subject-areas (1-Most Confident to 5-Least Confident) based on your level of personal comfort with your knowledge and skills in the content.

   Mark only one oval per row.

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Skip to question 1.

Principal Self-Efficacy Survey

You are asked to read the following items and rate the strength of your beliefs in your abilities to attain the following outcomes. These items should be answered from your perspective as a school administrator/instructional leader working to produce an effective teaching and learning environment. You are to indicate the degree to which you agree or disagree with each statement by choosing the appropriate scale value.

Scale:
- Very Weak Beliefs in My Abilities (1)
- Weak Beliefs in My Abilities (2)
- Strong Beliefs in My Abilities (3)
- Very Strong Beliefs in My Abilities (4)

9. 1. My beliefs in my abilities to influence teachers to utilize effective teaching and learning practices are

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10. 2. My beliefs in my abilities to provide effective modeling for teachers regarding effective teaching and learning practices are
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11. 3. My beliefs in my abilities to use research on teaching and learning practices to guide strategic planning for accomplishment of school goals are
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12. 4. My beliefs in my abilities to plan effective activities and experiences which impact teachers' beliefs in their abilities to provide effective teaching and learning activities to their students are
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13. 5. My beliefs in my abilities to use data collected from teacher observations to inform school-wide efforts for improving teaching and learning are
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14. 6. My beliefs in my abilities to regularly perform effective observations of teachers are
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15. 7. My beliefs in my abilities to stay abreast of current best practices for facilitating effective teaching and learning are
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16. **My beliefs in my abilities to communicate needs and goals necessary to enhance effective instructional effectiveness to faculty are**

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17. **My beliefs in my abilities to provide experiences that foster and facilitate high levels of teacher motivation towards teaching and learning are**

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18. **My beliefs in my abilities to protect instructional time so that effective teaching and learning can take place are**

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19. **My beliefs in my abilities to influence teachers to utilize effective teaching and learning practices which are specific to mathematics are**

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20. **My beliefs in my abilities to model effective mathematics teaching and learning practices for teachers are**

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21. **My beliefs in my abilities to use research on mathematics teaching and learning to guide strategic planning for accomplishment of school and district mathematics goals are**

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22. **My beliefs in my abilities to plan effective activities and experiences which impact teachers’ beliefs in their abilities to provide effective mathematics teaching and learning activities to their students are**
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23. **My beliefs in my abilities to use data collected from teacher observations to inform school/district-wide efforts for improving mathematics teaching and learning are**
Mark only one oval.

1 2 3 4

<table>
<thead>
<tr>
<th>Very Weak Beliefs in My Abilities</th>
<th>Very Strong Beliefs in My Abilities</th>
</tr>
</thead>
</table>

24. **My beliefs in my abilities to regularly perform effective observations of mathematics instruction by teachers are**
Mark only one oval.

1 2 3 4

<table>
<thead>
<tr>
<th>Very Weak Beliefs in My Abilities</th>
<th>Very Strong Beliefs in My Abilities</th>
</tr>
</thead>
</table>

25. **My beliefs in my abilities to stay abreast of current mathematical best practices for facilitating effective teaching and learning are**
Mark only one oval.

1 2 3 4

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<thead>
<tr>
<th>Very Weak Beliefs in My Abilities</th>
<th>Very Strong Beliefs in My Abilities</th>
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</thead>
</table>

26. **My beliefs in my abilities to communicate needs and goals necessary to enhance instructional effectiveness in mathematics to faculty are**
Mark only one oval.

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<thead>
<tr>
<th>Very Weak Beliefs in My Abilities</th>
<th>Very Strong Beliefs in My Abilities</th>
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</thead>
</table>

27. **My beliefs in my abilities to provide experiences that foster and facilitate high levels of teacher motivation towards teaching and learning mathematics are**
Mark only one oval.

1 2 3 4

<table>
<thead>
<tr>
<th>Very Weak Beliefs in My Abilities</th>
<th>Very Strong Beliefs in My Abilities</th>
</tr>
</thead>
</table>
28. 20. My beliefs in my abilities to protect instructional time so that effective mathematics teaching and learning can take place are

Mark only one oval.

1 2 3 4

Very Weak Beliefs in My Abilities

Very Strong Beliefs in My Abilities

29. 21. My beliefs in my abilities to apply district professional development to instructional leadership practices are

Mark only one oval.

1 2 3 4

Very Weak Beliefs in My Abilities

Very Strong Beliefs in My Abilities

30. 22. My beliefs in my abilities to provide feedback using consistent mathematics language regarding effective teaching and learning practices are

Mark only one oval.

1 2 3 4

Very Weak Beliefs in My Abilities

Very Strong Beliefs in My Abilities

31. 23. My beliefs in my abilities to lead mathematics conversations with teachers following instructional observations are

Mark only one oval.

1 2 3 4

Very Weak Beliefs in My Abilities

Very Strong Beliefs in My Abilities

32. 24. My beliefs in my abilities to lead conversations with teachers about how students learn mathematics are

Mark only one oval.

1 2 3 4

Very Weak Beliefs in My Abilities

Very Strong Beliefs in My Abilities

33. 25. My beliefs in my abilities to motivate teachers mathematically to reflect on their knowledge, skills, and dispositions regarding effective mathematics teaching and learning are

Mark only one oval.

1 2 3 4

Very Weak Beliefs in My Abilities

Very Strong Beliefs in My Abilities
34. **26. My beliefs in my abilities to recognize mathematical errors or misconceptions during instruction are**

*Mark only one oval.*

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<thead>
<tr>
<th>1</th>
<th>2</th>
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<tbody>
<tr>
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<tr>
<td>Very Strong Beliefs in My Abilities</td>
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</tbody>
</table>

35. **27. My beliefs in my abilities to justify change in mathematics teaching and learning during curriculum reform are**

*Mark only one oval.*

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<thead>
<tr>
<th>1</th>
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<th>4</th>
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<tbody>
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<tr>
<td>Very Strong Beliefs in My Abilities</td>
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</table>

36. **28. My beliefs in my abilities to implement or co-teach a mathematics lesson for students are**

*Mark only one oval.*

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<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
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<tbody>
<tr>
<td>Very Weak Beliefs in My Abilities</td>
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<td></td>
</tr>
<tr>
<td>Very Strong Beliefs in My Abilities</td>
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</tr>
</tbody>
</table>

**Open-Ended Section**

Please complete the following questions honestly and to the best of your ability.

37. **1. What word or words come to mind when you hear the phrase "effective mathematics instruction"?**

*[Space for response]*

38. **2. As an instructional leader during a curriculum reform process, what has been your greatest challenge in leading teachers through this change?**

*[Space for response]*
39. List professional development opportunities your district has provided in preparation for and during the new mathematics curriculum adoption.

-------------------------------------------------------------

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Skip to question 8.

END OF SURVEY
APPENDIX C

PERMISSION TO USE PSES BY SMITH & GUARINO (2006)
From: Wade Smith
To: Kelly Gomez Johnson: ajguarino@mgh.harvard.edu
Cc: Kelly Gomez Johnson
Subject: Re: PSES Permission Request
Date: Friday, October 7, 2016 8:27:43 PM
Attachments: image001.png

Rock and roll!

Sent from my BlackBerry Smartphone on the Verizon 4G LTE Network

From: kgomezjohnson@unomaha.edu
Sent: October 7, 2016 8:24 PM
To: smithwa@lsu.edu: ajguarino@mgh.harvard.edu
Cc: kgomezjohnson@unomaha.edu
Subject: PSES Permission Request

Dr. Smith and Guarino,
My name is Kelly Gomez Johnson and I am a STEM Instructor and Ed.D. candidate at the University of Nebraska at Omaha. For my dissertation study, I am interested in principals’ self-efficacy during a curriculum reform process, in particular in the area of elementary mathematics instructional leadership. Your Principal Self-Efficacy Survey (PSES) has presented itself in much of the literature I have read to this point. As I look to measure if self-efficacy in mathematical instructional leadership can evolve during a curriculum reform process, I believe that your instrument would be a great survey to help me through this investigation. With your permission, I would love to use the PSES in my dissertation study.

Please let me know if you have any questions or concerns and thank you for your consideration.

Sincerely,

Kelly Gomez Johnson
Instructor of STEM Education
Teacher Education | Roskens 408N
University of Nebraska at Omaha | www.unomaha.edu

402.554.4140
kgomezjohnson@unomaha.edu

Nebraska
APPENDIX D

NCTM EFFECTIVE MATHEMATICS TEACHING PRACTICES
# Effective Mathematics Teaching Practices

- **Establish mathematics goals to focus learning.** Effective teaching of mathematics establishes clear goals for the mathematics that students are learning, situates goals within learning progressions, and uses the goals to guide instructional decisions.

- **Implement tasks that promote reasoning and problem solving.** Effective teaching of mathematics engages students in solving and discussing tasks that promote mathematical reasoning and problem solving and allow multiple entry points and varied solution strategies.

- **Use and connect mathematical representations.** Effective teaching of mathematics engages students in making connections among mathematical representations to deepen understanding of mathematics concepts and procedures and as tools for problem solving.

- **Facilitate meaningful mathematical discourse.** Effective teaching of mathematics facilitates discourse among students to build shared understanding of mathematical ideas by analyzing and comparing student approaches and arguments.

- **Pose purposeful questions.** Effective teaching of mathematics uses purposeful questions to assess and advance students’ reasoning and sense making about important mathematical ideas and relationships.

- **Build procedural fluency from conceptual understanding.** Effective teaching of mathematics builds fluency with procedures on a foundation of conceptual understanding so that students, over time, become skillful in using procedures flexibly as they solve contextual and mathematical problems.

- **Support productive struggle in learning mathematics.** Effective teaching of mathematics consistently provides students, individually and collectively, with opportunities and supports to engage in productive struggle as they grapple with mathematical ideas and relationships.

- **Elicit and use evidence of student thinking.** Effective teaching of mathematics uses evidence of student thinking to assess progress toward mathematical understanding and to adjust instruction continually in ways that support and extend learning.

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[www.nctm.org/principlesetoactions](http://www.nctm.org/principlesetoactions)
APPENDIX E
INVITATION EMAIL TO ADMINISTRATORS FOR INDIVIDUAL DISCUSSION/VISIT
All,

I hope you are having a great week. As we continue with year 1 implementation of new mathematics standards and curriculum we want to make available a couple of optional opportunities for you and your staff. Please take a few minutes to read the following descriptions and respond to the survey link below...

https://goo.gl/DmTxYh

Math Discussion/Visit

If you are interested in chatting with us about how implementation is going, discuss ways that we can support you and your staff, walk us around to some math instruction in your building, etc. we would be happy to schedule a time to come out and visit with you.

Mathematics Vision Sharing/Staff Meeting

We are in the beginning stages of discussing ways to support mathematics teaching and learning for the 2017-18 school year. As a way of reflecting on this year, seeking feedback on implementation and sharing information about the 2017-18 school year, we are willing to visit with you and your staff beginning in March (similar to last year). As this year continues, next year’s plan and vision will be further developed and shared with you. Just wanting to give you the opportunity to get this on your calendar if it is something you are interested in.

I appreciate you. Let me know if you have any questions.
APPENDIX F

EFFECTIVE MATHEMATICS PRACTICES (EMP) TOOL
### Effective Mathematics Practices Resource

#### Structures

<table>
<thead>
<tr>
<th>Instructional Routines</th>
<th>Student Actions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Teacher Actions</strong></td>
<td><strong>Student Actions</strong></td>
</tr>
<tr>
<td>Facilitating the routine/Releasing responsibility to student leaders</td>
<td>Actively listening &amp; participating in routines</td>
</tr>
<tr>
<td>Extending learning, make connections between current concepts</td>
<td>Leading fluency activities</td>
</tr>
<tr>
<td>Providing language frames</td>
<td>Actively listening &amp; participating in quick practice activities</td>
</tr>
<tr>
<td>Teaching/modeling new activities</td>
<td>Using appropriate mathematical tools effectively</td>
</tr>
<tr>
<td>Facilitating math conversation</td>
<td>Explaining his/her thinking/strategy</td>
</tr>
<tr>
<td>Utilizing questioning strategies that stimulate higher level thinking skills</td>
<td>Determining accuracy of own answer and of others</td>
</tr>
<tr>
<td>Emphasizing a variety of strategies to get an answer</td>
<td>Restating what other students have shared</td>
</tr>
<tr>
<td>Reinforcing mathematical vocabulary</td>
<td>Appropriately agreeing &amp; disagreeing</td>
</tr>
<tr>
<td>Asking students to represent mathematical thinking through drawings and diagrams</td>
<td>Actively listening &amp; participating</td>
</tr>
<tr>
<td>Modeling talk moves</td>
<td>Demonstrating growth mindset and willingness to try different strategies</td>
</tr>
<tr>
<td>Monitoring for understanding by circulating room and noting students who may need reteaching or enrichment</td>
<td>Articulating the daily objective and/or learning goals</td>
</tr>
<tr>
<td>Communicating daily objective and/or learning goals</td>
<td>Showing flexibility moving from one activity to another</td>
</tr>
<tr>
<td>Applies appropriate pacing during lessons</td>
<td></td>
</tr>
<tr>
<td>Utilizing the mastery learning loop</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Classroom Environment</strong></th>
<th><strong>Student Actions</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Teacher Actions</strong></td>
<td><strong>Student Actions</strong></td>
</tr>
<tr>
<td>Teachers are facilitating and supporting student leaders</td>
<td>Students are willing to lead</td>
</tr>
<tr>
<td>Gradually releasing instruction</td>
<td>Demonstrating comfort with asking other students to justify their thinking</td>
</tr>
<tr>
<td>Modeling think alouds and good leadership skills</td>
<td>Paying attention to the leader</td>
</tr>
<tr>
<td>Encouraging student participation</td>
<td>Demonstrating open mindedness and flexibility in their thinking</td>
</tr>
<tr>
<td>Switching up student leaders to include all levels</td>
<td>Using appropriate mathematics vocabulary/language</td>
</tr>
<tr>
<td>Modeling vocabulary and routines</td>
<td>Engages in helping pairs-high/low students working together</td>
</tr>
<tr>
<td>Mistakes are welcome opportunities for learning</td>
<td>Shows willingness to take a risk and accept constructive criticism</td>
</tr>
<tr>
<td>Setting clear expectations of materials</td>
<td>Demonstrates responsibility and respect towards materials</td>
</tr>
<tr>
<td>Structuring environment to lend to cooperative and interactive learning</td>
<td></td>
</tr>
<tr>
<td>Providing accessibility to materials</td>
<td></td>
</tr>
<tr>
<td>Arranging tables/desks in ways that promote student discussion and learning</td>
<td></td>
</tr>
<tr>
<td>Provides area and/or projector for sharing work</td>
<td></td>
</tr>
</tbody>
</table>
## Monitoring Learning/Assessment

<table>
<thead>
<tr>
<th><strong>Teacher Actions</strong></th>
<th><strong>Student Actions</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Administering Quick Quizzes based on pacing guide</td>
<td>Justifying thinking through drawing, writing, numerical representation</td>
</tr>
<tr>
<td>Analyzing/reflecting on data and planning for differentiation as needed</td>
<td>Recalculating problems based on feedback</td>
</tr>
<tr>
<td>Administer End of the Year Tests</td>
<td>Setting goals for growth</td>
</tr>
<tr>
<td>Administer Beginning of the Year Tests</td>
<td>Explaining thinking and understanding of concepts</td>
</tr>
<tr>
<td>Providing feedback to students</td>
<td>Actively engaging in classroom discussions</td>
</tr>
<tr>
<td>Using data to guide instruction/small groups</td>
<td>Participating throughout activities and lessons</td>
</tr>
<tr>
<td>Utilizing checklists</td>
<td>Collaborating with peers; problem solving and math discussions</td>
</tr>
<tr>
<td>Actively monitoring student engagement</td>
<td>Utilizing proof drawings to demonstrate understanding</td>
</tr>
<tr>
<td>Organizing and using anecdotal records</td>
<td>Asking clarifying questions</td>
</tr>
<tr>
<td>Using exit slips to gauge student understanding</td>
<td>Explaining understanding of concepts</td>
</tr>
<tr>
<td>Utilizing Math Notebooks</td>
<td></td>
</tr>
<tr>
<td>Utilizing Journal Prompts</td>
<td></td>
</tr>
</tbody>
</table>

## Reflective Questions

<table>
<thead>
<tr>
<th><strong>Classroom Environment</strong></th>
<th><strong>Instructional Routines</strong></th>
<th><strong>Monitoring Learning/Assessment</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>How might you gradually release leadership to students?</td>
<td>In what ways might you make connections between the daily routine and previous or current concepts?</td>
<td>In what ways might you know if students have learned it?</td>
</tr>
<tr>
<td>How might you encourage risk taking?</td>
<td>As you reflect on mathematics instruction, what might be the supports you provide students to be successful?</td>
<td>How might you respond if students did not learn it or already know it?</td>
</tr>
<tr>
<td>What are some ways in which students demonstrate an understanding of math vocabulary?</td>
<td>In what ways might you engage your students throughout mathematics instruction?</td>
<td>How might you determine if there are concepts the whole class is missing or concepts an individual student are missing?</td>
</tr>
<tr>
<td>In what ways might you establish a collaborative environment built on trust and teamwork?</td>
<td>As you reflect on communication, how might you encourage students to be flexible in their thinking?</td>
<td>How might you use different assessments throughout a lesson/Big Idea/Unit?</td>
</tr>
<tr>
<td>What are some ways in which you ensure that students of all ability levels have the opportunity to be a student leader?</td>
<td>How might you refer back to the daily objective throughout a lesson/unit?</td>
<td>How might you provide meaningful feedback on student growth?</td>
</tr>
<tr>
<td></td>
<td>What might be some ways that you analyze data to plan conversations for math intervention, reteaching or enrichment?</td>
<td>In what ways might you use data to guide your daily instruction?</td>
</tr>
<tr>
<td></td>
<td></td>
<td>How might you know that all students are actively engaged?</td>
</tr>
<tr>
<td></td>
<td></td>
<td>In what ways might you hold all students accountable?</td>
</tr>
</tbody>
</table>
# Practices/Processes

## Solves Problems/Math Sense-Making

<table>
<thead>
<tr>
<th>Teacher Actions</th>
<th>Student Actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facilitating mathematical discussions</td>
<td>Students are explaining various methods they used to solve problems</td>
</tr>
<tr>
<td>Expanding students' thinking and discussion</td>
<td>Editing and revising student thinking/methods</td>
</tr>
<tr>
<td>Modeling use of mathematical vocabulary/language</td>
<td>Collaborating with other students to explain thinking</td>
</tr>
<tr>
<td>Clarifying students' thinking</td>
<td>Questioning their own and others' thinking</td>
</tr>
<tr>
<td>Modeling what good constructed responses look like</td>
<td>Showing engagement throughout the lesson</td>
</tr>
<tr>
<td>Modeling multiple strategies and approaches</td>
<td>Communicating in an effective manner with peers</td>
</tr>
<tr>
<td>Questioning to guide students' deeper understanding of math concepts</td>
<td>Using efficient methods to solve problems</td>
</tr>
<tr>
<td>Allowing students time to explain/model thinking</td>
<td>Demonstrating perseverance and grit</td>
</tr>
<tr>
<td>Providing opportunities for students to verbally and visually show thinking</td>
<td>Showing willingness to try new strategies</td>
</tr>
<tr>
<td>Intentionally grouping students to promote communication and flexibility</td>
<td>Learning from and explaining mistakes</td>
</tr>
<tr>
<td>Emphasizing how solutions are obtained equals that of the strategy used</td>
<td>Learning from peers</td>
</tr>
<tr>
<td>Modeling questioning strategies</td>
<td>Showing ability to explain and expand on their peers' thinking</td>
</tr>
<tr>
<td>Modeling how mistakes are a part of the learning process</td>
<td>Comparing their work/strategies to a peers</td>
</tr>
<tr>
<td>Establishing real world connections</td>
<td>Making connections to real world examples and to prior knowledge</td>
</tr>
<tr>
<td>Allowing students to engage in productive perseverance</td>
<td>Providing parents with curricular information to further help problem solving at home</td>
</tr>
<tr>
<td>Providing parents with curricular information to further help problem solving at home</td>
<td>Students are explaining various methods they used to solve problems</td>
</tr>
<tr>
<td>Editing and revising student thinking/methods</td>
<td>Collaborating with other students to explain thinking</td>
</tr>
<tr>
<td>Questioning their own and others' thinking</td>
<td>Showing engagement throughout the lesson</td>
</tr>
<tr>
<td>Showing engagement throughout the lesson</td>
<td>Communicating in an effective manner with peers</td>
</tr>
<tr>
<td>Using efficient methods to solve problems</td>
<td>Demonstrating perseverance and grit</td>
</tr>
<tr>
<td>Demonstrating perseverance and grit</td>
<td>Showing willingness to try new strategies</td>
</tr>
<tr>
<td>Showing willingness to try new strategies</td>
<td>Learning from and explaining mistakes</td>
</tr>
<tr>
<td>Learning from and explaining mistakes</td>
<td>Learning from peers</td>
</tr>
<tr>
<td>Learning from peers</td>
<td>Showing ability to explain and expand on their peers' thinking</td>
</tr>
<tr>
<td>Showing ability to explain and expand on their peers' thinking</td>
<td>Comparing their work/strategies to a peers</td>
</tr>
<tr>
<td>Comparing their work/strategies to a peers</td>
<td>Making connections to real world examples and to prior knowledge</td>
</tr>
</tbody>
</table>

## Modeling and Representing/Math Drawing

<table>
<thead>
<tr>
<th>Teacher Actions</th>
<th>Student Actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Providing accurate/meaningful models &amp; representations</td>
<td>Providing proof drawings</td>
</tr>
<tr>
<td>Guiding student practice</td>
<td>Collaborating with peers</td>
</tr>
<tr>
<td>Posing purposeful questions</td>
<td>Actively participating</td>
</tr>
<tr>
<td>Providing positive reinforcement</td>
<td>Assuming leadership roles</td>
</tr>
<tr>
<td>Encouraging use of a variety of or multiple strategies</td>
<td>Editing/Revising their work</td>
</tr>
<tr>
<td>Encouraging productive perseverance</td>
<td>Supporting/encouraging their peers</td>
</tr>
<tr>
<td>Building safe environment (agree/disagree, OK to make mistakes)</td>
<td>Providing multiple representations</td>
</tr>
<tr>
<td>Providing a variety of tools</td>
<td>Showing accurate/meaningful models</td>
</tr>
<tr>
<td>Verbalizing steps appropriately, clarifying student explanations</td>
<td>Agreeing and disagreeing in an appropriate and productive way</td>
</tr>
<tr>
<td>Finding appropriate opportunities to incorporate technology</td>
<td></td>
</tr>
<tr>
<td>Setting expectations for material use; setting expectations for participation and discussion</td>
<td></td>
</tr>
<tr>
<td>Utilizing wait time for maximum student engagement</td>
<td></td>
</tr>
<tr>
<td>Providing multiple opportunities for modeling and practice</td>
<td></td>
</tr>
<tr>
<td>Watching for common errors and misconceptions amongst students</td>
<td></td>
</tr>
</tbody>
</table>
## Communication/Math Explaining

<table>
<thead>
<tr>
<th>Teacher Actions</th>
<th>Student Actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Poses purposeful questions to find out multiple pathways to getting the answer</td>
<td>• Justifying thinking through verbal explaining, drawing, using manipulatives</td>
</tr>
<tr>
<td>• Restating/revoicing student thinking</td>
<td>• Restating/revoicing other student's thinking</td>
</tr>
<tr>
<td>• Allowing students to facilitate the discussion</td>
<td>• Asking questions</td>
</tr>
<tr>
<td>• Reinforcing mathematical vocabulary/language</td>
<td>• Engaging in Math Talk (may use sentence stems/starters)</td>
</tr>
<tr>
<td>• Observing/taking anecdotal notes of conversations</td>
<td>• Comprehending the explanations and solutions of peers</td>
</tr>
<tr>
<td>• Providing specific feedback</td>
<td>• Providing answers to questions</td>
</tr>
<tr>
<td>• Asks purposeful questions to build deeper understanding</td>
<td>• Actively listening</td>
</tr>
<tr>
<td>• Actively listening to student communication</td>
<td>• Adjusting their answers or drawings</td>
</tr>
<tr>
<td>• Encouraging student thinking</td>
<td>• Making connections</td>
</tr>
<tr>
<td>• Providing help to organize student thinking</td>
<td>• Monitoring their thinking</td>
</tr>
<tr>
<td>• Modeling appropriate math communication</td>
<td>• Keeping thoughts organized</td>
</tr>
<tr>
<td>• Providing time for student collaboration (structured &amp; unstructured)</td>
<td>• Using appropriate mathematics vocabulary/language</td>
</tr>
<tr>
<td>• Encouraging multiple strategies which allows all students to make connections and contributions, no matter ability.</td>
<td>• Explaining more than one way to solve a problem</td>
</tr>
<tr>
<td>• Asking clarifying questions</td>
<td>• Actively engaging in activities/showing accountability</td>
</tr>
<tr>
<td>• Providing sentence frames to assist with response formulation</td>
<td>• Providing written explanations</td>
</tr>
<tr>
<td>• Justifying thinking through verbal explaining, drawing, using manipulatives</td>
<td>• Reinforcing learning by teaching peers</td>
</tr>
<tr>
<td>• Restating/revoicing other student's thinking</td>
<td>• Adding on to the explanations of classmates if needed</td>
</tr>
<tr>
<td>• Asking questions</td>
<td></td>
</tr>
<tr>
<td>• Engaging in Math Talk (may use sentence stems/starters)</td>
<td></td>
</tr>
<tr>
<td>• Comprehending the explanations and solutions of peers</td>
<td></td>
</tr>
<tr>
<td>• Providing answers to questions</td>
<td></td>
</tr>
<tr>
<td>• Actively listening</td>
<td></td>
</tr>
<tr>
<td>• Adjusting their answers or drawings</td>
<td></td>
</tr>
<tr>
<td>• Making connections</td>
<td></td>
</tr>
<tr>
<td>• Monitoring their thinking</td>
<td></td>
</tr>
<tr>
<td>• Keeping thoughts organized</td>
<td></td>
</tr>
<tr>
<td>• Using appropriate mathematics vocabulary/language</td>
<td></td>
</tr>
<tr>
<td>• Explaining more than one way to solve a problem</td>
<td></td>
</tr>
<tr>
<td>• Actively engaging in activities/showing accountability</td>
<td></td>
</tr>
<tr>
<td>• Providing written explanations</td>
<td></td>
</tr>
<tr>
<td>• Reinforcing learning by teaching peers</td>
<td></td>
</tr>
<tr>
<td>• Adding on to the explanations of classmates if needed</td>
<td></td>
</tr>
</tbody>
</table>

## Make Connections/Math Structure

<table>
<thead>
<tr>
<th>Teacher Actions</th>
<th>Student Actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Using the curriculum as a tool to make connections between standards.</td>
<td>• Making real world connections</td>
</tr>
<tr>
<td>• Facilitating real world connections</td>
<td>• Making connections between math concepts</td>
</tr>
<tr>
<td>• Activating students' prior knowledge</td>
<td>• Building on the concept/thinking offered by other students</td>
</tr>
<tr>
<td>• Encouraging students to expand on their thinking</td>
<td>• Making connections between operations</td>
</tr>
<tr>
<td>• Allowing for student generated math stories/problems</td>
<td>• Extending vocabulary across curriculum in all areas</td>
</tr>
<tr>
<td>• Providing opportunities for students to make cross-curricular connections</td>
<td>• Generating real world problems</td>
</tr>
<tr>
<td>• Giving real world examples for the students to work through ex. grocery store items</td>
<td>• Applying learning to real world context</td>
</tr>
<tr>
<td>• Modeling making connections (i.e. think aloud)</td>
<td></td>
</tr>
</tbody>
</table>
### Reflective Questions

<table>
<thead>
<tr>
<th>Solves Problems/ Math Sense-Making</th>
<th>Modeling and Representing/ Math Drawing</th>
</tr>
</thead>
<tbody>
<tr>
<td>➢ When facilitating a mathematical discussion, what are you mindful of?</td>
<td>➢ In what ways might you choose students to share answers?</td>
</tr>
<tr>
<td>➢ In what ways might you support a student who is struggling so he/she can be successful?</td>
<td>➢ In what ways are students using various models to show their thinking?</td>
</tr>
<tr>
<td>➢ What might be some other ways to engage your low and high learners?</td>
<td>➢ How might you model risk taking for students to share their answers?</td>
</tr>
<tr>
<td>➢ What might you consider when you decide to move on to the next activity within a lesson?</td>
<td>➢ What patterns do you notice moving from concrete to abstract models?</td>
</tr>
<tr>
<td>➢ How might you support the new math vocabulary for all your students?</td>
<td>➢ How might you encourage productive perseverance?</td>
</tr>
<tr>
<td>➢ How might you use real world math examples to illustrate a math problem?</td>
<td>➢ How might you encourage students to offer each other constructive feedback or questioning?</td>
</tr>
<tr>
<td></td>
<td>➢ How might you differentiate with your students?</td>
</tr>
<tr>
<td></td>
<td>➢ How might you incorporate technology?</td>
</tr>
<tr>
<td></td>
<td>➢ How might you help parents support their kids at home with modeling and use of manipulatives?</td>
</tr>
<tr>
<td></td>
<td>➢ In what ways might you organize mathematical tools so they are accessible for the students to use?</td>
</tr>
<tr>
<td></td>
<td>➢ How might you provide opportunities for students to learn how to use the manipulatives during instruction?</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Communication/ Math Explaining</th>
<th>Make Connections/ Math Structure</th>
</tr>
</thead>
<tbody>
<tr>
<td>➢ How might you support students who have a difficult time expressing themselves?</td>
<td>➢ In what ways might you create space and time for students to share their connections?</td>
</tr>
<tr>
<td>➢ In what ways might you provide scaffolding to help students ask meaningful questions?</td>
<td>➢ In what ways might you know what the students have learned? What strategies might you use to activate prior knowledge? How might activating prior knowledge enhance teaching and learning?</td>
</tr>
<tr>
<td>➢ How might you display math vocabulary in a way that encourages students to refer to them during discussion?</td>
<td>➢ In what ways might allow students to demonstrate their thinking in a variety of ways?</td>
</tr>
<tr>
<td>➢ In what ways can you go about showing multiple solutions, allowing equity between the students that share, and making connections between the progression of solutions?</td>
<td>➢ How do students communicate to their peers to explain stories/problems? What might be the intent of the teacher to prompt other students?</td>
</tr>
<tr>
<td>➢ How might you use feedback so it is specific, purposeful, and timely?</td>
<td>➢ How might you make connections with mathematics to other content areas?</td>
</tr>
<tr>
<td>➢ How might you reflect on your instructional practices in order to increase student engagement?</td>
<td>➢ In what ways can we make connections between math and other content areas?</td>
</tr>
<tr>
<td>➢ In what ways do students have the opportunity to adjust their drawings and answers?</td>
<td>➢ In what ways might have you provided the skills/knowledge necessary to apply students learning at a higher-level?</td>
</tr>
<tr>
<td>➢ In what ways might you pose purposeful questions to encourage student thinking?</td>
<td></td>
</tr>
<tr>
<td>➢ How might you document student responses/answers/drawings for those students who have a hard time changing and modifying their work?</td>
<td></td>
</tr>
<tr>
<td>➢ In what ways might you go about ensuring that multiple strategies are shared, allowing students to make connections and contributions?</td>
<td></td>
</tr>
<tr>
<td>➢ How might you scaffold written responses for students?</td>
<td></td>
</tr>
<tr>
<td>➢ In what ways might you ensure that all students are justifying their thinking? (including written and drawings)</td>
<td></td>
</tr>
<tr>
<td>➢ How might you be modeling how to restate student thinking and encourage students to do the same with their peers?</td>
<td></td>
</tr>
<tr>
<td>➢ What might be some routines/procedures/supports that provide students the opportunity to use math vocabulary?</td>
<td></td>
</tr>
<tr>
<td>➢ How might you model active listening to your students?</td>
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</tbody>
</table>
PROBLEM OF PRACTICE
- The focus of an instructional round is the “Problem of Practice”.
- Problems are about finding solutions.
- “Something that would make a difference for student learning if we improved it...” - Richard Clune, Instructional Rounds in Education

PROBLEM OF PRACTICE
Communication in Mathematics
- How do we provide opportunities for students to engage in mathematical discourse?

Related questions:
- In what ways are students & teachers communicating about math?
- How does mathematical discourse move beyond just “talking”?

Math Background/Practices:
- Advances the understanding of the entire class.
- Analyzes and compares approaches, perspectives and arguments.
- Includes verbal, visual and written communication.

STRUCTURE
- Total time: 90 minutes
- Each group is led by a Rounds Facilitator

Pre Observation Conference:
- 10 minutes
- Protocol
- Frame the problem
- Problem of practice
- Host Building Contact
- Transition
- Observations
  - 10 or 15 minutes: 45 minutes
- Transition

Post Observation Debrief:
- 30 minutes
- Individually review notes and identify key observations
- Identify common themes in small group
- Each group shares common themes they observed
- Wrap
- Next Steps

HOST BUILDING INFORMATION & FAQs
- Host buildings are taking a risk by opening their doors, for that, they are greatly appreciated.
- About all of our learning.
- Remember the teachers we will see are not necessarily the experts. We want to observe the interaction between teachers, students, and context.
- Practice vs. Process.
- For this round, the observed teacher will not sit in on the debrief.
- Individual feedback will not be given to the teacher. Data is in aggregate form.
- System Wide Learning
- Next steps:
  - Feedback at ROUNDS (March)
  - Next Rounds: Fall 2017
**Instructional Rounds**

**Pre-Observation Facilitation Guide**

*Pre-Observation will be done whole group*

**Time**
- 8 minutes max

**Welcome and Expectations**
- Remind participants that this is about our learning at a systems level.
- Pre Observation Reminders
  - Rounds are non-evaluative
    - They do not count as a walkthrough or evidence for the evaluation
    - No feedback to individual teacher
    - Do not share comments from group members with the individual teacher.
  - Not an implementation check
- If asked for individual feedback “We appreciate you opening your doors to learning about mathematics communication, the observations helped us have rich conversations about mathematics instruction.”

**Problem of Practice**
- Remind participants that our objective is to observe the Instructional Core (interaction between teacher, student, content, and task) as it relates to our Problem of Practice:
  - *How do we provide opportunities for students to engage in mathematical discourse?*

**Protocols**
- Visits are 15 minutes each, we will do 3.
- Enter and leave as a group.
- Refrain from acknowledging the teacher or class upon entering.
- Move about the room, and talk to students when appropriate.
- Refrain from talking to network colleagues in the class or hall.
- Utilize the Note Taking Guide

**Building Context**
- This is an opportunity for the host principal to provide any background information or context prior to the visit.

**Transition to classrooms for Instructional Rounds.**
APPENDIX I
INSTRUCTIONAL ROUNDS OBSERVATION FORM
Observation # ________________

**Problem of Practice:** How do we provide opportunities for students to engage in mathematical discourse?

<table>
<thead>
<tr>
<th>Teacher Action</th>
<th>Student Actions</th>
<th>Questions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tbody>
</table>

**Next Steps:** Based on my learning today, what might my next step(s) be?
Instructional Rounds
Post Observation Debrief Facilitation Guide

Rounds Facilitator,

Thank you for facilitating this excellent professional learning opportunity. Please utilize these structures and questions during the Post-Observation debrief with your rounds group. It is important to adhere to the timing of each piece.

Time

- 30 minutes

Debrief Reminders

- Conversations are about the Instructional Core - Interactions between teacher, students, content, and tasks.
- Please refrain from making judgemental observations/comments about the teacher.
- None of the information in this conversation can be used in an evaluation or should be shared with the individual teacher.

Debrief Structure

1. Independently: (3 minutes)
   a. Review your notes
   b. Identify specific themes and items you would like to share or discuss

2. Small Group: (5-7 minutes)
   a. Identify and discuss common themes
   b. Try for a couple of common themes that you would like to share with the whole group.
   c. Identify a group member (other than facilitator) who will share themes with the whole group.

3. Small Group Sharing: (6-8 minutes)
   a. Each group shares their common themes with the whole group
   b. One of the facilitators should be keeping track of all of the common themes

4. Whole Group Discussion: (11-16 minutes)
   a. Discuss common themes, thoughts, ideas, next steps
   b. Based on our learning, what might be some next steps us?

5. Closing: (1 minute)
   a. Thank the group for their time and discussion
   b. Remind them we will expand on our conversation at Elementary Curriculum meetings with the large group
   c. We will also ask for feedback on this process.
### Observations

**What did we learn?**

- Variety of ways to engage kids in whole group and small group
- As a teacher you have to have that discourse in the back of your mind in conjunction with getting through the lesson
- Engagement looks different at each of the grade levels.
- Older students were more independent.
- Element of risk taking in trying to increase discourse.
- Some teachers are more comfortable than others with facilitating student discourse.
- It was evident when a teacher had a strong mathematical background.
- Students had to show learning.
- Variety of opportunities lead to more engagement.
- Evident that structures and routines had been set up over year. This is necessary.
- Some of the older students had a more difficult time taking risks with discourse (maybe because the way they've traditionally learned math is very different)
- Expectations at lower grade levels can be higher than they possibly are.
- The problem solving or inquiry approach comes more naturally for some teachers or in some classrooms than others.
- Conversations about math are becoming more natural.
- Stepping away the evaluative lens. Focusing on growing as evaluators by spending time discussing with peers.
- Vocabulary is used very fluidly amongst...
<p>| What were some next steps you walked away with? |<br />
|------------------------------------------------|---|
| ● 2nd grade teacher should see instruction in a 1st and 3rd grade class. |<br />
| ● I was affirmed. |<br />
| ● The need for teachers to experience a similar observation and debriefing process. |<br />
| ● Progression of the scope and sequence-vertical teaming |<br />
| ● How could we use instructional rounds in our own building to promote growth? |<br />
| ● Engagement strategies for teachers |<br />
| ● Ability to preplan and be responsive to students immediate needs |<br />
| ● Baseline data using the effective mathematics practices resource |<br />
| ● Create instructional resources and strategies that can be shared amongst teachers |<br />
| ● Teachers need more time to observe other teachers |<br />
| ● Having the opportunity to talk through feedback as a group is more powerful than a solo observation |<br />
| What are some pieces of information and/or next steps we need to consider at the district level? |<br />
| ● Need more with cooperative learning structures and grouping across subject areas. |<br />
| ● Want teachers to be able to do this and learn from each other. |<br />
| ● How do you share with teachers, instructional strategies that are working from one class to the next? |<br />
| ● Have done this, but required subs. |<br />
| ● Could we utilize Mathematical Mindset teams to leverage this practice. Could they teach a lesson and video. |<br />
| ● Leverage video to ease into Instructional Rounds. |<br />
| ● Whole group engagement strategies |<br />
| ● Additional sub days to support instructional growth for staff (ability to spend our budget towards these additional days) |</p>
<table>
<thead>
<tr>
<th>Restructuring Mindset team topics or Fall Workshop so that teachers have more collaborative time</th>
</tr>
</thead>
<tbody>
<tr>
<td>If you did not attend a round, what are some things you would like to know?</td>
</tr>
<tr>
<td>Management component</td>
</tr>
</tbody>
</table>

**Structure**

<table>
<thead>
<tr>
<th>Length of instructional rounds (90 mins)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location is also important. Hard to have the time to get to some buildings.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Length of observations (45 mins/3x15 mins)</th>
</tr>
</thead>
<tbody>
<tr>
<td>We liked the 15 minutes observations.</td>
</tr>
<tr>
<td>Maybe debrief a little after each observation instead of all at the end. This would help gather thoughts and look for certain things in next observation.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Length of debrief (30 mins)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liked the variation of small group and whole group.</td>
</tr>
<tr>
<td>Good to hear from the other groups and see how they plan to use the information to become better instructional leaders.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Use of Mathematics Observation Tool</th>
</tr>
</thead>
<tbody>
<tr>
<td>Helped narrow my focus.</td>
</tr>
<tr>
<td>Good use for teachers to focus on strengths and weaknesses</td>
</tr>
<tr>
<td>Good to use one area of the tool at a time.</td>
</tr>
</tbody>
</table>