

ELEMENTARY TEACHER PERCEPTIONS OF MATH PROFESSIONAL
DEVELOPMENT ON MATHEMATICS INSTRUCTION

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by
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ABSTRACT

The purpose of this heuristic case study was to describe the professional development experiences of kindergarten to fifth grades teachers that participated on a mathematics action research team and represented five different elementary schools in a large suburban school district. The central question for this study was: How do teachers, who participate on a mathematics action research team, perceive their experiences with professional development? Data collection included personal narratives in the form of journal entries, individual teacher interviews, and a theoretical focus group interview. Teachers gained confidence and motivation as they witnessed their students develop confidence in themselves as mathematicians. Collaboration with other teachers was a critical element in the process of teachers transforming their instructional practices. Implications for leadership suggest that relevance of professional development is the foundation for supporting teachers in transforming their instructional practices.

APPROVAL PAGE

The faculty listed below, appointed by the Dean of the School of Education have examined a dissertation titled “Elementary Teacher Perceptions of Math Professional Development on Mathematics Instruction,” presented by Chad Sutton, candidate for the Doctor of Education degree, and certify that in their opinion it is worthy of acceptance.

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CONTENTS

ABSTRACT.....	iii
LIST OF ILLUSTRATIONS.....	x
LIST OF TABLES.....	xi
ACKNOWLEDGEMENTS.....	xii
Chapter	
1. INTRODUCTION.....	1
The Problem.....	2
Purpose of the Study.....	5
Research Questions.....	6
Theoretical Framework.....	7
Demographics and the Changing Face of America’s Public Schools.....	11
Transformative Learning Theory.....	13
Self-Efficacy.....	17
Leadership for Transformation.....	19
Overview of Methodology.....	21
Significance of this Study.....	26
2. LITERATURE REVIEW.....	29
Changing Demographics and the Importance of Quality.....	30
Demographic Trends in the U.S. Public Schools.....	30
Teacher Quality and Changing Demographics.....	35
High Quality Professional Development.....	38
Transformation.....	41

Transforming Adult Learning	42
Self -Efficacy	47
Collective Efficacy.....	52
Power Dynamics and Transforming Teaching Practices of Adults	54
Professional Development Models for Transformation	56
Leadership for Transformation	59
Leadership for Transforming Teacher Practices.....	60
Power Dynamics and Leadership within Organizations.....	66
3. METHODOLOGY	70
Rationale for Qualitative Research	72
Case Study	75
Heuristic Inquiry	77
Role of the Researcher	78
Design of the Study.....	80
Setting, Participants and Sampling Techniques.....	80
Data Sources	81
Data Analysis Procedures	86
Limits and Ethical Considerations	90
Potential Ethical Problems.....	95
Discussion of Ethical Review Protocol.....	96
4. FINDINGS	98
Reflection about the Process	99

Setting and Participants	100
Telling the Story of the Data	102
Data Analysis Procedures.....	102
Within-Case Analysis.....	105
Case 1 – Erin	108
Case 2 – Shawn	120
Case 3 – Nicole.....	131
Case 4 – Jackie	144
Case 5 – Madison	153
Case 6 – Christy	163
Answering the Research Questions: Cross Case Analysis.....	172
Question 1.....	174
Question 2.....	175
Question 3.....	176
Question 4.....	178
Summary	179
5. CONCLUSION AND RECOMMENDATIONS	181
Leadership for Relevance.....	182
Leadership for Action.....	184
Leadership for Teacher Self-Efficacy	186
Leadership for Efficacy by Design.....	188
Recommendations	190
Prioritize Peer Collaboration.....	191

Establish a Positive and Safe Learning Environment.....	192
Intentional Planning	193
Develop an Inquiry Based Model.....	195
Suggestions for Future Research.....	196
Final Thoughts.....	197
 Appendix	
A. Consent Form School District Approval.	199
B. Principal Participant Recruitment Form.....	200
C. Teacher Recruitment Letter.....	202
D. Teacher Participation Consent Form.....	205
E. Teacher Journal Response Questions.....	210
F. Teacher Interview Protocol.....	211
G. Focus Group Protocol.....	212
REFERENCES	213
VITA.....	226

LIST OF ILLUSTRATIONS

Figure	Page
1. Recommendations	191

LIST OF TABLES

Table	Page
1. Within Case Analysis	108
2. Cross Case Themes	173

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CHAPTER 1

INTRODUCTION

As public school districts strive towards effective utilization of financial resources allotted to them from their local, state, and federal government, it is imperative that school districts utilize these resources in a manner that improves outcomes for students. An effective use of limited financial resources is especially critical in this time of high stakes testing and high accountability. When it comes to the allocation of these resources, school districts have difficult decisions to make. Competing priorities such as staffing, textbook adoptions, and salary increases are just a few items that school districts must take into consideration as financial resources are allocated. However, investing resources to improve the quality of teachers is arguably one of the most important investments school districts can make. Archibald, Cogshall, Croft, and Goe (2011) add to this argument and state, “in order to ensure the effective implementation of high-quality professional development, states and districts must have a plan for financing the costs of professional learning activities” (p. 8). Financing professional learning for the adults in the school district in which I am responsible for has been a part of my job that I have taken very seriously. Each year, a significant portion of my budget is spent toward professional learning for the adults throughout the elementary schools. While resource allocation for professional learning may not be the challenge for some school districts, the type of adult learning experiences that districts provide become critical to the potential benefits that professional learning may have on student achievement.

The Problem

Research has supported the idea for a number of years that one-time professional development workshops do not impact changes in teacher's classroom practice, are conducted outside of the context of a school, and do not typically align with the day to day practice of a classroom teacher (Loucks-Horsley & Matsumoto, 1999). The problem of short-term professional has been a challenge for schools throughout our country for years. In most districts, teachers experience relatively few hours of professional development, which is not adequate for transforming their instructional practices. In considering transformation of instructional practice, Vetter (2012) defines this type of transformation as "when practitioners redefine and reposition viewpoints and affiliations" (p. 29). In order for practitioners to begin redefining their viewpoints, school leaders must provide teachers with adult learning experiences that span a significant number of contact hours throughout the course of a school year. Darling-Hammond, Wei, and Andree (2010) note the reality for the majority of teachers and state "in 2008, for example, most US teachers received most of their professional development in workshops of eight hours or less over the course of a year, the kind of one shot workshops teachers bemoan" (p. 2). Additionally, a report developed by Gulamhussein (2013) at the Center for Public Education suggests, "most professional development today is ineffective. It neither changes teacher practice nor improves student learning" (p. 3). The report goes on to note that one-time workshops operate under a faulty belief about teacher learning. The faulty belief is that the challenge teachers face is that they need more knowledge about effective teaching practices and once they have new knowledge of effective practices, they will change their practices (Gulamhussein, 2013).

The problem of short-term teacher professional development workshops manifests itself through a negative impact on teacher effectiveness and student learning as schools or school districts typically do not improve without a strong system of professional development (Darling-Hammond & Richardson, 2009; Gulamhussein, 2013; Guskey, 2009;) Darling-Hammond et al. (2010) further noted that experimental studies confirmed what already has been known about professional development; less than 14 hours of professional development activity appeared to have no impact on teacher effectiveness. Guskey (2009) supports a strong system for professional development that is well executed and benefits teachers. He explains that “it is probably safe to say that in fact, no improvement effort in the history of education has ever succeeded without thoughtfully planned and well implemented professional development activities designed to enhance educators’ knowledge and skills” (p. 226). Recent reform related to the implementation of the Common Core State Standards will require such a system. As school districts begin to implement these standards, the country will expect students to learn at higher levels than ever before. Wei, Darling-Hammond, and Andree (2010) clarify that without intensifying the support for high quality teacher learning, the capacity for teachers and leaders to meet these new challenges of the Common Core will be difficult.

The deep- rooted cause of this problem can be identified through a gap in the understanding of adult learning and the types of learning experiences that adult educators actually experience. Merriam (2008) comments, “the more we know about how adults learn the better we are able to structure learning activities that resonate with those adult learners with whom we work” (p. 93). Additionally, it is important to understand that effective adult

learning is different than effective student learning. Trotter (2006) states “adult development theories provide a framework for understanding how adult learners are different from younger learners, while also providing insight into devising better professional development programs to meet the needs of teachers at all phases of their careers” (p. 8). One of the frameworks for adult learning includes the important idea of context based adult learning. In this framework, Hansman (2001) states, “it is imperative that adult educators understand that learning can take place in many settings and therefore design programs that incorporate tools, context, and social interactions” (p. 49). Context based professional development was formally researched by Podhajski, Mather, Nathan, and Sammons (2009). Their study focused on literacy professional development that involved first and second grade female teachers. Both the experimental and control group were given a pre-test that measured their current expertise in early reading, spelling, and language structure. Upon completion of the pre-test, the experimental group participated in 35 hours of professional development in relation to teaching methods that could be utilized in their classrooms. The experimental group was also provided with periodic literacy coaching support throughout the school year. The result of the study indicated that the teachers in the experimental group perceived that their instruction in the classroom changed as a result of receiving professional development that was relevant to the context of their classroom.

As the problem with short-term professional development continues to impact schools throughout the country, policies that limit short-term professional development practices will need to be considered if transformation of instructional practice is truly desired. However, the purpose of this study was to focus on how teachers describe their professional development experiences. Throughout the examination of these experiences, I have deepened

my understanding of how professional development can be utilized to transform the instructional practices of teachers.

Purpose of the Study

The purpose of this heuristic case study was to describe the professional development experiences (or lived experiences) of grades 3-5 teachers in a large suburban school district that are participating on a mathematics action research team. Lived experiences are the subjective transactions that individuals encounter in the world; mediated by social and cultural influences that affect behavior, including either restricting or expanding possibilities (Esteban-Guitart & Moll, 2014). Professional development was defined as “a comprehensive, sustained, and intensive approach to improving teachers’ and principals’ effectiveness in raising student achievement” (Hirsh, 2009).

While the phenomena I studied were the professional development experiences of intermediate teachers, the major approach or tradition was case study through the lens of heuristic inquiry. Creswell (2013) notes the importance of defining a boundary in case studies by stating, “The key is to define a case that can be bounded or described within certain parameters, such as a specific place and time” (p. 98). Developing an inquiry of grade K-5 teachers that are participating in a form of professional development known as a mathematics action research team provided me with a clear boundary, which is a consistent feature of case studies. Additionally, this case study research focused on real life cases that were occurring while the research was taking place which according to Creswell (2013) is characteristic of case study; “typically, case study researchers study current, real life cases that are in progress so that they can gather accurate information not lost by time” (p. 98).

The tradition of Heuristic inquiry has a strong historical connection to the tradition of phenomenology. Patton (2002) states, “heuristics is a form of phenomenological inquiry that brings to the fore personal experiences and insights of the researcher” (p. 107). The heuristic nature of this case study was my ability as the researcher to incorporate personal experiences with the phenomena being studied throughout the research (Patton, 2002). As I have had a significant number of professional development experiences throughout the past years, my knowledge of this topic assisted me in deeply understanding the experiences of the subjects in this study.

Through this study, my goal was to identify the characteristics of professional development experiences that teachers perceive as supportive for transforming their classroom practice. Additionally, I wanted to identify other types of professional development experiences that could assist educational leaders in understanding what effective professional development looks like in the context of a school-based setting. In order to achieve the goal of identifying characteristics of professional development that teachers perceived were supporting them in transforming their instructional practice, the next section will outline the research questions that were utilized throughout my inquiry.

Research Questions

In considering the range of research questions that could be utilized for this study, I narrowed them down to one central question and three sub questions. The purpose of these questions was to gather specific information about teacher’s perceptions of their experiences with professional development as a member of a mathematics action research team. These questions served to guide the study in a direction that allowed for great depth and richness of the data collected in order to best address the purpose of this study. The following central

question and sub questions guided this study: How do teachers, who participate on a mathematics action research team, perceive their experiences with professional development?

- a. How do teachers perceive their professional development experience in relation to understanding the mathematical content they teach?
- b. What do teachers do to apply what they have learned in their classrooms?
- c. How do teachers experience motivation for transforming their instructional practice as a member of a mathematics action research team?

Through the development of these research questions, related theories that support this study were identified. The next section describes the theories and knowledge that form the theoretical framework for this study.

Theoretical Framework

Maxwell (2013) utilizes the term theoretical framework in a broad sense, stating that it refers to “the actual ideas and beliefs that you hold about the phenomena studied, whether these are written down or not; this may also be called the “theoretical framework” or “idea context” for the study. Most importantly, this framework centers on the researcher’s conception of the phenomena that is being studied and what is going on with this phenomena (Maxwell, 2013).

When addressing the problem of short-term professional development as a barrier for transforming the practices of teachers, there are many personal assumptions and beliefs that assisted me in making sense of this problem, thus establishing the purpose of this study. I brought to this study an assumption about the intent of some teachers to seek out professional development experiences in order to transform their teaching practices. Teachers that seek out professional development experiences seem to have an innate desire to constantly

improve their professional practice. In considering these classroom teachers who constantly seek out professional development experiences as an avenue to better their instructional practice, I have often found that it is difficult to articulate their behaviors and motivation for wanting to do so. This is especially difficult when the opportunities are not tied to movement across the salary schedule. Being conscious of these assumptions allowed me to look beyond straightforward answers in order to deeply describe the professional development experiences of grades 3-5 teachers participating in a mathematics action research team. On the other hand, there are also teachers that do not seem to be willing to seek out the opportunities to improve their professional practice through adult learning experiences. It seems as if these types of individuals will only seek out professional learning opportunities that are tied to an increase on the salary schedule or mandated by their school district.

My personal life experiences as well as the professional opportunities throughout my career have driven my passion for increasing teacher quality through professional development experiences of teachers. Growing up the son of a teacher and witnessing the amount of effort, time, and nightly commitment that my dad made to ensure his students were getting high quality learning experiences is a memory that will forever be with me. These personal experiences have manifested themselves into current beliefs and expectations that I hold for the profession of teaching. Additionally, my experiences have also shaped a set of values and beliefs about the profession of teaching that continue to influence my decision making today.

When I became an administrator for the first time thirteen years ago, I must admit that I did not have a solid approach on how to improve the school in which I was leading. However, through my personal commitment to on-going learning and through my graduate

degree studies, I began to assemble a set of beliefs, practices, and foundational knowledge that have driven me towards continuing to strive for ways to improve the quality of teachers and outcomes for students. Additionally, my beliefs have been influenced through leading professional learning activities for classroom teachers and building administrators.

Throughout my participation in professional development such as coursework in post-graduate classes, leadership workshops, and through reading professional literature, I have come to develop a strong passion for increasing the quality of teachers. I have established a firm belief that the quality of a school system cannot exceed the quality of its teachers. This belief drives my work in leading elementary and middle schools through the process of closing the gap between the instructional practices that research demonstrates makes a difference in student achievement and the actual classroom practices that typically utilized in the classroom setting. As student demographics continue to change in our public schools and more students enter our school system with academic deficits, the higher the sense of urgency I feel to improve the quality of instructional practices in our K-12 schools. After all, I believe that it is the educators in our schools that provide the best hope for students to be successful, especially those students that grow up in poverty.

Traditionally, my experiences with professional development could be seen and treated by the research community as a bias and an aspect of the research that must be eliminated if the study is going to be credible. However, Maxwell (2013) challenges this assumption through what he calls the use of experiential knowledge in the research process. He describes the use of this knowledge as a way to demonstrate the value that one's experiences can bring throughout the process of research. Maxwell (2013) adds, "Separating your research from other aspects of your life cuts you off from a major source of insights,

hypotheses, and validity checks” (p. 45). Therefore, throughout this study, my experiential knowledge served as an asset to this research study in that it allowed me to gain a deeper understanding of the phenomena of professional development experiences. Additionally, I was able to utilize my background knowledge of professional development and assimilate it with my new learning and experiences in this research process in order to make sense of the research.

In my search of literature, a problem that I found is the use of numerous definitions of professional development. Additionally, professional development and staff development are often utilized interchangeably. To resolve this problem, I utilized a definition for professional development that remained consistent throughout the study. For the purpose of this study, I utilized the Learning Forward (2012) organization’s definition of professional development, defined as a “comprehensive, sustained, and intensive approach to improving teachers’ and principals’ effectiveness in raising student achievement” (p. 1). As I reflect upon my personal experiences with professional development, this definition strongly aligns with my belief that professional development for educators can positively impact student learning.

Based on my search of literature and considering topics most closely related to my topic, I chose to examine four areas that assisted me in making meaning of the data collected throughout this study. These topics include changing demographics in America’s public schools, transformational/adult learning theory, self-efficacy, and leadership for transformation. While these are four separate topics, they are all very strongly connected. In order to understand why transformation of instructional practice is necessary in our schools, it is important to understand how the demographics throughout the public schools in the United States have changed throughout the past several decades. Understanding the changes in

student demographics can give insight into the type of instructional practices needed to meet the ever-changing needs of our population. In order to lead the transformation of instructional practice, it is important to be knowledgeable of transformational/adult-learning theory to understand how to lead the adult learner through the process of transformation. As adult learners experience a process of transformation and begin to have successful experiences, a belief in their abilities to positively influence student achievement through a new set of instructional practices is developed. Finally, it is important for teachers to have access to leadership for transformation throughout the process of transforming their instructional practice. Without the support of a transformation leader, it may be very difficult to transform teaching practices to best meet the needs of the changing demographic population in America's public schools.

Demographics and the Changing Face of America's Public Schools

In the fall of 2014, the U.S. department of education predicted that for the first time in the history of the United States, student populations in public schools will be drastically changed. A consistent change in America's demographics over the past several years has led to a decrease in the number of white students enrolled in public schools while the largest growth has been with Hispanic and Asian schoolchildren born in the United States (Krogstad & Fry, 2014). Most significantly, the Hispanic population enrolled in public schools shifted by more than 7% from the 1993 school year to the 2005 school year (Fry, 2007). To capture this dramatic shift in population, a report by Ron (2007) for the Center for Public Education stated that the United States is very close to not having a racial or ethnic group that comprises fifty percent or more of the overall population. Additionally, he notes that from the time period between the year 2000 and 2010, the United States saw a 9.7% increase in

their Hispanic population. In the same report released by the Center for Public Education in 2012, Ron (2007) added the following:

Changing patterns of fertility and immigration have put the United States on a short road to a population diversity never before experienced by a nation---a population in which all races and ethnicities are part of groups that make up a complex whole. At the same time, the Unites States faces an aging population of Baby Boomers who are concerned about running out of money before they run out of life, about the increasing cost of health care, and the need for a new definition of “old”. (p. 1)

The data in this report is in stark contrast to the past population makeup of the public schools throughout the United States. For example, during the 1993-1994 school year, approximately 31% of America’s public schools were made up of almost all white students. However, during the 2005 -2006 school year, this percentage changed to approximately 18% of America’s public schools serving mostly white students (Fry, 2007).

With many school districts throughout the country experiencing dramatic changes in the diversity of their schools, it is critical that as their demographics change, so do the educators. Howard (2007) builds on this idea and states, “change has to start with educators before it can realistically begin to take place with students” (p. 3). Central to the work of teachers experiencing demographic changes is building their cultural competence, or in other words their ability to build and maintain authentic relationships with students despite their differences (Howard, 2007). Another major challenge that public schools face with the changing demographics is the deep-rooted history of social dominance and justice within our public schools. The United States has a strong history of having systems of privileges and preference to certain demographic groups while other demographic groups are allowed to fail (Howard, 2007).

As changing demographics continue to influence public schools, it is also important for educational leaders to understand how changing demographics have historically impacted the teaching population. Hanushek, Kain, and Rivkin (2004), studied the problem of teacher attrition in public schools throughout the state of Texas that has experienced significant changes in demographics throughout the past 30 years. Researchers utilized student/teacher panel data on public elementary schools in Texas to deepen their understanding of school factors and teacher salaries that affect teacher transitions. The use of panel data serves the purpose of examining specific information over time. Their findings included strong evidence that as more students of color enrolled in public schools the probability that white teachers exited the school also increased. This was in contrast to the finding that when Black and Hispanic enrollment increased, Black and Hispanic teacher turnover reduced. The findings of this study are a stark reminder that as public schools continue to experience changes in student demographics, teacher retention may ultimately be a key to successfully educating all students. An additional factor will be for leaders to understand how to transform adult learning practices to best meet the challenges that student demographic changes may create.

Transformative Learning Theory

As leaders in America's public schools encounter rapid changes in student demographics, understanding how adults transform their instructional practice in order to meet the ever-changing needs of students may prove to be critical to the success of public schools. Developing this understanding of adult learning is the basis for the transformative learning theory. The transformative learning theory has gained significant ground throughout the past several years and is becoming a more prominent theory than andragogy. The

rationale for this prominence includes the idea that transformative learning theory can provide more guidance with teaching practices that are specific for adults (Taylor, 2007). This guidance can support educational leaders in utilizing the transformative learning theory with the adults in which they lead.

The transformative learning theory is centered on the belief that teachers should be involved in the decision making process about change. Marks and Printy (2003) add to this idea and state, “Whereas the transformational leaders plays a pivotal role in precipitating change, followers and leaders are bound together in the transformation process (p. 375). The results of bringing together teachers and leaders in the process of transformation can also have a positive impact on social justice and equity within an educational system. Brown (2006) conducted a quantitative study with forty graduate students enrolled in an Educational Administration program to measure the impact of transformative learning strategies on their attitudes toward issues of diversity in education. The findings of this study indicated that engaging in transformative learning strategies in a pre-service program can influence growth in awareness, acknowledgement, and action toward issues of social justice.

Developing an understanding of how adults transform their practice will also require an understanding of adult learning theory, also known as andragogy. Knowles (1970) describes andragogy as rooted in the Greek word *aner*, meaning a man and not a boy. This differs from the student centered learning model of pedagogy. Pedagogy has its roots in the word paid, which means “child” and agogus, meaning “leader of” (Ozuah, 2005). Ozuah (2005) adds, “It literally means the art and science of teaching” (p. 83).

While some people may view adult and student learning as one in the same, Knowles (1970) argues that andragogy is premised on some critical assumptions that differ from traditional student centered pedagogy. Knowles (1970) states that as individuals mature:

- 1) their self-concept moves from one of being a dependent personality toward being a self-directed human being; 2) they accumulate a growing reservoir of experience that becomes an increasingly rich resource for learning; (3) their readiness to learn becomes oriented increasingly to the developmental tasks of their social roles; and 4) their time perspective changes from one of postponed application of knowledge to immediacy of application, and accordingly, their orientation toward learning shifts from one of subject centeredness to one of performance centeredness (p. 45)

While Knowles (1970) argues that adult learning is distinct from student learning, not everyone agrees. Darbyshire (1993) addresses Knowles idea that as one matures, you become more self-directed; “this view encapsulates much of the deficit-mode thinking related to children’s education which sees them as essentially unwilling conscripts in an endeavor in which they have no motivation, interest or personal involvement” (p. 329). In addition, criticism still exists in relation to characteristics of learners that are solely associated with either adults or students. For example, Merriam (2001) states, “some adults are highly dependent on a teacher for structure, while some children are independent, self-directed learners” (p. 5). While disparagement still exists about the similarities and differences in adult and student learners, the intersection of adult and student learning is becoming more recognized. Ozuah (2005) highlights this idea and states, “it should be noted that andragogy contains an appreciation and acceptance of pedagogy in many instances” (p. 84).

In order to understand adults as learners, Taylor (2007) argues, “The transformative process is formed and circumscribed by a frame of reference. Frames of reference are structures of assumptions and expectations that frame an individual’s tactic points of view and influence their thinking, beliefs, and actions” (p. 5). Through connecting to an adult’s

frame of reference, a relevant learning experience can be provided, which ultimately increases the likelihood for transformation.

Taylor (2007) conducted a review of existing research in order to analyze current literature trends centered on transformative learning theory. Several databases were used in the search and were expected to meet three criteria. These criteria included the utilization of transformational learning as the primary theoretical framework, the research had a clear methodology section, and the research included findings that informed the future study of transformative learning theory. While there were several significant findings in this research, most notably was Taylor's conclusion, "that epistemological change among some participants was not adequate for a transformation to reach fruition. In other words, cognitive awareness of underlying epistemic assumptions and changing the form of meaning making was not enough" (p. 187). Providing specific steps and direction to support educators to act upon their newly acquired knowledge can be influential in the process of transformation (Taylor, 2007).

Since transformation is not as successful in a top down professional development model, Vetter (2012) implies that new learning by teachers acquired through professional development should be utilized within the context of the teacher's classroom which this causes transformation to come from within one's self. Another strategy that can support transformation is the process of critical reflection. Howard (2003) notes that critical reflection "attempts to look at reflection within morale, political, and ethical contexts of teaching" (p. 197). Mezirow (1990) adds to this idea: "Reflection enables us to correct distortions in our beliefs and errors in problem solving. Critical reflection involves a critique of the presuppositions on which our beliefs have been built" (p. 1).

As individuals move through the process of critiquing their presuppositions, beliefs that have been previously held may be altered and influence how teachers and leaders perceive their ability to lead others. The next section will address how both previous and new learning experiences may influence one's perceived ability to influence outcomes for students.

Self-Efficacy

As teachers engage in the process of transformation and make new meaning from both their previous experiences and new learning experiences, they can begin to develop a new sense of teacher self- efficacy. Friedman and Kass (2002) define teacher self-efficacy as “the extent to which a teacher believes that she or he can influence students’ behaviors and their academic achievement, especially of pupils with difficulties or those with particularly low learning motivation” (p. 675). My personal belief is that the self-perception that teachers have of their ability to influence all students can be positively changed as they gain new knowledge and skills through a transformative learning process. As new knowledge and skills are acquired, the more confident teachers will become of themselves when tackling the challenges of a more diverse student population and with students that exhibit low learning motivation. However, I believe the opposite is also true. If teachers do not transform their practices as they teach a more diverse student population, the more difficult it will be for an individual teacher to believe that he or she can make a difference in student achievement. Bandura (1982) builds on this notion of individual belief through the concept of perceived self-efficacy. He stated that “perceived self-efficacy is concerned with judgments of how well one can execute courses of action required to deal with prospective situations” (p. 122). These prospective situations for teachers can include the context of teaching a more diverse

student population than what they may be accustomed to in the past.

As teachers experience a transformative process and begin to develop a stronger sense of self-efficacy, a strong commitment to the teaching profession may also be critical for long-term success. For example, Ware and Kitsantas (2007) investigated if teacher and collective efficacy beliefs predict commitment to the teacher profession. The participants included 26,257 teachers and 6,711 principals that responded to a public school teacher questionnaire. Findings were the work environments in schools can enhance the commitment of teachers, especially those that are expected to have their students meet or exceed state standards. Therefore, the challenge for building leaders is to develop a positive work environment in order to enhance teacher commitment. Ware and Kitsantas point out that, “commitment is enhanced when teachers believe that they have efficacy to (a) enlist the support of their principals, (b) influence policies at their schools, and (c) control their instruction” (p. 309). These work environment conditions that promote the self-efficacy and commitment of teachers can also influence the self-efficacy of their students as well. As the self-efficacy strengthens for a teacher, those self-efficacious behaviors often translate themselves into their work with students; those that struggle academically can begin to develop a stronger sense of efficacy leading to increased motivation to learn and seek help from teachers (Ross & Bruce, 2007).

Leadership for Transformation

As teachers engage in a transformative process of learning, simply acquiring new knowledge is often not enough to transform instructional practice. Therefore, it is important that teachers have strong transformational leaders that are supportive through the process of change. Jason (2000) states that strong transformational leaders “are open to change and, more fundamentally, embrace its prospect since they realize that school improvement is inextricably connected with the personal and professional development of themselves and their staffs” (p. 2). This strong connection that transformational leaders have with their personal professional development and the professional development of their staff can enhance the support given to teachers as they apply new knowledge in the context of their classrooms.

A transformational leadership approach allows the principal to create a school culture in which diverse points of view are heard, respected, and valued. Hence, individuals are encouraged, not discouraged, to present their individual opinions. This collaborative approach encourages all staff engaged in the process of change to gain new insights from one another that may not have happened if such a collaborative culture was not established (Jason, 2000). Hallinger (2003) adds that this collaborative approach can also have an impact on the commitment of staff to understand the alignment “between what they are trying to accomplish and the mission of the school” (p. 338). Developing commitment through transformational leadership was also studied by Ross and Gray (2006). They hypothesized that transformational leadership would have direct effects on teacher commitment and indirect effects on teacher self-efficacy. Data in this study were collected from 3,074 teachers in 218 elementary schools. Findings were “transformational leadership had direct

effects on teacher commitment, independent of agency beliefs. Commitment to school mission was the strongest outcome, one that is especially important given evidence that is a strong predictor of group effectiveness” (Ross & Gray, 2006).

Transformational principals also develop a culture of commitment that places greater emphasis on the educational team and less emphasis on individuals working in isolation. In order to build a commitment centered on the group and organizational goals, Griffith (2004) notes that transformational leaders “through interpersonal relations, appeal to broad human moral and psychological needs. Moral needs include a sense of goodness, righteousness, duty, and self-actualization” (p. 334). As transformational leaders commit to appealing to the moral and psychological adult groups in which they lead, it is critical that they become cognizant of their own personal beliefs and assumptions as well. If leaders cannot align their beliefs and practices, the transformation process could be jeopardized. As leaders work toward developing an alignment between their beliefs and practices, a very important process for transformational leaders to engage staff in is the process of discourse centered on the current reality of instructional practices within the school. Such practice allows the leader to support teachers in the transformational process through making meaning of new experiences (Mezirow, 1997).

In addition to acquiring an understanding of transformation through the development of this research study, I have long held some personal beliefs about the process of transformation that have been developed through personal experiences. First, teacher transformation often begins with some sort of external pressure to change. That external pressure can exist in the form of teacher evaluation, changes in societal expectations, student achievement results, or as in the case outlined in this theoretical framework, the changing

demographics of the public schools throughout the United States. As teachers begin to engage in the process of transformation, acquiring new learning is simply not enough. It is how teachers utilize new learning and experiences to impact the learners in their classrooms that is significantly important. Therefore, it is critical that teachers have systems of support and accountability as they experience the process of transformation. When teachers begin to see the new knowledge that they have acquired through professional learning as having a positive impact on the achievement outcomes of their students, they will develop a stronger sense of self-efficacy. This stronger sense of self-efficacy then leads to a stronger commitment towards the goals of the school. Finally, in order for teacher transformation to have its greatest impact, building principals must create the conditions that foster teacher transformation. Building principals that lead through a transformational leadership style provide teachers with support that allows them to put their newly developed knowledge into action within the context of a supportive and reflective school culture. The design of the study intended to describe the professional development experiences (or lived experiences) of grades 3-5 teachers in a large suburban school district that are participating on a mathematics action research team.

Overview of Methodology

There are many variations and interpretations of the concept qualitative research. However, Ritchie, Lewis, Nicholls, and Ormston (2013) have assimilated the variations and provide clarity through stating qualitative research is “directed at providing an in-depth and interpreted understanding of the social world of research participants by learning about their social and material circumstances, their experiences, perspectives, and histories” (p. 3). In order to learn about the circumstances and experiences of others, the researcher must be

willing to commit a significant amount of time toward gathering a high level of detail from each participant in the research process. This detail can only be established by talking directly with people, going to their homes, or places of work, and allowing them to tell their own stories” (Creswell, 2013, p. 48).

For the purpose of this study, a qualitative research design permitted me to design and implement a study that focused on how teachers interpret their experiences within a specific professional development model termed “mathematics action research team.” Additionally, the qualitative method of research allowed me to interpret and construct social meaning from teachers’ experiences with professional development while also integrating my own experiences with professional development. Merriam (2002) explains the importance of socially constructed meaning as, ... “socially constructed by individuals in interaction with their world” (p. 3).

In addition to developing meaning through social interaction, qualitative research also allowed for an emergent design. Frankel and Devers (2000) state, “rather than thinking of qualitative research design as a blueprint containing exact specifications or a gold standard, a more appropriate image is of a rough sketch” (p. 253). Through the emerging design of this study, I had the ability to modify my central questions and sub questions as I learned new information during the data collection phase that may become pertinent to my study.

Qualitative researchers must establish trusting relationships with the participants in their study. Frankel and Devers (2000) add that “developing and maintaining good relationships are important for effective sampling and for the credibility of the research” (p. 265). Throughout the course of this study, I had the opportunity to build relationships with participants and closely examine the problem through observation and conversing

individually and collectively with the participants in the study. Most importantly, this data collection took place in the context of the setting in which participants typically experience the issue.

My study was a heuristic case study, which focused on creating an understanding of the individual experiences of teachers in relation to their professional development experiences. Additionally, I used my shared experiences with professional development throughout the process of interpreting the data collected. To examine these experiences, I centered my attention on the foundational question of heuristic inquiry which is “what is my experience of the phenomenon and the essential experience of others who also experience this phenomenon intensely” (Patton, 2013, p. 107). This essential question of heuristic inquiry strongly fit the rationale for why I studied this problem as it provided the opportunity to incorporate my personal experiences with professional development into this research study.

To deepen my understanding of the phenomena through the heuristic inquiry lens, the major technique that was used for this study was case study. Yin and Davis (2007) state, “the classic case study focuses on single entities—an individual, organization, decision, community, and the like” (p. 4). Johansson (2003) adds that “at a minimum, a case is a phenomenon specific to time and space” (p. 4). The specific time and space that bounded this study included a group of six teacher participants on a mathematics action research team during the 2016-2017 academic year. In order for me to develop a deep understanding of each case within a specific space and time, it required examination of evidence through multiple lenses. Yin (1981) states that this evidence “may come from fieldwork, archival records, verbal reports, observations, or any combination of these” (p. 58).

The research setting for this heuristic case study was conducted in multiple elementary schools throughout a large Midwest suburban school district. This setting was selected as the researcher had convenient access to the subjects in this research and has been directly involved with similar experiences as the teachers participating on the mathematics action research teams.

In 2016, the district that was be utilized for this study had 19,380 students divided into five major racial subgroups as described by the State Department of Education. The population of the three largest subgroups in the district of study in 2016 included: 12.8% black, 13.4% Hispanic, and 61.5 white. Forty-nine percent of students participated in the free and reduced lunch program (State Department of Education, 2016). The setting included grades K-5 teachers working in the context of a classroom with students, implementing their action research plans.

Throughout the past five years, the district of study has implemented a variety of professional development models in order to attempt supporting classroom teachers in transforming their instructional practices. Here after, the site of the study will be identified with the pseudonym of Clay School District. With teachers in this school district participating in a variety of professional development experiences, it was my goal to identify teachers for this study that had a strong background experiences with professional development that will provide clarity about the characteristics of professional development that have best supported them in transforming their instructional practice throughout their career.

The participants for this heuristic case study included 6 grade K-5-classroom teachers representing 5 of the 21 elementary schools in the school district of study. I used a multiple

case study design with each participant being considered an embedded case within the larger instrumental case. Through an instrumental case study design, “the researcher focuses on an issue or concern, and then selects one bounded case to illustrate the issue (Creswell, 2013, p. 99). Additionally, the study of the teachers participating on action research teams provided a clear case to study with parameters and the intent to deeply understand the case (Creswell, 2013).

In terms of sampling, the participants selected for this study began with teachers recommended by elementary principals in the Clay School District through snowball or chain sampling. Patton (2002) adds that snowball or chain sampling “is an approach for locating information-rich key informants or critical cases” (p. 237). The specific criteria shared with elementary principals for selection included teachers that are reflective about their classroom practices, are currently engaged in mathematics professional development, are learners and frequently try out new instructional practices after a professional development session, and are a K-5 classroom teacher. Upon receiving the names of participants, the criteria utilized for final participation selection in this study included specific grade level, diversity in student demographics, years of experience, race, and sex.

As the sampling was completed and the data collection process began, I developed a coding system that allowed me to take the vast amounts of information collected throughout the study and organize it into identifiable patterns and themes. Creswell (2013) describes the coding process as “aggregating the text or visual data into small categories of information, seeking evidence for the code from different databases being used in a study, and then assigning a label to the code” (p. 184). Patton (2002) adds that, “classifying and coding qualitative data produce a framework for organizing and describing what has been collected

during fieldwork” (p. 465). Organizing the data collected from individual interviews, journal entries, and focus groups allowed me to create a framework for organization and then determine themes and generalizations throughout the data. Johnson (1997) discusses the bottom line with generalizations and states “the more similar the people and circumstances in a particular research study are to the ones that you want to generalize to, the more defensible your generalizations will be and the more readily you should make such a generalization” (p. 290).

The intent of this study was to add to the current literature surrounding professional development that transforms teaching practices and to provide readers with a perspective from grades K-5 teachers in a large Midwest suburban school district. This study may also be valuable to district leaders, building leaders, and teacher leaders who are striving to develop professional learning experiences for teachers that are supportive in transforming instructional practices.

Significance of this Study

Increasing teacher quality through professional development has become a very important topic to American Educators over the recent years. While the concept of professional development is certainly not a new term in the United States, it is clear that many school districts throughout the country still struggle with implementing effective professional development models. A challenge for school districts seems to be in utilizing the research on professional development to actually translate it to professional development experiences that support teachers in transforming their instructional practice. Additionally, many U.S. teachers still experience traditional models of professional development. In a 2009 study conducted by Darling-Hammond, Wei, Andree, Richardson, and Orphanos, they

note, “more than 9 out of 10 U.S. teachers have participated in professional learning consisting of short term conferences or workshops” (p. 5). This study also found American teachers state that most of the professional development available to them is not useful (Darling- Hammond et al., 2009).

As public school districts continue to experience a “new normal” in an era of high accountability for increases in student achievement on high stakes assessments, having the highest quality teachers in front of students is as of utmost importance. Hightower et al. (2011), defines high quality teachers as “one that has a positive effect on student learning and development through a combination of content mastery, command of a broad set of pedagogical skills, and communications/interpersonal skills” (p. 5). Hattie (2003), adds to the importance of high quality teachers and indicates that teachers account for approximately 30% of the variance in student achievement. This percentage of variance in student achievement is only second to the experiences students actually bring to the classroom. With the percentage of variance in student achievement closely related to the effectiveness of the classroom teacher, Rockoff (2004) adds that empirical evidence suggests, “Raising teacher quality may be a key instrument in improving student outcomes” (p. 251).

In order to improve the quality of teachers, Darling-Hammond and Richardson (2009)

note:

current research suggests that providing intensive, content-rich, and collegial learning opportunities for teachers can improve both teaching and student learning. When schools support teachers with well-designed and rich professional development, those teachers are able to create the same types of rigorous and engaging opportunities for students—a foundation for student success in school and beyond. (p. 5)

The necessity to raise the quality of teachers in the United States is demonstrated through the most recent Programme for International Student Assessment (PISA) results. Kelly, Nord,

Jenkins, Chan, and Kastberg, (2013) add “In the United States, nine percent of 15-year old students scored at proficiency level 5 or above, which was lower than the OECD [Organisation for Economic Co-operation and Development] average of 13 percent. The U.S. percentage was lower than 27 education systems, higher than 22 education systems, and not measurably different than 13 education systems” (p. 9). Additionally, this focus on increasing the quality of teachers was a major emphasis of the No Child Left Behind Act of 2001 and will continue with the reauthorization of the 50-year-old Elementary and Secondary Education Act (ESEA) now distinguished as Every Student Succeeds Act (ESSA (U.S. Department of Education, 2015). I intended to present the findings of this study as a theoretical model that might be of value to the school district of study as well as external audiences.

CHAPTER 2

LITERATURE REVIEW

One of the most significant challenges that we face today in our public school systems is that of meeting the needs of all students. As our diverse population continues to grow throughout the United States, so must our knowledge as educators about how to best meet the needs of all learners. As I searched for literature centered on the transformation of teaching practices, the key terms and core ideas relative to my research topic included: content knowledge, leadership for change, characteristics of effective professional development, capacity, self-efficacy, experiences, impact, teacher induction, and beliefs. A search of the ERIC EBSCO database revealed 18 results, ERIC proquest yielded 2,660 results, Education full text database reflected 69 results, Article first revealed 21 results, World cat dissertations and theses showed 905 results, and Google Scholar revealed 1,710,000 results. In order to narrow my focus with the abundance of results, I examined articles that represented researchers and scholars that are well respected in their field along with scanning articles to determine which ones seemed to best support the topic of this research study. Finally, a gap that I noticed in the literature was in the area of how transformational leadership supports teachers in transforming their classroom practices. While I did locate some minimal research in this area, the volume of articles that I discovered was not significant. Therefore, this research study will add to the literature base for future school leaders in their quest to transform the instructional practice of their teachers.

I chose to examine four areas that assisted me in making meaning of the data collected throughout this study. In contrast to chapter one, this chapter will explore the

research base that supports the significance of specific topics in relation to teacher transformation of instructional practice. These specific topics include changing demographics and the importance of teacher quality, transformation of adult and student learning, self-efficacy, and leadership for transformation. All four of these topics are critically important to transforming teacher instructional practice within our school systems. As our countries demographics continue to change, it is important that leaders have a strong understanding of how to lead adult learners through a process of learning that supports transforming their instructional practice. Throughout this learning process, developing a belief in our teachers that they can meet the needs of their changing population and supporting this belief through strong transformational leadership will be critical to the success of our students.

Changing Demographics and the Importance of Quality

Demographic Trends in the U.S. Public Schools

Public school educators are on the edge of dramatic diversity changes throughout the United States. As a microcosm of society, our public school teachers see this change first hand within the context of their individual classrooms. Ron (2007) adds, “The face of our nation is changing, and nowhere is the change more evident than in public school classrooms (p. 1). In part, this change in demographics and increase in student population throughout the United States has been influenced by immigration throughout the past several decades. Fry (2007) adds “high levels of immigration have resulted in considerable growth in minority student populations, while white public school enrollments have modestly declined since 1993” (p.1). This change in demographics has been impacted mainly by a steady growth of both Asian school-age students born in the United States along with Hispanic students (Krogstad & Fry, 2014).

As schools and school districts embrace the opportunity to provide high levels of learning for a growing diverse population, engaging the entire school community is critical. Howard (2007) builds on this idea of engaging the community through stating “changing demographics have profound implications for all levels and functions of the school system. To create welcoming and equitable learning environments for diverse students and their families, school leaders must engage the entire school community” (p. 6). While a welcoming school environment is important for all families, they can be even more important for newly immigrated families. Portes and Smagorinsky (2010) describe the importance of this and adds that “for many immigrants and their children, schools can be alienating and frightening places full of angry and antagonistic classmates and their parents” (p. 241). While creating welcoming school environments can be critical to the early success of diverse students within our schools, they may also be critical to the future success of our country.

Ron (2007) states:

achievement gaps between student groups will have ever-more serious economic implications. Minorities have historically been under-represented in such professions as science, medicine, and engineering. With the non-Hispanic white population shrinking and the entry-level workforce increasingly made up of minorities, the nation could face serious shortages in many critical professions. (p. 1)

Potential economic implications are profound as the U.S. continues to experience demographic transitions; meanwhile, schools experiencing substantial changes with student populations may face significant challenges with existing school cultures.

Howard (2007) states that within some schools that are noticing substantial changes in their demographics, “some teachers, administrators, and parents view their school’s increasing diversity as a problem rather than an opportunity (p. 1). Gay (2010) states “the

ethnic, racial, cultural, social, and linguistic diversity that is growing by leaps and bounds in U.S. schools and society is a defining feature of our lives, even though we often try to deny its existence or minimize its significance in the educational enterprise” (p. 143). For public schools, a challenge is closing the cultural gap between the teachers and the students. Sleeter (2001) states, “It is widely recognized that the cultural gap between children in the schools and teachers is large and growing” (p. 94). In order to address this cultural gap, Richards, Brown, and Forde (2007) suggest that “as more and more students from diverse backgrounds populate 21st century classrooms, and efforts mount to identify effective methods to teach these students, the need for pedagogical approaches that are culturally responsive intensifies” (p. 64).

As the cultural gap between children and teachers grow, a transformation of our school system is necessary if we are to provide all students with the opportunity to live the American Dream. The United States for many years has been viewed as a nation sought after by immigrants to live the American dream. However, if the American dream is to become a reality of our changing population, our public school system is in need of transformation. Hochschild, Scovronick, and Scovronick (2004) add to the importance of public education in reaching the American dream by noting that public education “is arguably our most important domestic policy. It represents the nation’s greatest effort to turn ideology of the American dream into practice and it has accomplished a great deal for this country, recently as well as historically” (p. 2). Additionally, as educators work toward transforming school systems to meet the needs of a more diverse population, an impact on teaching and learning is inevitable. Black (2010) states, “increasing number of immigrants and increasing diverse cultural, economic, and geographic backgrounds have a great impact on teaching and

learning” (p. 93). In order to address the impact on teaching and learning, Howard (2007) believes that “rapidly changing demographics demand that we engage in vigorous, on-going, and systemic process of professional development to prepare all educators in the school to function effectively in a highly diverse environment” (p. 1).

As rapidly changing demographics continue to push the educational system toward developing a stronger understanding of the populations in which they serve, changing teacher perceptions of culturally diverse students through professional learning can play a critical role. Banks, Cookson, Gay, Hawley, Irvine, and Stephan (2001) state “professional development programs should help teachers understand the complex characteristics of ethnic groups within U.S. society and the ways in which race, ethnicity, language, and social class interact to influence student behavior” (p. 197).

While the intensified need to develop professional development programs to support teachers in understanding the complex characteristics of ethnic groups is critical, so is the need to identify pedagogical approaches that are effective for students from culturally diverse backgrounds. As this need to identify pedagogical approaches increases, not everyone is patiently waiting for them to be discovered. Gay (2010) adds that “more and more ethnically and racially diverse students, families, communities, and their advocates are demanding the right to be recognized, respected, and educated for who they are, instead of having to conform to Eurocentric norms as a condition for receiving high-quality educational opportunities” (p. 143). While the intensified need for more effective teaching methods for culturally diverse students is recognized, it still may not be the norm within the public schools in the United States. Additionally, this slow transition to teaching methods that best support a diverse group of student learners may be having an impact on teacher burnout.

Tatar and Horenzyk (2003) suggest, “that the stress and difficulties involved in working with a culturally diverse student body can contribute to professional burnout among teachers” (p. 398). This burnout can be a challenge for school and district leaders as it may ultimately impact the retention of teachers and cause a high level of annual teacher turnover.

Joshi, Eberly, and Konzal, (2005) conducted a study to better understand how teachers prepare learning experiences for a diverse student population. These researchers collected data related to how teachers make use of what they know about their students’ cultural backgrounds when planning for their instruction. The participants included 25 teachers in pre-k through 5th grade. A major finding indicated that teachers believed in the importance of knowing and understanding the cultures in which their students come from. However, in terms of considering student cultural diversity when planning for instruction, responses indicated that most teachers demonstrated consideration through the celebration of holidays and reading multicultural books instead of deeper meanings of culture.

With more and more ethnically and racially diverse groups pressing our public school system to ensure that all students are recognized and respected for who they are, one of the first factors that schools must acknowledge is teachers’ perceptions of cultural diversity. While the teacher’s perceptions of the students in which they teach can go a long way in supporting all students to achieve high levels of success, if negative perceptions exist, they can be detrimental to students’ learning. La Vonne, McCray, Johnson, and Bridgest (2003) explain how negative perceptions can influence the practices of teachers: “Teachers misunderstandings of reactions to students’ culturally conditioned behaviors can lead to school and social failure” (p. 49). In order to address such challenges a focus on ensuring the highest of quality teachers in our school systems is essential.

Teacher Quality and Changing Demographics

Research suggests that the most influential variable of student achievement within our schools is the quality of the classroom teacher (Hightower et al., 2011; Rockoff, 2004; Stronge, Ward, Tucker, & Hindman, 2007). Hightower et al. (2011) defines a high quality teacher as:

one who has a positive effect on student learning and development through a combination of content mastery, command of a broad set of pedagogical skills, and communication/interpersonal skills. Quality teachers are lifelong learners in their subject areas, teach with commitment, and are reflective upon their teaching practice. (p. 5)

In contrast to this definition, a different approach to defining a quality teacher was one of the key provisions to the No Child Left Behind Act. Goe and Stickler (2008) challenged the attempt of this law to define a high quality teacher as this law correlated highly qualified teachers with certification. In their research, they note that advanced degrees and teacher certification did not have a strong impact on the achievement of students. Therefore, the attempt of the No Child Left Behind Law to emphasize certification did not result in improved teacher quality and student achievement. Harris and Sass (2011) agree that the level of teachers' education, for example those with master degrees, does not always have a positive correlation to student achievement. In some cases, a negative correlation of the achievement of students in math or reading and teachers' levels of education exists. Croninger, Rice, Rathbun, and Nishio (2007) conducted a study to examine the effects of teacher certification and degree on the early learning of students. The data utilized were obtained from the National Center for Educational Statistics and included a sample of 23,000 kindergarten students from over 1,000 public and private schools in the United States. With each one of the Kindergarten students utilized in this study, the teacher qualifications and

certifications for these students were also obtained. The results of the study demonstrated that measures such as “certification status and possession of an advanced degree were not found to be related positively to elementary student achievement in reading; in the case of student achievement in mathematics, the relationship with possession of advanced degrees was actually negative” (p. 321). There is common agreement amongst most researchers that improving the quality of the classroom teacher is a key strategy in improving educational outcomes for students in our elementary and secondary schools (Harris & Sass, 2011; Hightower et al, 2011), but also toward improving the quality of the school as a whole. Therefore, improving teacher quality should be at the center of reforms aimed at improving the achievement throughout a school (Hanushek & Rivkin, 2006).

Rivers and Sanders (2002) support the importance of focusing on the quality of the classroom teacher as a means to improve student achievement. Their research suggests that the variable of the classroom teacher has much more of an influence than other factors such as class size, past levels of student achievement, and classroom diversity. Hattie (2003) also supports the emphasis on improving the quality of the teacher and highlights the importance of schools and school districts spending their time and their money on the major variables that influence the variance of achievement in students. In his research, he noted that approximately 30% of the variance in student achievement is related to the classroom teacher. While the focus on increasing the quality of the teacher may often be the strategy that leaders utilize to improve the short-term achievement results in their schools, the effect of a high quality teacher can have a long lasting impact on students. Rivers and Sanders (2002) indicate in their research that the classroom teacher will still influence the learning of the student for four years after leaving a teacher’s classroom. If a child experienced a series

of classroom teachers that are poor quality, the negative effects can be devastating and the child may never recover academically from this damage. While there is no clear answer as to how to improve the quality of teachers, the important concept for educators to understand is that the continuous development of teachers is critical if our students are to have quality learning experiences and teachers are to raise student achievement (Marcelo, 2009).

In order to improve the quality of teachers, school districts must place a strong emphasis on adult professional development models. For use in the re-authorized No Child Left Behind Act, professional development was defined by Learning Forward (2008) as a “comprehensive, sustained, and intensive approach to improving teachers’ and principals’ effectiveness in raising student achievement” (p. 1). In addition, this new definition calls upon school districts to make professional learning a normal part of the teacher’s workday instead of professional development being an event that occurs periodically throughout the year. It is also important that schools build upon the expertise that already exists within their school or district while at the same time work with external experts to support the learning needs within their building (Hirsh, 2009). With the expiration of the No Child Left Behind Act in 2015, the new Every Student Succeeds Act (ESSA) also emphasizes the importance of teacher quality in the quest of raising academic achievement. However, the approach with this new law will be different than the No Child Left Behind Act. ESSA will utilize poverty measures as a heavier weight in the allocation of federal grants such as Title II. This will provide more finances to improve teacher quality for high poverty school districts. Additionally, districts will have the autonomy to use monies from the Federal Title II grant to develop teacher preparation programs that allow candidates to be partnered with a mentor throughout an entire school year before taking over their own classrooms (Sawchuck, 2016).

While improving the quality of teachers and the identification of professional development models can certainly be a challenge, school districts throughout the country also face difficulties in recruiting and retaining high quality teachers that represent the diverse student populations exhibited within their schools. Eubanks and Weaver (1999) explain the importance of hiring teachers that represent diverse student populations and state “children of color need teachers who look like them, who share similar cultural experiences, and who can be role models to demonstrate the efficacy of education and achievement” (p. 452). Boser (2014) adds, “when students see teachers who share their racial or ethnic backgrounds, they often view schools as more welcoming places” (p. 3). If school districts are to create welcoming school environments, improve the quality of their teachers through a professional development model and recruit teachers that represent the diversity of their students, it is important that district leaders understand the key elements of high quality professional development.

High Quality Professional Development

In order to improve the quality of our teachers, educational leaders must engage them in high quality professional development that meets their needs in addressing our ever-changing student population. Therefore, as the demographic and cultural diversity within our schools continues to grow, so must our commitment to preparing teachers through professional learning. However, participation in professional development throughout the United States has not been the problem. Most teachers participate in some sort of professional learning on an annual basis. While there is participation by most teachers on an annual basis, the frequency of participation over time by most adult educators is minimal (Hill, 2009). In a national professional development survey, Darling-Hammond et al. (2009)

found that more than nine out of ten teachers participated in some sort of professional development activity throughout a school year. However, the variation in the frequency of opportunity and support for continuous learning varied greatly among states and schools throughout the United States. Not only was variation in the frequency of professional development high throughout the country, so was the relevance of the professional development. DeMonte (2013) adds that some of the common problems with professional development include irrelevance to the daily work of classroom teachers, a disconnection to the curriculum, and required frequency to provide the level of support needed to change teacher practice.

An additional challenge that schools face with professional development is the fundamental belief for some organizational leaders that classroom teachers are not a significant contributor to student achievement. Rather, the emphasis for these leaders is on creating the right structural organization of a school that is not dependent upon the quality of teachers. This type of thinking places more of an emphasis on purchasing materials and programs that are not dependent upon teachers, as the teachers will just need to read lessons from a pre-packaged program (Sparks & Hirsch, 2000). Instead of attempting to organize schools in a way that reduces dependency upon teachers and continuously replace one professional development model for another, leaders should first consider how to fix the professional development models and structures that currently exist within their organization (Hill, 2009). One way to do this is through ensuring a connection of professional development to the daily work of the classroom teacher. Additionally, research by Goe and Stickler (2008) maintains that in order for the professional development to impact the quality of classroom teachers, it occurs over a long period of time, aligns to the content in which the

teachers are teaching, and focuses on the pedagogical practices that teachers can utilize in the classroom. A research study conducted by Garet, Porter, Desimode, Birman and Yoon (2001) involving more than 1,000 teachers, also found that professional development was of higher quality and more impactful on teacher's classroom instruction when it occurred over a longer period of time and had a large quantity of contact hours. They also noted that when teachers have the opportunity to be active learners in the learning process and when the learning was relevant to their daily work, professional development improved the skills and knowledge of the classroom teachers. Marcelo (2009) adds to the importance of professional development having context for teachers through emphasizing the criticalness of professional development activities being very tightly aligned to the daily work of teachers. Hightower et al. (2011) support the idea of tight alignment and suggests that effective professional development must be aligned to the content in which the teachers are teaching. Additionally, they also cite the importance of teachers having the opportunity to work in teams within the same school for an extensive period of time on issues directly impacting their daily work. This level of relevance will bring meaning to the professional development experience of the classroom teacher.

Darling-Hammond et al. (2009) found that in addition to relevance, alignment, and sustained professional learning over time, teachers working collaboratively also enhanced the learning of students. Harris and Sass (2011) clarified that it is especially important for middle school and high school teachers to experience professional development that is related to the content that they are teaching. While Harris and Sass (2011) support the argument of professional development that is aligned, they are also cautious to add other factors contribute to teacher effectiveness. Teachers seem to become more effective as they gain experience in the classroom.

While there are many factors that contribute to the quality of professional development, school districts are finally starting to see the value that professional development has on teacher quality. Marcelo (2009) adds that throughout the past several years, professional development is finally being viewed by school districts as a model that is long term and systemically planned by school districts. This could be a result of school districts beginning to see how professional development can increase the effectiveness of their teachers and ultimately influencing student achievement. Sanders and Horn (1998) support this idea in their study of the Tennessee value added assessment system: “It is clear that teacher effectiveness is the major factor influencing student achievement gain” (p. 255). As school districts tackle the challenge of improving the quality of their classroom teachers in order to increase achievement for all students, understanding how to transform adult and student learning will be essential.

Transformation

As education progress from the 20th century model of education through the 21st century, the transformation of adult and student learning is essential to meet the needs of today’s learner. O’Brien (2013) supports the idea of a different approach to adult and student learning and states, “underlying many of the arguments for transformative responses to global environmental change is a growing recognition that the complex environmental and social challenges of the 21st Century require a different approach to education and capacity building” (p. 2). A part of this different approach must consider globalization of our world as well. If the members of our society are to compete in a global market, transformation of the current educational system is necessary. Kozma (2009) adds that “significant reform is

needed in education, world-wide, to respond to and shape global trends in support of both economic and social development” (p. 13).

Economic and social development is of utmost importance within our changing demographic landscape to transform the educational system to better meet the needs of a multi-cultural society. To transform our educational system, it is important to begin with pre-service teachers. Gay and Howard (2000) state, “we seriously doubt that existing pre-service programs are adequately preparing teachers to meet the instructional challenges of ethnically, socially, and linguistically diverse students in the 21st century” (p. 1). The transformation of teaching practices to better meet the needs of an increasingly diverse society entails a strong understanding of how those responsible for teaching students learn new instructional practices and behaviors. A deep understanding of how to transform adult learning is needed to meet the challenges of transforming student learning.

Transforming Adult Learning

In order to transform our practices in public education to better meet the needs of our changing student demographics, it is important to clearly understand how adults learn and transform their instructional practice. However, while researchers have been studying the process of how students learn for some time, it was still being questioned by researchers whether or not adults could still learn in the early parts of the 20th century (Merriam, 1996). One of the keys to effective adult learning researchers have supported is effective facilitation skills that are critical for the teachers of adults. It is important that facilitators have a strong base of knowledge about adult learning so that the learning experiences of adults will assist the organization in meeting its intended goals. Therefore, the assumption is that the more effective the adult learning process is, the more effective the classroom teacher can be in

utilizing newly developed skills (Russell, 2006). As school districts strive to increase the effectiveness of teachers, Merriam (1996) argues that the more educational leaders can begin to develop their own knowledge about how adults learn, the more skilled these leaders will become in leading the transformation process for adults. The more skilled the leaders, the more likely the adult learning experiences will not only cause learning but will impact the ways adults go about their work.

Adults who engage in learning experiences typically want to create some sort of change within their personal or professional lives. Whether the intended change is related to their behavior, their current level of knowledge within a given field, or just to change their attitude, all can encompass the rationale for adults seeking new learning experiences (Russell, 2006). Motivation also plays a critical role as to why adults engage in new learning experiences. Motivation for entering adult learning experiences that were not required can include opportunities to raise the level of career gratification, to enhance individual skills in order to increase job performance, and to acquire new knowledge to move into a new career field (Beinart & Smith, 1998). However, while some adults are motivated to learn and to enhance their understanding or work related performance for a variety of reasons, this is not necessarily true of all adults. Some adults state that nothing would motivate them to seek new learning experiences. The older the adults, the more typically this was seen (Beinart & Smith, 1998).

Understanding how to motivate adult learners is critical for leaders of adult learning. Through facilitating learning experiences, leaders have an opportunity to connect to the internal motivation that adults bring to the learning process. Merriam (1996) specifies leaders of adult learning should focus efforts on developing the characteristics of learners that are

self-directed and not dependent on external forces to enhance their own learning. Self-direction is critically important as with the expedited rates of change in professions, there will likely never be enough classes or opportunities for adults to engage in all of the necessary learning to keep pace with their field. Therefore, adults must be self-directed and take individual responsibility to engage in the process of lifelong learning (Russell, 2006). Developing this self-direction through internal motivation is critically important to the process of adult learning. When internal motivation can be extracted through effective facilitation of learning, the level of engagement of adults can increase. Additionally, Russell (2006) adds the motivation and engagement of adults in the learning process can increase when they have power over the content, input into the process in which they will learn the new information, and are provided some direction with clear outcomes. Ultimately, the goal is for the level of engagement to be so high that the professional development experience can be almost entirely facilitated by the adult learners themselves.

When planning for adult learning experiences, it is important to understand that adult learning is a multidimensional phenomenon that includes many aspects of the brain. While it is important to understand research on learning and the brain, adult learning is not limited to just brain research (Merriam, 2008). Therefore, when providing adult learning experiences, facilitators can make connections between the brain and the physical emotions that are a part of the learning process. This interaction of the brain and emotions can especially play a role in the learning process if the adult had not experienced success as a student or in other learning situations (Merriam, 2004). In order to overcome potentially negative emotional experiences in previous learning situations, a more recent focus in the workplace has been placed on understanding the role of spirituality in the work environment. Merriam (2004)

describes spirituality in the work environment as “all about creating work environments that are open, friendly, and safe, where people feel connected to others and to their organization” (p. 215). This feeling of connection in the workplace can support positive emotions that ultimately enhance the process of learning.

Throughout the process of researching adult learning theory and identifying it as a type of learning that is unique to adults, there have been two prominent theories that have dominated the adult learning field. The main theory of adult learning is Andragogy. Self-directed learning, while some researchers recognize it as a theory and other researchers do not, is viewed by some within the theoretical framework of andragogy (Merriam, 1996). The second major adult learning theory that this review addresses is described as Transformational Learning.

Andragogy. Malcome Knowles introduced Andragogy over forty years ago as a way to distinguish adult learning from student learning (Merriam, 1996). Clardy (2005) adds that in a basic sense, the theory of Andragogy assumes that adults have distinctive learning characteristics that are not the same as children. For example, learning for adults is problem centered and not necessarily content centered. In addition, an outcome of adult learning experiences is the desire to apply newly learned information within the context of the purpose for pursuing the new learning. Finally, while the theory of Andragogy makes a distinction between adult and student learning, it is important that the adult learning process is approached with different strategies than what is utilized for students (Merriam, 1996).

While there is an attempt to make a clear distinction between the characteristics of adult and student learners, there is not uniform agreement amongst researchers and theorists. Knowles (1973) argues that many adult learning theories were based on student learning

theories, which were grounded in the study of animal learning. With this theoretical foundation, adult learning theories are unsound at best. Additionally, as the theory of constructivism has become more defined and studied, there is clearer connection to adult and student learning characteristics than was once assumed. Through this connection, it is now argued that children can express a strong interest in a topic and have internal motivation and drive to want to learn new things, which varies from traditional beliefs about student learning (Boulton-Lewis, Wilss, & Mutch 1996).

The self-directed learning belief articulates the idea that adults inherently take control of their learning (Merriam, 1996). Ellinger (2004) adds to this and states that a goal of self-directed learning is “to enhance the learners’ abilities to be self-directed in their learning, which draws on a humanistic philosophy of learning” (p. 162). While self-directed learning was a developing theory, it began to lose ground in the 1980’s and 1990’s. This is potentially due to the shifting of the focus from the individual adult learner to the larger context of adult learning (Merriam, 2004). Grow (1991) argues that self-directed learning can often be situational. Grow states not all learners are motivated by everything in which they do. Therefore, individuals will be more likely to self-direct their learning with some things more than others and are often dependent upon individual interests. The larger context of learning involves a more holistic approach whereby learners become transformed by the process.

Transformational learning theory. The transformational learning theory has several different strands with the underlying perspective that when adults are engaged in powerful learning experiences, they become changed in fundamental and lasting ways (Merriam, 1996). While the theory of andragogy and the underlying assumption of self-directed

learning focus more heavily on the characteristics of the adult learners, the transformational theory centers on the cognitive processes involved in learning (Merriam, 2004). Additionally, transformational learning can be viewed as a frame of reference based on the emotions and past experiences that have shaped the view of one's world. As adults engage in experiences over time, their frame of reference will guide how they perceive situations and how these perceptions develop positive or negative emotions. However, the ultimate goal of transformational learning is assisting others in being cognizant and analytical of their own internal assumptions and the internal assumptions of others (Mezirow, 1997). Therefore, in analyzing one's internal assumptions, it may be recognized that individual self-efficacy may be an opportunity to grow in the context of adult learning experiences.

Self-Efficacy

The importance of understanding adult learning theory cannot be understated, as it is the adults within the school that can have a significant impact on the learning of the students. Teacher self-efficacy plays an important role in the process of adult and student learning. Within the school context, teacher self-efficacy refers to the level of teachers' desire and persistence to utilize instructional strategies that they believe will have the most influence on the achievement levels of their students (Overbaugh & Lu, 2008).

Bandura and Adams (1977) state the development of self-efficacy has four main sources that contribute to how people perceive themselves. These include performance accomplishments or mastery experiences, social persuasion, vicarious experience, and emotional arousal. The source of performance accomplishments or mastery comes from the positive experiences individuals have as they conquer challenges. However, there is a caution in that if success come too easily for individuals, when failure occurs, it is likely to result in a

strong sense of discouragement and ultimately impacting one's self-efficacy (Goddard, Hoy, & Hoy, 2000). Bandura and Adams (1977) add that the strong sense of discouragement from failing can be most impactful if it happens frequently and early in the new learning experience. However, the effects of failing on an individual's self-efficacy will not be as strong if most of the initial experiences are successful and the success lasts for a duration of time. While successful experiences are critical in developing self-efficacy, not all successful experiences enhance one's self-efficacy. For example, if large amounts of external support are needed throughout an experience, an increase of self-efficacy may not be noticed (Tschannen-Moran, Hoy, & Hoy, 1998).

Individuals do not necessarily rely on their own experiences as a source of self-efficacy. Vicarious experience through conversations about success with peers or with other colleagues serves as an additional source of individual self-efficacy (Goddard et al., 2000). Bandura and Adams (1977) add that when individuals see others struggle through a situation or problem and are successful, they are more likely to believe in themselves when addressing a challenge. While vicarious experiences can be a source of positive impact on individual self-efficacy, it is not as influential as authentically experiencing success or overcoming a challenge.

Verbal persuasion is often utilized as a tool to increase the self-efficacy of others. One of the main factors that has caused verbal persuasion to be so widely utilized is its instant availability. While verbal persuasion can have an effect on self-efficacy, it may not be as strong of a source as performance accomplishments. This mainly has to do with the authentic experience that is based on a real personal accomplishment instead of being verbally persuaded that you can do something that you may never have done before (Bandura

& Adams, 1977). Experiences such as workshops, speakers, and other professional development experiences utilize verbal persuasion as a source to improve the self-efficacy of teachers and faculties. Verbal persuasion can also support motivating teachers or other individuals to give the extra effort which could then result in a resolution to the problem they are trying to address (Goddard et al., 2000). While workshops and professional development experiences can be an effective way to utilize verbal persuasion, the self-efficacy of the teacher may not be realized until he or she has been able to successfully utilize what they learned in the workshop with the students they teach (Tschannan-Moran et al., 1998).

Emotions play an important role as a source of influencing self-efficacy. When individuals experience emotions that are highly stressful in nature, they tend not to have high degrees of success when compared to experiencing positive emotions. Emotions that are negative in nature will also increase the likelihood that an individual will utilize avoidance behaviors as a strategy to not engage in a situation or problem in which negative emotions are associated (Bandura & Adams, 1977). Tschannen-Moran et al. (1998) add that modest levels of emotional arousal can actually assist in improving an individual's performance in meeting a goal or completing a task. However, it is when the emotional arousal becomes too high that it can have a negative impact and not allow individuals to fully utilize their capabilities.

When considering self-efficacy, it is important to understand that it is not a fixed trait of an individual. Rather, it involves one's ability to organize a set of skills into a coordinated action (Bandura, 1982). This belief that teachers hold about their personal ability to influence student achievement can also have a direct impact with how they work with the students in their classrooms. The more classroom teachers believe that they can impact others, the more

effort they are likely to give in accomplishing their goals (Tschannen-Moran, Hoy, & Hoy, 2001). Bandura and Adams (1977) expand on this idea by noting that when teachers have strong self-efficacy they are likely to persevere when facing difficult challenges and obstacles.

While those teachers that are more likely to persevere when facing difficult challenges may develop a stronger sense of self-efficacy, those that avoid challenges and obstacles are not likely to increase their self-efficacy throughout time. Additionally, when teachers are hesitant about their self-perceived ability to reach goals or to overcome a challenge, they tend to undermine their own efforts (Bandura, 1982). Teachers that experience a low sense of self-efficacy can also be more likely to experience burnout. In a study conducted by Skaalvik and Skaalvik (2007), they found a strong correlation between teacher self-efficacy and teacher burnout. In addition, they found a positive correlation between perceived collective teacher efficacy and individual teacher self-efficacy.

With teacher burnout being a concern that likely impacts educational leaders throughout our country, it is important to understand the role of self-efficacy in facing challenges that may ultimately lead to burnout. Tschannen-Moran et al. (2001) note that when teachers are faced with challenges within their classrooms, it will ultimately be their levels of individual self-efficacy that will determine how resilient they will be when facing challenges. The stronger the individual self-efficacy of the teacher, the more likely the teacher is to stay in the profession of teaching.

In order to support teachers as they tackle difficult challenges in the classroom, leaders must understand that there are specific actions they can take to influence teacher self-efficacy. For example, teacher motivation and self-efficacy can be influenced through

acknowledgment of good work and the level of respect they receive from peers and superiors with whom they work (Caprara, Barbaranelli, Steca, & Malone, 2006). Additionally, Tschannen-Moran et al. (2001) found another influential source of individual teacher self-efficacy was the access to teaching resources; a variable that educational leaders may have influence over in schools and districts. While access to teaching resources can be beneficial, it was not as impactful on veteran teacher self-efficacy beliefs as it was for new and beginning teachers.

Individual classroom practices, teacher experience, and challenging tasks may also have an influence on teacher self-efficacy. Research conducted by Klassen and Chiu (2010) examined individual teacher self-efficacy in relation to classroom management, instructional strategies, and student engagement. The results of this study demonstrated an increase of self-efficacy with instructional strategies as teachers gained years of experience, up to about 23 years, and then self-efficacy began declining after this time. Similarly, self-efficacy in relation to student engagement increased through about the mid-career of a teacher and then began declining. While self-efficacy can increase throughout the years of experience for teachers, task complexity can have an influence on individual teacher self-efficacy in any stage of the career. Stajkovic and Luthans (1998) found that as task complexity increased, teacher self-efficacy toward the given task decreased. However, for simple and moderately complex tasks, teacher self-efficacy was greater. While there are specific classroom practices that can influence individual teacher efficacy, there are also certain characteristics of a school that influence individual teacher self-efficacy. For example, a school culture that has a strong emphasis on academic achievement, leadership that listens and responds to the needs of

teachers, and a culture that supports risk taking and innovation all contribute to a higher level of teacher self-efficacy (Tschannen-Moran et al., 2001).

As school districts strive to continuously improve the quality of teaching and meet the needs of the adult learner, the professional development experiences that a district provides can play a key role in meeting these challenges. Professional development experiences for teachers are often initiated to create some sort of change in teacher practices or beliefs. However, leaders often neglect understanding the process of change throughout the professional development experience (Guskey, 2002). Indeed, individual teacher self-efficacy is a significant factor in the process of transformation; however, leaders must also understand the importance of collective efficacy in the change process.

Collective Efficacy

Understanding collective efficacy is important as schools operate as a unifying organization and are held accountable as a unit for student achievement results. Collective efficacy can be viewed as the result of how dynamics within a team of teachers influence both their individual self-efficacy and their collective efficacy as a working team (Goddard et al., 2000). This collective efficacy can influence how a team or group of teachers address the challenges they face as they collectively work together to produce a desired result. Caprara et al. (2006), sought to determine how self-efficacy beliefs influence job satisfaction and student achievement within a school. In a sample of teachers from over 100 junior high schools, the results indicated previous academic achievement of students influenced teacher efficacy beliefs and job satisfaction within a school. Additionally, they found that teachers who demonstrated a high level of self-efficacy beliefs were more likely to establish

conditions within the school that promote job satisfaction. These conditions then promote a stronger sense of collective efficacy amongst the entire staff.

If there is a strong belief amongst the team or group of teachers that the challenges they face are too great or the obstacles too difficult to overcome, this will influence the level of effort they put into addressing the challenge. (Bandura, 1982). Tschannen-Moran et al. (1998) add to this by discussing that when teacher teams or schools heavily focus their conversations on the difficulties of educating all students, this will eventually undermine the sense of efficacy brought forth by the classroom teachers. This low sense of efficacy can be infectious amongst the staff, resulting in a culture characterized by self- defeat and failure. A collective low self-efficacy cannot only have a negative effect on the beliefs of teachers but on the students as well. Tschannen-Moran et al. (2001) state that a low level of collective teacher efficacy can translate into a low level of student's self-efficacy, ultimately manifesting itself through low levels of academic achievement. However, when teams collaborate to search for strategies to enhance student learning and other challenges they face, efficacy of the team can be raised. Additionally, when student achievement is improved, collective efficacy can be raised as well. Goddard et al. (2000) studied collective efficacy by utilizing a revised collective teacher efficacy instrument with teachers and students in 47 elementary schools. Their results indicated a positive relationship between the trust amongst staff members and the overall collective efficacy of the school in which they worked. In addition, they found that collective efficacy was a predictor of student achievement in both reading and mathematics.

Whereas both individual and collective teacher efficacy are critical factors in the success of schools independently of one another, it is also important to understand the

influence of their interaction within schools. Skaalvik and Skaalvik (2007), utilizing the Norwegian Teacher Self-Efficacy Scale, found a strong relationship between the perceived collective teacher efficacy and individual teacher self-efficacy. They add that this correlation could be a result of teacher experiences over time. The implication of their research in the practical school setting calls for more focus on developing teams of teachers as problem solvers within the context of their own classrooms instead of sending individual teachers to outside workshops and trainings to find solutions to their problems.

Both individual and collective teacher efficacy play an important role in the transformation of teaching practices along with school cultures. Additionally, the role of power within schools and organizations also plays a role in the transformation of teacher instructional practices. The next section will outline the role of power in transforming the teaching practices of adults.

Power Dynamics and Transforming Teaching Practices of Adults

An understanding of how adults learn and the role of individual and collective efficacy are major variables in transforming teacher practices; however, recognition of how power impacts transformation is also critical. When attempting to transform the teaching practices of adults, leaders often rely on different models of professional development including internal and external workshops that will assist teachers in developing the capacity to transform their instructional practice. However, an assumption is made that when teachers are a part of professional development workshops or other structures, they all enter this experience on the same playing field and with equal power relationships (Drennon, 2003). This assumption is not necessarily true as teachers are ranked in relation to one another just as they are through the social and cultural structures within their schools. This power and

ranking can then be utilized to accomplish the personal goals or beliefs of those with the most power (Drennon, 2003). Webs of power relationships can be very counterproductive and may lead to defiance if teachers are not supportive of the change. Sork (1984) provides a counter argument and believes that teachers in workshops are of equal power and not ranked in relation to one another at the onset of a workshop. He states:

The workshop participant is both an emigrant and an immigrant: He or she temporarily leaves one environment or social system and temporarily enters another. Although a certain amount of environmental baggage always accompanies learners to workshops, removing them from their natural setting for the time of the program isolates them from distractions and day-to-day concerns and enables them to concentrate on the problem at hand. (p. 42)

The other consideration is that workshops are very real and representative of the power dynamics that exist within organizations and in our lives outside of work. These dynamics cannot simply be left at the door upon entering a workshop (Johnson-Bailey & Cervero, 1997).

While workshops play a role in the power dynamics of a school or a school district, Goodson (2001) also discusses the additional dynamic of positionality in the context of transforming teaching. He states that this concept centers on the idea that the ability for the internal dynamics and culture of the organization to develop its own personal vision is often compromised by external interest groups with more power. These external groups could include consultants, school reform teams, central office leaders, or State departments. Further, Goodson contends due to such pressures individuals within organizations are now the respondents, instead of initiators of change. This change in position often leads to external changes not being accepted within the organization.

If external changes are to be accepted, these may be dependent on the norms within

the organization. Norms are created within organizations as a result of the power dynamics. These norms can shape both how internal changes and external changes are received which validates the importance of leaders understanding the relationship between proposed changes and the norms within the organization (Stoll, 1998).

As school leaders continue to make every effort to improve the achievement of all students, a focus on creating positive, trusting relationship with teachers will improve the leaders ability to utilize the power dynamics within the school in a positive way that impacts the achievement of students. While leadership development can be approached in a variety of ways, the research and literature presented in this review can serve as a guide toward designing learning experiences for leaders that can assist them in supporting teacher transformation. However, additional research that focuses specifically on how to put the consensus of research and theory into an actionable plan for leaders and school districts is still needed.

Professional Development Models for Transformation

As school district leaders develop a stronger understanding of how adults learn and the role that power plays in transformation, understanding professional development models is an important next step. School districts implement professional development initiatives for a variety of reasons, including enriching the learning experiences and changing the assumptions and beliefs of teachers (Doig & Groves, 2011). In order to change assumptions, beliefs, and practices of classroom teachers while also improving their effectiveness, school districts employ a variety of professional development models. One of the models that school districts have utilized is called a “lesson study”, which is also known as a “Japanese Lesson Study.” In a lesson study, teachers take time to plan collaborative lessons, collaboratively

observe lessons, and analyze the effectiveness of their collaboratively developed lessons. The analysis involves a reflective process of their lessons for the sake of student learning while also providing teachers with feedback about their instructional practice (Lewis, Perry, Hurd, & O'Connell, 2006). In addition to collaboratively working with other teachers, a lesson study involves collaboration with administrators, school specialists, and with teachers from other schools. The emphasis is on the learning in the classroom and the planning of lessons that will enhance the engagement and achievement of students (Wang-Iverson, 2002).

There are three main phases to a lesson study. The process begins by a collaborative team identifying a goal within a given content area, then collaboratively planning a series of lessons, and finally meeting after the observations to discuss individual reflections and ways in which they can improve the lesson. Additionally, teachers participating in a lesson study will either revise previously created lesson plans and re-teach the lesson in another classroom or design a new lesson to teach (Fernandez, Cannon, & Chokshi, 2003). In a lesson study, the lesson is not considered the end of the process but simply as an opportunity to publicly view a shared vision for teaching in the context of a live classroom, and amongst a group of teachers committed to improving their practice (Lewis et al., 2006).

Another form of professional development that school districts utilize to improve the quality of teaching is through an instructional coaching model. This model involves instructional specialists that work intensely with both small groups of classroom teachers and individual teachers. The goal of instructional coaching is to not only improve classroom instructional practice but to also increase the achievement of students (Russo, 2004). Additionally, one of the priorities of an instructional coach is to take educational research that has been linked to improved student achievement and work with the adults in the

educational community to implement these practices to improve student learning. While instructional coaches may serve a variety of roles within a school, their primary function should be modeling lessons for classroom teachers and providing feedback to classroom teachers through a process of observation. However, in order to be successful at doing this, it is important for coaches to have strong content knowledge, strong knowledge of effective instructional practices, and strong relational skills (Kowal & Steiner, 2007).

The key to instructional coaching is the ability of the coach to build a trusting relationship with the classroom teachers. It is critical that this relationship is viewed as non-evaluative by the classroom teacher and the conversations that exist between the coach and classroom teacher are kept confidential (Habegger & Hodanbosi, 2011). A partnership approach to instructional coaching can be a key to this model's success. When coaches can give teachers choices about their learning and treat teachers with respect, the conversations and trusting relationship between the coach and teacher will be enhanced and will more likely lead to the improvement of instructional practice (Knight, 2011). Ultimately, school systems aim to implement instructional coaching throughout their organizations because they believe that this model can improve the quality of classroom teaching and in turn positively impact the achievement of their students (Cornett & Knight, 2009).

Engaging teachers in a process of collaborative inquiry, also known as Action Research is another model of professional development employed by school districts throughout the United States. In defining action research teams, Calhoun (2008) states, "action research asks educators to study their practice and its context, explore the research base for ideas, compare what they find to their current practice, participate in training to support needed changes, and study the effects on themselves and their students and

colleagues” (p. 18). Levin and Rock (2003) studied five pairs of pre-service teachers and their mentor teachers while conducting action research. One of the prominent findings in this study included “participation in the collaborative action research projects provided opportunities for deliberate, focused dialogue about teaching and learning, while revealing important personal and professional understandings about one another” (p. 145). In many action research structures, a clear process is identified for teachers to engage in throughout their research. Gravett (2004) outlines a five-step process for action research that includes:

1. Defining the problem.
2. Developing a plan to address the problem.
3. Acting: implementing the plan.
4. Observing: paying attention to what is happening-thus generating evidence from data.
5. Reflecting: analyzing and evaluating outcomes, identifying ways to improve my practice (p. 262).

While variations to this process exist, it provides a clear path for teachers to follow throughout their process of action research. No matter the professional development model that school districts implement, a contributing factor to its success will be the leadership responsible for implementing the coaching model.

Leadership for Transformation

In order to provide teachers with the support and knowledge to transform their teaching practices, it is critical for leaders to understand how to lead teachers through the transformation of their instructional practice. In this section of the literature review, the following areas are examined: leadership for transforming teacher practices and power dynamics and leadership within organizations. Leadership for transforming teacher practices has an important and strong connection to broader fields of research. One of the areas is the

role of power within organizational change. The role of power is often an underestimated force that can strongly influence the decision making of leaders and those that they lead. If leaders are to successfully transform the teaching and learning practices of those that they lead, understanding the role of power is essential. An additional research connection is to the field of adult learning and the role of power in the context of adults learning new behaviors and instructional practices. Through the process of adults learning new behaviors and instructional practices, is important for leaders to understand that adults learn differently than students. Adults are also a part of a cultural system within a school that creates a set of power dynamics that may or may not be a barrier to the process of change.

Leadership for Transforming Teacher Practices

In order to support classroom teachers in transforming their teaching practices, leadership for transformation is of great importance. As the transformation of teaching practice has taken center stage in an era of high stakes accountability, the roles of a building based and central office leaders have transformed dramatically throughout the past twenty - five years. Historically, the role of the principal in an educational setting was that of a manager and not a lead instructor.

The past twenty-five years in education have seen the development of new theoretical models of educational leadership develop. Based solely on the number of empirical studies that have been conducted, the two most prominent models have been instructional leadership and transformational leadership. Additionally, the instructional leadership models emerged throughout the 1980's as a result from the research on the effective school's movement (Hallinger, 2003). Marks and Printy (2003) add that as the model of instructional leadership developed throughout the effective school's movement, the Principal was viewed as the

primary source of instructional expertise. Murphy (1994) expands on this evolving role of the principal and adds that the principal is no longer just at the top of the hierarchy but is now at the center of an existing web of human relationships and functions as a change leader and a resource for the educational community.

As the role of the leader has transformed throughout the past twenty-five years, a major problem still exists within our schools. The problem is that leaders often still employ traditional models of professional development for grades three through five teachers which are often short term and not relevant to the practice of these teachers. This can be a significant problem as school districts often spend a tremendous amount of money and time on short-term professional development sessions. Additionally, school districts may never realize the intended outcome of professional development, which is to improve the quality of the classroom teacher and ultimately raise student achievement. Transforming the practice of teaching through professional development is arguably one of the most important jobs that face our principals and central office personnel today. If principals are to be successful in transforming teacher practice, their understanding of the role that power and leadership behaviors have on influencing teacher behavior is very important. With the classroom teacher having such a strong impact on student achievement, it is critical that our leaders responsible for the development of teachers are acutely aware of the entities that must be addressed if successful transformation is going to occur. When leaders are not, the consequences for students can be devastating. Rivers and Sanders (2002) note that when a student has experienced an ineffective teacher or ineffective teachers over a multiple year period of time, there is very little evidence that the child will ever recover academically.

One of the greatest challenges that leaders have is transforming the teaching practices of the teachers in which they lead. Therefore, employing different types of leadership styles and behaviors might be a key factor in transforming teaching throughout an organization. A meta-analysis conducted by Robinson, Lloyd, and Rowe (2008) examined the impact of transformational leadership and instructional leadership on both academic and non-academic outcomes of students. For the purpose of this review, I am focusing the findings on the non-academic achievement impact of these two leadership styles. The methodology involved analyzing the findings from 12 published studies which involved a comparison of the effects of five inductive sets of leadership dimensions on student outcomes. Through analysis of 199 survey items from the leadership studies, five categories of leadership dimensions were developed. The findings of this meta-analysis showed strong average effects for leadership focused on promoting and participating in teacher learning and development. The findings also included that leaders had indirect effects on student achievement when teachers were more satisfied in the work environment. While the focus for this review was on the non-academic achievement impact of leadership styles, the meta-analysis supported that the closer leaders are to the process of teaching and learning, the more likely they are to have a positive impact on student outcomes. One of the limitations of this study is that the researchers developed their own categories for the dimensions of leadership, making it more difficult to compare this research to similar studies of dimensions of leadership. An advantage is that the study consisted of findings from previously published leadership research studies. Rather than generating new research, this study identified consistent research studies and summarized the results to better understand implications of various leadership characteristics. However, further research still needs to be developed and

leadership dimensions more closely linked to effective teacher learning (Robinson et al., 2008).

An additional study conducted by Marks and Printy (2003) examined the relationship between leaders and teachers when they collaborated around instructional matters that enhance the quality of teaching and student performance. Out of a nationally sampled pool of 300 schools, the sample was narrowed down for this study to include 24 schools throughout the country that were restructured as a strategy to enhance student achievement. Researchers collected survey data from teachers, observed classrooms, and collected student work samples related to assessment tasks. The findings of this study showed that when principals partnered with teachers in furthering the development of high quality teaching and learning, positive student outcomes can be achieved. The findings also included that when principals lack capacity for transformational leadership, it is very unlikely that they will involve teachers in decisions about curriculum, instruction, and assessment (Marks & Pinky, 2003). One of the weaknesses of this study was utilization of an independent tool for teacher observation. The researchers utilized a tool for classroom observations titled “the standards for intellectual quality.” While these standards may be very strong and supported by research, there are various amounts of these types of tools and each tool may lead to different outcomes when utilizing them in classroom observations. Ironically, I also believe a strength was the substantial utilization of qualitative data. The researchers spent most of their time in classrooms and talking with teachers, which is where the rubber really meets the road.

It has become widely understood that the success or failure of school reform often hinges on the quality of the school leadership. To test this idea, Leithwood and Jantzi (2006) conducted a research study utilizing data from a four-year evaluation of England’s national

literacy and numeracy strategy initiative. While this study in part focused on the implementation of transformational leadership practices during the implementation of this reform, it also provides data that suggests there are specific leadership practices that influence the transformation of teaching practices. The data were collected through two representative samples of 500 national surveys of teachers and headmasters (principals) in England utilizing a Likert-type questioner. The overall results of this study developed the theme that transforming teacher practice is dependent upon how leaders stimulate, promote, and encourage specific classroom practices. The findings also included that teachers perceived to receive very little support from their administrator with implementing instructional strategies driven by the reform (Leithwood & Jantzi, 2006). An advantage of this study is that the focus of the research is on leadership practices that can be applied in any school setting, making it a relevant study for current leaders. However, a limitation may be that there is not a correlation determined between specific leadership practices and student achievement. While perceptions and survey data can provide useful information, the ultimate question is whether or not specific practices positively influence the achievement of students.

Leading the transformation process can cause a high degree of stress amongst all staff involved, prompting Margolis and Nagel (2006) to conduct a study that examined the relationship between teacher learning and school restructuring. This study was conducted in an urban Midwest charter school consisting of sixth and seventh graders. Qualitative data were collected through teacher interviews, teacher artifacts, and with formal and informal classroom observations. The findings in this study support the need for teachers to have the difficulty of their work acknowledged by administrators, and for leaders to acknowledge this in both day-to-day interactions and through systemic professional development that builds on

the experiences of the teacher. The findings also included the importance of leader and teacher relationships, specifically noting the power that this relationship has in controlling the levels of stress when teachers feel valued, appreciated, and trusted by the school leader (Margolis & Nagel, 2006). One weakness of this study is that the sample size is relatively small and limited to an urban charter school setting.

While leadership behaviors can greatly influence the success of a leader, understanding and utilizing the role of power can also have a strong influence on the success that a leader has on transforming teaching and learning. Bradshaw and Boonstra (2004) offered four perspectives of power within the context of transformation. They include manifest personal power, manifest structural power, latent cultural power, and latent personal power. The manifest personal power is described as power being a person and a force. Simply stated, this perspective suggest that one person has more power over the other and can utilize that power to get other individuals to do something they might not otherwise do. Munduate and Gravenhorst (2003) add to this perspective by stating leaders hold true power when other individuals believe the leader has the authority to exercise their power and the individual must accept the exertion of this power. The manifest structural power perspective emphasizes less personal power but rather developing an understanding of the power that is held within a certain position or department within an organization. This perspective notes that power can belong to any group within the organization, regardless of personal characteristics and that both competition and cooperation are characteristics of interdependent groups with the organization (Bradshaw & Boonstra, 2004). Latent- cultural power perspective involves shared values, understanding of the current reality, and ideas are essential and necessary for organizing. Culture is developed in organizations over time and in

time provides relative stability for individuals. As a result of the development of culture, power relations are created and translate into a social hierarchy. This hierarchy has influence over how change is defined and how others throughout the organization view reality (Bradshaw & Boonstra, 2004). The final perspective is latent-personal power. In this perspective the belief is that power is inherently spread throughout the organization. Through this inherent distribution of power, the ability to utilize power is not as dependent upon social hierarchy within the organization and allows those at the lower levels of the hierarchy to utilize personal power to enact change. This perspective can be difficult for many to see as it requires one to remove themselves from the social hierarchy structure of thinking to that of believing that autonomous choices can be made (Bradshaw & Boonstra, 2004).

Bradshaw and Boonstra (2004) argue that most people agree that social structure influences and impacts the use of power. They also argue that social structure can additionally constrain power and one's ability to pursue authentic existence. Kanter (1993) argues that power, which is determined by structure in an organization, can assist in explaining behaviors throughout an organization which may have previously been associated with individual characteristics. This power manifests itself through all levels of relationships in schools including students versus teachers, teachers versus principals, principals versus district administrators, districts versus state departments and teachers versus teachers. With these dynamics, power throughout the organization can cause meaning of the change to not be shared, which causes disagreement, defiance, and conflict about reform (Datnow, 2000).

Power Dynamics and Leadership within Organizations

As leaders in organizations attempt to transform teaching practices to align to

research and 21st century skills, it is critical that they understand the role and types of power in organizational change. Lunenburg (2012) discusses three different types of organizational power that include legitimate power, coercive power, and reward power. Legitimate power is described as an individual's ability to coerce others within the organization due to holding a position of authority within the organization. Coercive power is when the leader uses threats or punitive measures to punish subordinates if directions are not followed. Finally, reward power is when the leader provides incentives for their employees to perform better or follow the directions of the leader.

No matter the type of power, the role of power has been recognized in educational reform since the 1970's. This is also the time period in which major educational reforms were implemented. Datnow (2000) notes the importance of studying politics throughout the process of school reform. He states that through study, one can begin drawing conclusions on how individuals and groups influence what happens in schools through their demonstration of power and influence. With reforms being implemented throughout the country, the conceptual thinking about the relationship between power and reform began to evolve and has since been aligned to a variety of theoretical assumptions (Bradshaw & Boonstra, 2004). In relation to power and reform, Clement (1994) adds, "we now recognize that changing organizations requires a consideration of power and politics. Effective managers of change understand that what others do and say may not reveal their true intent. People do attempt to

create meaning for others--perhaps through manipulation of information--to reach desired objectives” (p. 9).

Undoubtedly, when major reform strategies are initiated in school districts, some teachers will resist the reform and the leaders attempting to control the reform agenda. Bradshaw and Boonstra (2004) state that resistance to change is often a strategy utilized when exercising power. Often, this resistance can serve two purposes, attempting either to achieve power within a given situation or to escape power. Acknowledging the individual while also the larger collective group of individuals responsible for reform is critical. Bradshaw and Boonstra (2004) note, “individual agency must be mobilized while simultaneously acknowledging the role of collectivity. We can work as active agents but we also need to understand the constraints and limits imposed by the systems of which we are a part” (p. 295). These constraints and limits must be understood as power and politics play a role in almost every major reform adoption.

Datnow (2000) examined the role that power plays in the reform adoption process. In this study, she collected qualitative data from six schools that were a part of implementing the Memphis Restructuring Initiative. Additionally, Datnow (2000) examined the reform through a lens that focuses on the role of power, perspective, and micro politics in school reform. The findings of this study showed that the power of superintendents as a promoter of a reform significantly influences decisions about reform adoption. The findings also yielded that not a single reform that was adopted by a school district of study was initiated by teachers (Datnow, 2000).

While the role of power in educational reform can be utilized inappropriately, Bal, Campbell and Steed (2008) bring a different perspective of the role power can play in

effective leadership. Survey data for this study were collected over a five-month period from attendees of a leadership program developed by the Center for Creative Leadership. The findings from this study state that leaders can increase their effectiveness when they emphasize the power of relationships and the power of information. However, the findings also included that leaders often leverage the power of relationships to influence their personal leadership agendas (Bal et al., 2008).

While various research studies on power dynamics may lead one to make inferences about how to utilize power in a positive way to transform teaching and learning, I believe that further research in this area could be of great benefit to leaders. Utilization of power is often associated with a negative connotation but in fact can be utilized in a way that is very productive for the learning of students.

CHAPTER 3

METHODOLOGY

The purpose of this heuristic case study was to describe the lived experiences with professional development of grades kindergarten through fifth grade teachers in a large suburban school district that are participating on a mathematics action research team. Short-term professional development is a problem for teachers because it is not a supportive model to transform their instructional practices. Richardson (2003) adds:

Indeed, most of the staff development that is conducted with K-12 teachers derives from the short-term transmission model; pays no attention to what is already going in a particular classroom, school, or school district; offers little opportunity for participants to become involved in the conversation; and provides no follow up. (p. 401).

The unit of analysis for this study was the participants' lived experiences with professional development as they engaged in mathematics professional development experiences.

Additionally, the heuristic method of inquiry allowed me to utilize my personal insights of the teacher action research team professional development model in order to contribute to providing an accurate report of teacher perceptions. Within this study, I researched embedded cases within a larger case of teacher action research teams in the area of mathematics to contribute to knowledge and practice.

Improving the quality of teachers is required for the success of elementary students as they matriculate from grade to grade. Epstein and Miller (2011) explain the importance of teacher quality at the earliest of educational levels by advocating "elementary level learning lays the foundation for later success, and many of our elementary school teachers do not currently have the requisite knowledge and skills to deliver high-quality math and science

instruction” (p. 17). As districts began to invest in professional development for teachers, researchers began to take note about effective models for professional development. Blank and de las Alas (2009) add, “A large body of education research has been published over the past decade which provides a base of knowledge about the characteristics of effective programs of teacher professional development in mathematics and science” (p. 3). Garrett et al. (2001) explains the barrier to high quality professional development:

results of our study indicate that if we are serious about using professional development as a mechanism to improve teaching, we need to invest in activities that have the characteristics that research shows foster improvements in teaching. A major challenge to providing this type of high quality professional development is cost. (p. 937)

I contend that a major barrier may also be the ways districts design professional development. Cost may be a secondary factor to design.

Thus, the design of this study focused on teachers’ lived experiences with professional development. A central question and three sub questions guided this study. The central question and sub-questions:

How do teachers, who participate on a mathematics action research team, perceive their experiences with professional development? The sub questions are:

- a. How do teachers perceive their professional development experience in relation to understanding the mathematical content they teach?
- b. What do teachers do to apply what they have learned in their classrooms?
- c. How do teachers experience motivation for transforming their instructional practice as a member of a mathematics action research team?

In this chapter, I discuss the rationale for qualitative research, including my role as the researcher. An overview of case study as a major approach in this research along with the heuristic inquiry tradition are presented, followed by the design of the study that specifies sampling techniques, data sources, and data analysis procedures. I conclude with a discussion of limitations and ethical considerations that are related to this study. Qualitative research with its focus on experience was certainly an appropriate design for this study.

Rationale for Qualitative Research

Short-term professional development does not lead to the transformation of teachers' classroom practices that are necessary to increase student learning in math. DeMonte (2013) supports this idea about short-term professional development and states a common problem in professional development is that it is not frequent enough to provide the level of support needed to change instructional practice. Hill (2009) agrees and adds that while there is participation in professional development by most teachers on an annual basis, the frequency of participation over time by most adult educators is minimal (Hill, 2009). In order to understand the frequency and type of professional development that supports teachers in transforming their practice, researchers must seek to understand the perceptions of the subjects under study. Miller and Alvarado (2005) support this rationale, they explain researchers "seek to understand the world from a participant's point of view, by listening to or observing a person in a natural environment" (p. 348). The natural environment for this study consisted of the place in which the participants experience the phenomena of professional development. Through studying the participants in their natural environment, I was able to gain a deeper understanding of the problem. Golafshani (2003) continues this thinking and states: "Qualitative research allows the researcher to familiarize him/herself

with the problem or concept to be studied, and perhaps generate hypotheses to be tested” (p. 1). As I studied this problem of short-term professional development, I was most interested in uncovering the meaning of the phenomena of professional development for the participants that can best be captured through words and phrases.

Stiles (1993) clarifies the nature of qualitative research and explains, “In qualitative research, the results tend to be expressed in words rather than primarily in numbers” (p. 594). Therefore, in order to study this problem and phenomena in an in-depth manner, a qualitative approach in which the results are expressed in words is necessary. Creswell (2013) further supports the selection of qualitative research as appropriate for my inquiry:

We also conduct qualitative research because we need a complex, detailed understanding of the issue. This detail can only be established by talking directly with people, going to their homes or places of work, and allowing them to tell the stories encumbered by what we expect to find or what we have read in the literature. (p. 48)

As a qualitative researcher gathering data through human interaction, my understanding of the variables within these interactions will be critical. Black (1994) adds, “in essence it is research that helps us to understand the nature, strengths, and interactions of variables” (p. 425).

Further, qualitative research placed me in the role of research instrument, described later in this chapter, where I deepened my understanding about the professional development variables that influence the perceptions of participants as they interact with others on an action research team. To achieve this goal, it was important for me to empower participants which is critical for obtaining rich, in-depth information that will illuminate their experiences. Page and Czuba (1999) define empowerment as “a process that fosters power

(that is, the capacity to implement) in people, for use in their own lives, their communities, and in their society, by acting on issues that they define as important” (p. 1). In order to de-emphasize a potential power conflict between the participants and myself, I continually worked toward building trust with the participants through social interaction and communication in a non-judgmental stance. These social interactions and conversations can provide a qualitative researcher with rich, thick descriptions that allow the researcher to gain deep meaning and understanding of the problem that is being studied. Geertz (1973) coined the term rich thick description for reporting on participants’ meanings with insiders’ views that reflect the realities of their worlds (Cho & Trent, 2006).

As noted earlier, research questions can change during the process of data collection, especially while conducting interviews. According to Seidman (2013), researchers learn about participants’ perceptions through the interview process and as the process deepens through the establishment of trust, individuals are likely to talk about “the most complicated social and educational issues, because social and educational issues are abstractions based on the concrete experiences of people” (p. 7). Such dialogue may change the direction of the study. In addition to questions potentially changing as the researcher gains more of an in-depth understanding about the problem, the sequence of a qualitative research study is one of flexibility as well. Maxwell (2013) notes, “In qualitative research, any component of the design may need to be considered or modified during the study in response to new developments or to changes in some other component “(p. 2).

One unique aspect of qualitative research is that it is in part dependent upon the interpretation of the data by the researcher. This interpretation by the researcher can also lead to the truth value of the research. The concept of truth value is clarified by Krefting (1991) as

“it establishes how confident the researcher is with the truth of the findings based on the research design” (p. 215). As the primary research instrument in this qualitative study, my background experiences were used as tool, not a hindrance, in determining the truth value of the research. The truth lies in the lived experiences of the participants; thus, I was careful in my interactions with participants not to impose my beliefs and assumptions about professional development onto their ontological realities.

Finally, qualitative researchers strive to discover the root causes associated with specific outcomes. In qualitative research, this is accomplished through the close examination of the cases associated with the theory being studied (Mahoney & Goertz, 2006). The qualitative research method aligns well with this study as the perceptions of teachers were captured through words and social interaction that allowed for a thick description of their professional development experiences. I have purposefully situated this study within a case study approach for exploring the participants’ experiences within the boundaries of an action research team in a mid-west suburban district.

Case Study

For this research study, case study served as the major research technique. Case study has a deep-rooted history in the field of anthropology dating back to the the early 1900’s. Anthropologists within this time period utilized field studies, with observations of participants in their natural setting as the main form of data collection. As this method gained momentum throughout time and in different social contexts, it became an established method for qualitative research at the Chicago School of Sociology. With the case study approach being supported within an established university setting, this methodology began to be utilized within many research contexts throughout society.

A second generation of case study, known as grounded theory, also evolved from the Chicago School of Sociology. This methodology aimed at combining the qualitative field study methods that were practiced at the Chicago School of Sociology with quantitative methods for data analysis. As grounded theory developed over time, another generation of case study, naturalistic viewpoint, was developed to combine naturalistic inquiry with qualitative methods by Robert Yin (Johansson, 2003). Throughout the historical development of case study as a qualitative approach to research, Robert Yin and Robert Stake have been very influential in the development of key approaches to this methodology. Baxter and Jack (2009) add that these influential researchers “both seek to ensure that the topic of interest is well explored, and that the essence of the phenomenon is revealed (p. 545).

While case studies have been defined in various ways, for the purpose of this study, I utilized Yin’s (2009) two-part definition of case study. Yin’s (2009) two- part approach in defining a case study is as follows:

1. A case study is an empirical inquiry that investigates a contemporary phenomenon in depth and within real-life context, especially when the boundaries between phenomenon and context are not clearly evident
2. The case study inquiry copes with the technically distinctive situation in which there will be many more variables of interest than data points, and as one results; relies on multiple sources of evidence, with data needing to converge in a triangulating fashion, and as another result; and benefits from the prior development of theoretical propositions to guide data collection and analysis. (p. 18)

The rationale for utilizing case study for this research included the opportunity to capture multiple perspectives through collecting data from multiple participants. In capturing multiple perspectives about the phenomena of teacher professional development experiences, the case study tradition allowed me to collect pertinent data to answer my research questions.

Heuristic Inquiry

Heuristic inquiry is the tradition that I utilized for this research study as it allowed the me to utilize my own experiences with the phenomena as an important asset to the research. Heuristics has historical context with the tradition of phenomenology. Additionally, the term heuristic has origins in the Greek word *heuriskein*, which stands for discovering or to find. The Greek term “Eureka” also refers to the idea that through a process of discovery, researchers can develop new meanings of phenomena that can be relevant to their own lives (Moustakas, 1990). Magana (2002) addresses the importance of discovery within heuristic research and states “the only way for us to really know what another person experiences is to experience the phenomenon as directly as possible for ourselves. Therefore, through my direct experiences in working with the mathematical action research teams, I will be able to gain a much deeper insight into the perceptions that teachers have of their experiences with this professional development model.

This relationship between the research and my experiences with the phenomena allowed me to utilize my experiences as a valuable asset to the research and not as a hindrance. Magana (2002) further explains this concept within heuristic inquiry and states, “The self of the researcher is present throughout the process and, while understanding the phenomenon with increasing depth, the researcher also experiences growing self-awareness and self- knowledge” (p. 1). Therefore, using my personal understanding of classroom teacher’s professional development experiences in the district in which this study occurred, I was able to utilize the heuristic research process to synthesize the data into themes that are identified in the analysis of journal entries, individual interviews, and focus group sessions.

Role of the Researcher

During the process of quantitative research, researchers often tend to disassociate themselves from the process of the research. However, in qualitative research, the researcher will embrace their involvement as the main instrument in the research process (Golafshani, 2003). Atieno (2009) adds to this idea of the researcher as the main instrument and further points out “the qualitative researcher is the primary instrument for data collection and analysis. Data are mediated through this human instrument, rather than through inventories, questionnaires, or machines (p. 14).

The challenge with the researcher serving as the primary instrument in the research is that there might be associated biases, which can have an influence on the research study. In order to control these biases, it is critical the researcher frequently monitors how their individual biases may be shaping the interpretation of the data (Merriam, 2009). However, monitoring these biases can be a challenge for the researcher. Creswell (2013) addresses the challenge of controlling bias in qualitative research and argues, “To undertake qualitative research requires a strong commitment to study a problem and its demands of time and resources” (p. 49).

As the researcher serves as the primary research instrument in heuristic research, it is critical that the researcher has experiences with the phenomena being studied. My experiences with the phenomena of professional development experiences lend themselves to the process of heuristic inquiry in which Sela-Smith (2002) states is “open-ended with only the initial question as the guide” (p. 58). The open ended structure of heuristic research allowed me to deeply study my interest in the problem of short- term professional development; while at the same time careful not to serve as a strong model to transform the

instructional practices of teachers or to speak for them. These are areas that teachers must negotiate for themselves if they are to develop and sustain effective practices. Additionally, my current professional role has allowed me to have a tremendous amount of professional development experiences throughout the past several years. These experiences were a strong resource for me when making meaning of the data collected throughout this process. Aware of my role as participant observer, I guarded against biasing the participants of this study.

Johnson, Avenarius, and Weatherford, (2006) describe role of participant observer as “a means for the observer to immerse himself or herself in the daily lives of the people under study without actual participation” (p. 3). While my primary role was data collection in this study, the secondary role of participant observer gave me frequent opportunities to interact with the participants of this study. Through assuming this role, my identity as the researcher was known by all participants in this study.

As the researcher in this heuristic case study, I emphasized making connections and identifying relationships in the data that are of high personal interest to me. Therefore, understanding and being aware of my personal perspectives was critical in this research process. This self -understanding is known as reflexivity. Finlay (2002) defines reflexivity as “where researchers engage in explicit self-aware meta-analysis” (p. 209). In the conduct of this research, it was critical that I was reflective and conscious about my stance as a researcher, careful to not allow my biases and perspectives to cloud the meanings participants have of the phenomenon of professional development, the focus for the design of the study.

Design of the Study

Setting, Participants, and Sampling Techniques

The research setting for this study included five different elementary schools in a large, Midwest suburban school district, and at the sites where the research participants currently teach. Based on data submitted by school districts to the state of Missouri for Core Data in 2016, the district for this study had 19,380 students. The demographics of the district include 12.8% black, 13.4% Hispanic, and 61.5% white. Forty-nine percent of students in this school district qualify for free and reduced lunch status (Department of Elementary and Secondary Education, 2016).

In order to locate information rich cases, snowball or chain sampling was used for this study. Patton (2002) states that snowball or chain sampling is about identifying “those people or events, recommended as valuable by a number of different informants that take on special importance” (p. 237). The informants for the purpose of this study included elementary principals in the 21 elementary schools in the school district being studied. Through these informants and in using snowball or chain sampling, I communicated with the elementary principals in order to solicit recommendations of individuals who could serve as information rich cases. Additionally, these leaders were being asked to review the purpose of this study along with the research questions. Finally, they were asked to submit the names of grade K-5 teachers who they believed were able to provide in depth, information rich experiences that addressed the research questions. By involving all of the leaders from the 21 elementary schools, an opportunity for a wide range of sampling was achieved.

The criteria for participants in this study included a variety of factors but not limited to years of experience, age, race, sex, and student demographics. As the researcher, I selected

participants that exhibited a wide range of these factors. However, it was my priority to utilize both criteria and snowball or chain sampling to identify participants that provided the most in-depth information for this research study. Upon receiving recommendations for participation in this research study, I contacted the potential participants that met the criteria and asked for their consent to participate.

The specific research design that I chose for this study was a multiple case design instead of a single case study design. Yin (2009) supports my rationale for this approach and states, “analytic conclusions independently arising from two cases, as with two experiments, will be more powerful than those coming from a single case alone” (p. 61). Additionally, in considering single case design, Yin (2009) adds, “a potential vulnerability of the single-case design is that a case may later turn out not to be the case it was thought to be at the outset” (p. 49). Finally, another vulnerability of a single case design lies within the rigor of the study. With only a single case, achieving a thick description of the phenomena can be very difficult task. However, through the utilization of a multiple case study design, I was able to provide a thick description through identifying and examining the relationship between the theories embedded in my theoretical framework with the experiences of the participants.

Data Sources

Polkinghorne, (2005) states, “the data required to study experience require that they are derived from an intensive exploration with a participant” (p. 138). For this study, my intensive exploration was through three different data sources to examine my research questions and to provide cross-validity checks. These data sources included journal entries, individual interviews, and focus groups. Analysis of these three data sources concurrent with the collection of data were executed in this study. Miles, Huberman, and Saldina (2013),

advise analyzing data in conjunction with collection as “it helps the field-worker cycle back and forth between thinking about the existing data and generating strategies for collecting new, often better data” (p. 70).

Documents. Patton (2002) articulates the importance of understanding documents in qualitative research through advising that, “learning to use, study, and understand documents and files is a part of the repertoire of skills needed for qualitative inquiry” (p. 295). Bogdan and Biklen (2007) articulate that these documents can be categorized as either personal or public. For the purpose of this study, I used personal documents.

The personal documents that I collected for this study were personal narratives in the form of journal entries. Through this type of narrative data collection, Webster and Mertova (2007) state that it “provides researchers with a rich framework through which they can investigate the ways humans experience the world depicted through their stories” (Introduction). The production and consumption of these journal entries allowed me to deepen my understanding of the phenomena of teacher professional development experiences through the individual stories of the participants. The professional development experiences in which I am referencing are those in which the participant’s experience as a result of participating on a mathematics action research team. The journal entries were completed upon the conclusion of a professional development experience by the participants of this study in order to collect in-depth, rich information over time. Each participant completed three journal entries over a five-month period. The prompts for the journal entry documents included:

1. As a result of your most recent mathematics professional development experience, how has this experience supported you in developing a deeper understanding of mathematical content standards?
2. How have you gone about transferring your recent professional development experience into your mathematics instruction with students?
3. How have your students responded to the instructional practices you have learned and implemented as a result of your recent mathematics professional development?

In order to organize and manage the data collected from journal entries, I first organized the responses by research question in order to examine trends were common amongst the participants. These trends were identified through using an established descriptive code book and then through identifying interpretive codes. The document data for this study was managed by asking participants to provide their responses in an electronic format. Upon receiving these documents, they were stored on a hard drive, password protected, along with utilizing printed copies, kept in a locked file, throughout the coding process.

Individual interviews. Another set of data that I utilized for this study was extracted from individual interviews. Patton (2002) states, “qualitative interviewing

begins with the assumption that the perspective of others is meaningful, knowable, and able to be made explicit. We interview to find out what is in and on someone else's mind, to gather their stories" (p. 341). Seidman (2013) contributes to the importance of interviews through stating, "I interview because I am interested in other people's stories. Most simply put, stories are a way of knowing" (p. 7).

In order to obtain as much rich information about the phenomena of professional development and to gather the stories of others, I designed in-depth interviews. Crouch and McKenzie (2006) communicate the importance of in depth interviews, they state:

. . . in an in-depth interview, the researcher's discretion with respect to the conduct of the interview is part of an open-ended mode of inquiry which can produce great richness of material if the researcher is responsive to cues as they occur in the course of the interview. (p. 487)

To ensure a clear focus during the in depth interview and to collect rich data centered on my research questions, an interview guide was utilized. The interview was be a semi-structured interview in order to have the flexibility to go further in depth with some questions or to go in a slightly different direction with the questioning if new information provides me the opportunity to do so. The individual interview guide consisted of the following questions:

1. How has participating on this team supported you in learning the mathematical content standards for your grade level?
2. What specific experiences keep you motivated while participating on this Action Research Team?
3. How do you apply what you have learned in your Action Research Team into your own classroom?
4. How have your students responded to the instructional practices you have

learned and implemented as a part of a mathematics action research team?

I audio recorded each individual interview. After the audio recording, I transcribed the interview word for word in order to ensure that I collected as much rich information about my research questions as possible. Upon transcribing the interviews, I manually coded the interview. Merriam (2009) adds that “once your data set is inventoried, organized, and coded for easy retrieval and manipulation, you can begin intensive analysis” (p. 207).

Theoretical focus group interviews. The third and final source of data I collected for this study was acquired through theoretical focus group interviews. Upon completing the individual interviews and the journal entries, the data collected was analyzed and the results were presented to this focus group. One benefit of this sequence is that if conflicting information was in the interview process or the journal entries, this provided me with an opportunity to present this conflicting information to the focus group. Harrell and Bradley (2009) add, “focus groups are especially helpful in explaining findings that appear counterintuitive or conflicting” (p. 82). An additional benefit to this sequence of data presentation is that the focus group provided the participants with an opportunity to interact and add meaning to the findings through focused interactions. McLafferty (2004) adds, “focus groups depend primarily on focused interaction among participants to generate data” (p. 193). Through this interaction of the focus group, an additional layer of depth was added to this interview process. (p. 10). This depth, according to Rabiee (2004) could come from a “range of ideas and feelings that individuals have about certain issues, as well as illuminating the differences in perspective between groups of individuals” (p. 656).

As with the individual interviews, the focus group interview was a semi-structured

interview centered on the findings of the individual interview. The purpose of conducting a semi-structured interview with the focus groups allowed for the opportunity to go further in depth with questioning based on the results from the individual interviews. The focus group interview was recorded and transcribed to provide a credible analysis of the data.

Data Analysis Procedures

For this study, I collected data in the natural setting in which teachers work and teach on a daily basis. Additionally, this setting was where the participants experience the problem being studied in this research proposal. Collecting data in the natural setting is critical in qualitative research. Atieno (2009) adds “Qualitative research involves fieldwork. The researcher physically goes to the people, setting, site, or institution to observe or record behavior in its natural setting (p. 14).

In the data analysis process, qualitative researchers must be prepared to submerge themselves with their subjects throughout their research study in order to provide credibility to their study. Krefting (1991) supports this idea and explains, “Credibility requires adequate submersion in the research setting to enable recurrent patterns to be identified and verified” (p. 217). Grbich (2013) adds to this importance of submersion and states researchers should collect “any information that can shed light on your research question” (p. 16). During this study, I submersed myself through the utilization of journal entries, individual interviews, and focus group sessions involving teachers who are participating on a mathematics action research team.

Multiple qualitative data will provide the opportunity to use an inductive approach to construct meaning of the participants’ experiences of the phenomena in three different ways—what they write, say, and understand. Atieno (2009) adds, “The process of qualitative

of research is inductive in that the researcher builds abstractions, concepts, hypotheses, and theories from details” (p. 14). I manually coded the journals, individual interviews, and focus group interviews using descriptive codes and interpretive codes; then clustered these codes to develop themes. Descriptive codes were utilized throughout the coding process in order to summarize the re-occurring concepts throughout this analysis process (Miles et al., 2013). Secondly, interpretive codes were formed by grouping the descriptive codes in clusters of meanings; finally, these interpretive codes were then utilized to develop themes. Grbich (2013) states “themes have variously been referred to as: groupings; outcomes of coding/conceptualizing; abstract constructs; and analytic patterns” (p. 261). Miles et al. (2013) add, “The interrelationships of these categories with each other then are constructed to develop higher level analytic meanings for assertion, proposition, hypothesis, and/or theory development” (p. 73). Utilizing this process of coding also assisted me in identifying commonalities of meanings in the journal entries, individual interviews, and focus group sessions.

As a qualitative researcher, I interacted with the participants in this study to shape the themes that emerged from the research. The participants’ experiences in this study were of great value and added a depth of meaning to my research. While my personal experiences played a role in this study, they did not alone obtain the level of informational depth needed in order to make meaning of the problem being studied. The use of my personal experiences with the phenomena is a characteristic of the heuristic inquiry which was used in the data analysis process. I utilized use the six phases of heuristic research (Moustakas, 1990) to discover meaning in the journal entries, individual interviews, and focus group sessions.

Initial engagement is the first phase of the heuristic research process. Moustakas

(1990) describes this phase by explaining, “during the initial engagement, the investigator reaches inward for tactic awareness and knowledge, permits intuition to run freely, and elucidates the context from which the question takes from and significance” (p. 27). As a leader of professional development throughout the past several years, teacher’s perceptions centered on this topic have been of very high value and interest to me. Through initial engagement, I had the opportunity to allow the perceptions of teachers to drive my intuition and lead me toward a deeper understanding of the problem in which I am studying.

The second phase of the heuristic research process is immersion. Moustakas (1990) explains, “The immersion process enables the researcher to come to be on intimate terms with the question-to live it and grow in knowledge and understanding of it” (p. 28). For this study, I consumed myself with deepening my understanding of the experience and perceptions of my participants in order to make meaning from their experiences. In order to do this, I devoted a significant amount of time to building relationships with my participants. This was important so that I was able build their trust in order to allow them to feel comfortable in being completely open and honest with me throughout this research process.

The third phase of this process is incubation. Throughout this phase of the process, I removed myself away from the intense focus on my research questions and from consuming myself with the experiences of my participants (Moustakas, 1990). In this phase of the research, a significant amount of my time was spent re-visiting the data collected through journal entries, individual interviews, and focus group sessions. Revisiting this data allowed me to develop new understandings about the phenomena in which I studied. Moustakas (1990) adds, “The heuristic researcher through the incubation process gives birth to a new understanding or perspective that reveals additional qualities of the phenomenon, or a vision

of its unity” (p. 29). This period of incubation and removal from the research allowed me to grow and deepen my knowledge of the phenomena in which I am studied (Moustakas, 1990).

The fourth phase of this process is illumination. Moustakas (1990) states “illumination opens the door to a new awareness, a modification of an old understanding, a synthesis of fragmented knowledge, or an altogether new discovery of something that has been present for some time yet beyond immediate awareness” (p. 30). In order to create this synthesis of knowledge, it was this stage of the research process that I incorporated enumerative or descriptive coding (Miles et al., 2013) and thematic coding (Grbich, 2013).

To analyze data in this phase, coding as previously described, was the primary method in which this was completed. Grbich (2013) states “coding involves the grouping and labeling of data in the process of making it more manageable both for display and to provide answers to the research question/s” (p. 259). Miles et al., (2013) adds “but we believe that coding is deep reflection about and, thus, deep analysis and interpretation of the data’s meaning” (p. 72).

The fifth phase in this process is explication. Moustakas (1990) states that the purpose of this phase is to “fully examine what has awakened in consciousness, in order to understand its various layers of meaning” (p. 31). Throughout this process of explication, I brought forth the dominant themes that have been found through analysis. Upon identifying the dominant themes, my next step was to organize them in a manner that is representative of my experiences with this phenomena (Moustakas, 1990).

The sixth and final phase of this process is creative synthesis. Moustakas (1990) notes:

the final phase of heuristic research is the process of creative synthesis. The

researcher in entering this process is thoroughly familiar with all data in its major constituents, qualities, and themes in the explication of the meanings and details of the experience as a whole” (p. 31).

During this phase of the research, I closely examined the relationships and patterns that existed throughout this study to reveal the story of the data. Sela-Smith (2002) further describes this synthesis phase and states that it “tells the story that reveals some new whole that has been identified and experienced as a result of this union of the deep-unconscious and the waking consciousness and between the internal and the external” (p. 68).

Within every research study, there are important limitations and considerations to acknowledge in order to ensure that the research is highly valid and reliable. In the next section, I will discuss these limitations and considerations as they specifically related to the validity and reliability of this study.

Limitations and Ethical Considerations

In traditional forms of research, the knowledge and experience that a researcher brings into a study has historically been viewed as bias. This meant that these experiences would have needed to be excluded from the research design rather than viewed as a critical component to it (Maxwell, 2013). Additionally, researcher bias is a very common threat to legitimation in constructivist research because the researcher usually serves as the instrument collecting the data (Onwuegbuzie & Leech, 2007). However, in qualitative research, these biases can be viewed as important to the research. Maxwell (2013) builds on this idea and adds, “Separating your research from other aspects of your life cuts you off from a major source of insights, hypotheses, and validity checks” (p. 45).

In this study of mathematics teacher action research teams, there are several biases I brought to this study. The major bias that I brought into the study was my belief that

effective adult learning needs to be a job embedded experience for classroom teachers. I believe that when teachers are taught new strategies outside of the context of their own classroom, the likelihood of teachers utilizing newly learned strategies to transform their practice is not very strong. While job embedded experiences for adult learners are critical to transforming teacher practice, there are other factors that can influence teacher transformation as well. These other factors that influence teacher motivation to transform practice may be difficult to capture in this study. Therefore, an assumption that I brought into this study is that motivation to transform practice may not be something identifiable in all educators.

Throughout this study, it was important for me to ensure that my personal experiences and perspectives did not negatively interfere with the study of the participants. Therefore, it was essential for me to focus heavily on the research and theory behind the research problem and not just my background experiences. Through incorporating my personal experiences with literature, data, and theory, I provided a variety of perspectives that assisted me in making sense of the data collected throughout this study.

A limitation of this study is that I am the Assistant to the Superintendent in the school district in which this study was conducted. In my role as a central office administrator, I am responsible for directly overseeing and implementing a variety of professional development opportunities for teacher's pre-k through 8th grade. Being viewed as the "lead learner" of elementary and middle schools may have an impact on the power dynamics that may exist in specific settings. Johnson-Bailey and Cervero (1997) add, "The power relationships between learners and the instructor are important sets of conditional factors that affect the quality of the experience" (p. 43). Additionally, my role may be viewed as one responsible for change

throughout the elementary schools simply because of hierarchy in the organization.

Bradshaw and Boonstra (2004) state “thus, position power mostly refers to the existing organizational hierarchy that provides management with the ability to control the behavior of others and to change the organizational structure and processes. This use of power is observable and direct” (p. 284). Therefore, in my current role with the school district, it was critical for me to establish a trusting relationship with the participants of this study and to ensure them that I am in the role of researcher and not central office administration.

Another limitation of this research proposal is that through the qualitative approach, the findings are much more limited to the population being studied. Maxwell (2013) describes this as internal generalizability, which is a “conclusion within the case, setting, or group studied, to persons, events, times, and settings that were not directly observed, interviewed, or otherwise represented in the data collected (p. 137). With the findings of this study being limited to the population being studied, it was difficult to generalize these findings to an external population (Atieno, 2009). Maxwell (2013) describes the external population as “beyond that case, setting, or group, to other persons, times, and settings” (p. 137). Although the findings may be difficult to generalize to a larger population, they may illuminate as an extreme case that provides greater insight into the problem (Maxwell, 2013). However, for the purpose of this study, I was seeking to answer how the findings of this research apply to a similar population and in a similar context.

In considering the reliability and validity in qualitative research, it is important to note that researchers engage in qualitative research through a different perspective than quantitative research when determining validity and reliability. In quantitative research, Golafshani (2003) states, the “quantitative researcher needs to construct an instrument to be

administered in standardized manner according to predetermined procedures. But the question is if the measuring instrument measures what it is supposed to measure” (p. 598).

In contrast, within the process of qualitative inquiry, verification strategies can be utilized as a means to ensure reliability and validity. Morse, Barret, and Mayan (2008) recommend “verification strategies that ensure both reliability and validity of data are activities such as ensuring methodological coherence, sampling sufficiency, developing a dynamic relationship between sampling, data collection and analysis, thinking theoretically, and theory development” (p. 17). In this research study, crystallization was utilized as verification strategy to strengthen the reliability and validity. Richardson and St Pierre (2008) describes the change in thinking of researchers from the concept of triangulation to crystallization by adding “in postmodernist mixed genre text, we do not triangulate, we crystallize. We recognize that there are far more than “three sides” from which to approach the world” (p. 934). Ellingston (2009) additionally argues, “Crystallization adds another way of achievement depth, through the compilation not only of many details but also of different forms of representing, organizing, and analyzing those details” (p. 10). This depth of crystallization was also obtained through the use of a critical friend to examine the transcriptions with themes from the individual interviews, focus group interviews, and journal entries.

To ensure reliability for this study, clear articulation of my research questions was critical. This clarity will allow me to collect data that is pertinent and relevant to the research questions. Additionally, ensuring that the components of my study directly aligned to my research questions also supported strong reliability.

As a researcher, it was my objective in this study to clearly demonstrate themes and patterns

throughout all three data sources that were utilized to inform this study. These data sources were collected from a range of settings, times, and participants.

Validity is referred by Maxwell (2013) as “the correctness or credibility of a description, conclusions, explanation, interpretation, or other sort of account” (p. 122). In order to effectively crystallize the data, I committed a significant amount of time in the data collection phase of this research study. The significant time in which I allocated for crystallization also allowed me to saturate the data. If discovered through this process of crystallization that the data was saturated, I would have reconvened with the participants of the study to collect more data. My intent was to also create a rich, thick description of this study. Ponterotto (2006) develops a vision for a thick description through stating, “This type of description aims to give readers a sense of the emotions, thoughts and perceptions that research participant’s experience. It deals not only with the meaning and interpretations of people in a culture but also with their intentions” (p. 541).

Throughout this study, I strictly followed the guidelines of the University Of Missouri Kansas City’s policies and procedures related to the Social Science Institutional Review Board. In order to ensure the protection of human rights, all ethical issues were addressed so that those that volunteer for this study had the fullest protection. The participants for this study included six teachers from five of the twenty- one elementary schools in the Clay School District. These six teachers served as a multiple case design for this heuristic case study. Additionally, the participants were those that were currently participating on one of the districts mathematics action research teams. Throughout the course of this study, I worked extensively with these participants in order to deeply understand their experiences with a mathematics action research team professional development model. In order to

provide the fullest protection of the participants, I followed the three guiding principles of the SSIRB, which include:

1. Inform subjects about the nature of the study and to ensure that their participation is voluntary
2. Ensure that the benefits of the research outweigh the risks
3. Ensure the risks and benefits of research are evenly distributed among the possible subject populations.

If for any reason one of the volunteer participants wished to remove themselves from this study, they were able to do so without consequence or fear that there will be some sort of penalty associated with their decision. Finally, I ensured these participants of this study that the information in which they provided will be confidential and in no way be utilized for evaluation information or future professional learning opportunities.

Potential Ethical Problems

Serving in my current role as an Assistant to the Superintendent, one of the hesitations that future participants may have had is that they may have found it difficult to be completely honest with me. Having the opportunity to be directly involved in the design of professional learning experiences for teachers, the participants may have felt that if being honest means saying something negative about their experiences. In order to combat this potential risk for the participants, it was important that I worked diligently to build the trust of these participants and ensure them that nothing they say will have any negative impact on them as teachers in the school district in which the study occurred. Rather, their participation

will benefit the future of learning for the adults and for the students throughout the school district.

In addition to building trust with the participants of this study, communication throughout the research process was critical. One communication strategy to address potential ethical problems was clearly outlining what is expected from each participant throughout the study prior to the beginning of the actual study. This communication supported the participants in deeply understanding what they will be involved in from the very beginning. An additional part of my communication plan to participants included ensuring them of the confidentiality of the data that will be collected. Finally, I provided the participants a copy of their case prior to publishing this dissertation in order to ensure accuracy of the story being developed throughout the research process.

Discussion of Ethical Review Protocol

As I conclude this qualitative research study, I have complied with the University of Missouri Kansas City's Social Science Institutional Review Board (SSIRB). As the main researcher in this process, it was critical that I protected the subjects of study. This was accomplished through ensuring the participants understand the nature of study and were clear that it was voluntary participation. In considering the Belmont report (1979), it states, "respect for persons demands that subjects enter into the research voluntarily and with adequate information" (p. 4). Additionally, I ensured the participants that the benefits of participating in this research greatly outweigh the risks. Through this research process, participants had an opportunity to inform a larger body of research that supports models of effective professional development for classroom teachers. If a participant became uncomfortable throughout any stage of this study, they were able to drop out of the study

without fear of repercussions. Finally, it was important for me to present information to the subjects in a clear and coherent way in order to ensure that the presentation of information does not cause confusion and the research subject's ability to make an informed decision (Belmont Report, 1979).

CHAPTER 4

FINDINGS

This study was a heuristic multiple case study that enabled me to utilize my personal experiences along with my professional experiences with the phenomenon to develop a story of the findings (Patton, 2002). The problem I encountered in this suburban school district was the limitations of short-term professional development as a supportive model for transforming the math instruction of grades K-5 teachers. The purpose of this Heuristic Case Study was to describe the professional development experiences (or lived experiences) of teachers that participated in a mathematics action research team. The unit of analysis in conjunction to the research questions, was centered on their experiences on the team and ultimately their mathematics instructional practices which provided the data for the analysis of my findings.

For this study, I had one central question with four sub questions. The central question was: “How do teachers, who participate on a mathematics action research team, perceive their experiences with professional development?” The sub questions included:

- (1) How do teachers perceive their professional development experience in relation to understanding the mathematical content they teach?
- (2) What do teachers do to apply what they have learned in their classrooms?
- (3) How do teachers experience motivation for transforming their instructional practice as a member of a mathematics action research team?

Prior to this study, it was not exactly clear how the experiences of classroom teachers would evolve. The qualitative nature of the study allowed me to discover new information that led to unfolding of the participants’ experiences. as new information was discovered.

Through this evolution, I was able to describe the lived experiences of kindergarten to fifth grade teachers that were participants of mathematics action research team. Within this chapter, I report on the themes and interpretive codes identified through within-case analysis of participants' journal entries and interview data collected for this research study. These are depicted in Table 1, page 10. Following the table is the presentation of each case with the purpose of telling the stories of teachers' perceptions of their professional development experiences, constructed through interviews and journal entries. Upon the conclusion of the sixth case, I also completed a cross case analysis to determine which themes were prevalent across the six cases which aided answering the research questions.

Reflection about the Process

As I reflect upon this process, I was very fortunate to have been able to work with a group of participants that were so committed to the profession of teaching and to their own learning as adults. In each one of these cases, each participant had an individual story to tell about how professional development influenced the transformation of their instructional practices. While not all past experiences with professional development were influential in transforming their practices, each case demonstrated an appreciation for the opportunity to collaborate with other teachers for improving their practice.

The selection of participants was narrowed in order to encompass a wide range of grade levels; teachers' experiences, race and ethnicity, gender, and school settings were also considered. Most of the participants I identified were teachers that I worked with in the past; and, thus, I began this study with an established rapport that was important as it allowed the teachers to be very open and honest with me. They seemed to be very comfortable and had a strong level of trust as well. To maintain a high level of trust, I also sent each case

description back to participants for review prior to completion of this chapter in order to ensure accuracy of the data collected. As an additional measure to neutralize power, I met with the teachers in their preferred locations for the interviews and reassured each one of them through the consent protocol that if at any time, they felt uncomfortable, they could discontinue the study.

Throughout each stage of this study, I progressively discovered what it meant to be a qualitative researcher. Prior to this qualitative study, I was not sure how strongly I would feel about qualitative research. However, as I embedded myself in the research, I began to deeply value the importance of conversations, relationships, and individual perceptions for developing meaning of participants' experiences. I discovered the importance of individual stories and how these stories can be utilized to uncover questions centered on phenomena that I am deeply passionate about in my work with schools.

Setting and Participants

The participants for this study included six classroom teachers that taught grade levels ranging from Kindergarten to fifth grade. One of the participants was male and five were female. Five participants were classified as European American and one participant was classified as African American. The research setting for this study included five different K-5 elementary schools in a large, Midwest suburban school district. The research sites were the schools where the research participants currently teach. The demographics of these research settings ranged from 28% to 60% of students classified as black, Hispanic, Asian, Indian, and Multi-race, 40% to 71% classified as white, and from 31% to 80% percent of the students receiving a free or reduced lunch. This data demonstrated the settings for this study have great variance, which allowed for deeper, richer information to be collected and provided me

with a strong sense of teacher perceptions in a wide variety of settings. In order to locate cases that would yield rich data, snowball or chain sampling was utilized to identify the six participants for this study. It was important to find these information rich cases through multiple informants who identified these potential individuals as valuable to the case (Patton, 2015).

The motivation to begin this study materialized through a question that I have had for many years, which centered on classroom teachers' perceptions of their professional development experiences. After reading many professional development survey results throughout the past five years, I have always wondered why those who experienced the same activities often had different perceptions. Therefore, I wanted to begin this study to really dig deeper into the perceptions that grades kindergarten to fifth grade teachers have about their professional development experiences. For the purpose of establishing a boundary for this heuristic multiple case study, I focused on grades kindergarten to fifth grade classroom teachers that were participating on a mathematics action research team.

Throughout this study, I was determined to get to know my subjects in an in-depth manner. While I had previous rapport with several of the subjects prior to the study, I also spent on average approximately three hours through face to face or phone communication with each participants throughout this study. By getting to know my participants as more than classroom teachers, it greatly assisted me in understanding their perspectives about their professional development experiences. Intentionally getting to know my participants was a critical aspect to building strong and trusting relationships with them; a critical part of this study as I was allowed access to deep, rich information. To build this relationship, I communicated with my participants' multiple times over the course of this study to gain a

deeper understanding of their perspectives, but they also developed a level of comfort with me that led to more in depth, data rich information. Finally, exploring my experiences with professional development allowed me to better understand the biases I brought to this study and to control them to the best extent possible.

Telling the Story of the Data

For the purpose of this study, I used three different sources of data which I examined in conjunction with my research questions. Through individual interviews, I learned about each teacher's in-depth experiences of professional development as a part of a mathematics action research team. In addition to the interview, I conducted follow up interviews with each participant as well. Another source of data utilized in this study included journal entries. The journal entry questions were centered on my research questions and provided the teachers with another avenue to share their experiences. Finally, I utilized a theoretical focus group interview as an avenue to share and ensure the accuracy of emergent themes and for teachers to provide me feedback and add additional comments about their professional development experiences.

Data Analysis Procedures

In considering the data analysis process for this heuristic case study, the primary process for analysis was the utilization of the six phases of heuristic research (Moustakas, 1990). The steps in this process, outlined in the methodology, included (1) initial engagement, (2) immersion, (3) incubation, (4) illumination, (5) explication, and (6) creative synthesis (Moustakas, 1990). Through brainstorming potential research topics within the initial engagement phase, I discovered a strong passion for effective mathematics professional development. This passion was driven through my compelling purpose for

understanding how to support teachers in transforming mathematics instruction. As a building leader, I was often frustrated with professional development and its limited influence regarding teacher practice. My intense interest in this topic allowed me to generate a guiding central question. The immersion in the central question for this study was examined through multiple lenses and discussed with other educators over a period of several months. I also read many article articles and books about my central question to develop a deeper understanding of its meaning. During the incubation phase, I removed myself from the strong concentration on the central question. The removal from an intense focus allowed me to view the question outside of the concreated lens I had used for several months. I turned my attention toward reading a variety of literature that was insignificant to my central question. As I transitioned out of the incubation phase, I began collecting data from participants in the form of journal entries and individual interviews. Through the process of data collection, I began to uncover and document themes that developed during the illumination of the data. As I examined these themes, I noticed several similarities across each case. During the explication phase, a significant amount of time was spent self-reflecting on the meaning of my central question. I came to understand the meaning of the question was centered on my frame of reference for the phenomena I was studying. Through utilizing my frames of reference and personal experiences with the phenomena and data collected, I deeply studied the themes that were developed in the illumination phase. During the final phase, creative synthesis, I developed a stronger understanding of the data and the participants. My deep understanding of the participants and the data was translated into a comprehensive picture of the phenomena. Through the narrative picture I painted, I also utilized specific examples from the participants' data that supported the development of each

theme. Finally, I utilized focus group interview data to further confirm and expand on the themes identified in each case and to identify any discrepancies.

To conduct a valid and reliable study, crystallization of the data was critical. Throughout this research study, crystallization was utilized as a verification strategy to strengthen the reliability and validity. Richardson and St Pierre (2008) described the change in thinking of researchers from the concept of triangulation to crystallization by adding “in postmodernist mixed genre text, we do not triangulate, we crystallize. We recognize that there are far more than “three sides” from which to approach the world” (p. 934). Ellingston (2009) additionally argued, “Crystallization adds another way of achievement depth, through the compilation not only of many details but also of different forms of representing, organizing, and analyzing those details” (p. 10). Good practice in research demands that the researcher use multiple data sources to enhance the validity and reliability of their researcher. (Mathinson1988). Additionally, crystallization of the data supported the use of thick description of this heuristic case study. Creswell and Miller (2000) noted that thick descriptions are those statements from the subjects that produce for the reader a set of feelings that deeply describe their experiences with the phenomena. The significant time I allocated for crystallization allowed me to reach the level of data saturation. If discovered the data was not saturated, I would have reconvened the participants of the study to collect more data.

To ensure reliability for this study, clear articulation of my research questions was critical. This clarity allowed me to collect data that were relevant to the research questions for this study. As another measure to ensure strong validity and reliability, each subject was presented with their individual case to examine as a means to ensure accuracy of the data

presented in their individual cases and continue to build trust. Finally, ensuring that the various components of study—problem, purpose, theoretical framework, and methodology -- directly aligned to my research questions also supported reliability.

Within - Case Analysis

The data that comprised the six cases in this study were analyze using within-case analysis. Pseudonyms were selected by the participants and used in place of their real names. Each participant submitted three journal entries during the data collection and analysis phase of the study, September 2016 through February 2017. I asked each participant to submit their journal entries within two weeks after a math professional development experience sponsored by the school district. Within each journal entry, there were three prompts related to the research questions structured for participants' responses. These prompts were: (a) Because of your most recent mathematics professional development experience, how has this experience supported you in developing a deeper understanding of mathematical content standards? (b) How have you gone about transferring your recent professional development experience into your mathematics instruction with students? (c) How have your students responded to the instructional practices you have learned and implemented because of your recent mathematics professional development? If any journal entries were not descriptive enough, I would ask the participants to add more description in the response and send it back to me. I would also conduct follow-up telephone interviews to inquire about the responses in order to get a clearer description if necessary.

In addition to the journal entries, individual interviews were conducted during the months of October 2016 through November 2016. The interviews ranged in length from approximately thirty minutes to forty- five minutes. This range was influenced by the level of

description that each participant provided during the interviews. I conducted follow up phone interviews with each participant in order to gather more descriptive responses or to ask additional questions based on their initial responses. Each follow up interview lasted approximately fifteen minutes. The final interview was the theoretical focus group interview. This focus group data was used as a verification method for the identified themes and to strengthen the validity of this study. During the focus group interview, I invited all of the participants to one location. I shared the themes that were identified in the within-case and cross-case analysis. After sharing and briefly describing each theme, I asked a series of questions to the participants. These questions included:

- Based upon the themes that I presented to you, which themes do appear to resonate with you more? Why?
- Based upon the themes that I presented to you, were there themes that you did align with your experiences? Why?
- Are any other potential areas of mathematics professional development that support teacher transformation that were not identified?
- How has participating on a mathematics action research team supported you in transforming your teaching practices in mathematics?

Throughout this study, four major themes were identified in the the data collected through journal entries, individual interviews, and a theoretical focus group interview. These themes included: *action orientation, efficacy by design, relevance, and teacher self-efficacy*. In this study, at least two interpretive codes were required to be considered a theme. Each interpretive code was generally derived from multiple descriptive codes that determined its meaning, The findings in the within-case analysis are organized by each participant with a

brief introduction of the participant followed by a report of the themes of each case, and then through reporting the themes identified in multiple data. This provides the reader an opportunity to learn from the experiences of teachers and to develop a better understanding of their perceptions of mathematics professional development experiences.

The four themes were not consistently present in each of the six cases. The themes that are represented ranged from two themes to four themes dependent on each participant's experience. Additionally, in some cases, the themes were the same but the interpretive codes were different. The number of descriptive codes found related to an identified interpretive code also influenced the level of the description. I provide more descriptive information related to the definition of each theme the first time that it is identified within a case. In the subsequent cases that had the same themes, I expanded on the theme with a brief description as it related to the case.

Table 1 includes the representation of the interpretive codes that led to the development of the themes identified in the six cases. The interpretive codes required at least five occurrences, but no more than twelve to be considered a moderate presence in the interview and journal entries. Interpretive codes of more than twelve were considered strong in presence.

Table 1

Within Case Analysis

Interviews and Journal Entries	Christy	Shawn	Madison	Erin	Jackie	Nicole
Theme: Action Orientation						
Interpretive Codes						
Planning	M	S	M	M	M	M
Doing the Work	-	S	M	-	M	S
Strategy implementation	M	-	M	S	-	-
Theme: Teacher Self Efficacy						
Interpretive Codes						
Student Success	M	-	M	-	-	M
Peer Collaboration	M	-	M	-	-	
Perseverance	-	-	-	-	S	
Theme: Efficacy by Design						
Interpretive codes						
Student Ownership of Math	-	S	S	S	S	M
Inquiry	-	M	M	S	-	M
Learning Community	-	M	M	M	M	-
Theme: Relevance						
Interpretive codes						
Peer Collaboration	-	M	M	M	M	M
Transformation	-	S	S	M	M	M
Reflection	-	-	M	M	-	-

Note: S=Strong Presence (13 or more occurrences)

M=Moderate Presence (at least 5 but no more than 12 occurrences)

Their cases are stories of their lived experiences while participating on a mathematics action research team, a source of professional development for the six teachers. The following cases describe the stories of Erin, Shawn, Nicole, Jackie, Madison, and Christy. They are presented in no particular order, each having equal value.

Case 1 - Erin

As I walked into the school to meet Erin for our interview, I was graciously met by her upon entry into the front office of her school. She was very eager to begin the interview

and almost instantly began talking about her students and complementing them on how much they have progressed throughout the course of the school year. Everything that Erin talked about during our walk down the hallways was about her students. It was clear from the very beginning of our conversation that she is truly a passionate educator who cares deeply about her students. It was also evident that Erin valued her students no matter where they were on the progression of learning and she viewed her role as a teacher of taking her students from where they are in order to reach their potential. Erin is currently a primary grade teacher and is classified as European American. She has been in teaching in the primary grades for six years and during the time of this study was in her sixth year of education. For the purpose of this study, a primary grade teacher is defined as a teacher who is teaching grades kindergarten through second grade. The school in which Erin teaches serves approximately 627 students, 71.3% of the students are considered white, and 30% of the students are eligible for free and reduced lunch (Department of Elementary and Secondary Education, 2016).

Erin is also a mathematics demonstration teacher for the school district in which she teaches. For the purpose of this study, a mathematics demonstration teacher is defined as a teacher who has demonstrated exemplary mathematics instruction and hosts teachers throughout the school district in her classroom as observers throughout the course of the school year. Erin is currently participating on an action research team with other demonstration teachers throughout the school district in which she currently teaches. My memories of the initial contact with Erin and the subsequent interview in addition to her journal entries helped to apprehend meaning of her experiences with the action research team.

Action orientation. The first theme identified in the journal entries and the interview with Erin was action orientation. For the purpose of this study, action orientation is defined as the classroom teacher intentionally planning and executing newly learned instructional strategies from a professional development session in their own classroom. Throughout the data collection process with Erin, the collaborative inquiry process of an action research team helped support and increase her motivation to take action with her newly learned knowledge. The interpretive codes that supported the emergence of this theme included planning and strategy implementation.

Adults who engage in learning experiences typically want to create some sort of change within their personal or professional lives. Whether the intended change is related to their behavior, their current level of knowledge within a given field, or just to change their attitude, all can encompass the rationale for adults seeking new learning experiences (Russell, 2006). As I developed an understanding of Erin's motivation throughout the data collection phase, it became clear that her true motivation was simple, for the betterment of the students she serves.

Planning was an interpretive code that emerged throughout the journal entries and interview with Erin which directly tied to the theme of action orientation. Planning is defined as the teacher working individually or with a peer group to develop written plans for implementation of newly learned strategies from professional development. Some of the descriptors related to this interpretive code of planning include intentional planning, use of assessment, and utilization of a math progression. Throughout the data collection process, it was clear that intentional planning during and after professional learning experiences was critical in taking action with newly learned strategies. In examining the data collected, Erin

was always very thoughtful and deliberate when planning her lessons for students. She would intentionally utilize the new information learned at a professional development session and incorporate that newly acquired knowledge into her planning process so that she could work towards meeting the needs of all students. During her interview, Erin shared how she goes about prioritizing her planning after a professional development and shared,

...after attending meetings, professional developments, or team meetings, and getting new ideas, I can get lost and confused with all of the different focuses. In order to stop the feeling of being overwhelmed, I try to tune in on just one focus. I feel like if I come away with lots of ideas, the chances of me trying them all is not high. If I try them all, it's not going to be the quality that I want for my students. After a meeting, I pick one idea that was meaningful to me for my students and I feel I could really grow in. Once I pick one, I will really try to chew on it and figure out what that strategy or concept might look like in my classroom with kindergarten students and I go for it. For example, after a professional development session, I felt that my students needed more time to collaborate so I re-organized some of my classroom in order to support more student collaboration.

Additionally, in one of her journal entries, Erin reflected upon learning more about planning through an inquiry based model of teaching mathematics during a professional development session that focused on the utilization of five practices (anticipating, monitoring, selecting, sequencing, and connecting). She wrote in her journal entry that “I also looked at planning my math lessons differently, trying to incorporate as many of the five practices as possible.” While planning for the use of strategies learned from the professional development sessions she attended was evident in the interview with Erin, she did not just plan the “what” or the standards she was going to teach, but she also planned for how she would go about teaching her students the strategies as well.

Strategy implementation was another interpretive code, aligned to the theme of *action orientation*, that evolved throughout the data collection process with Erin. The descriptors utilized to develop this code included content approach, content understanding, and

discourse. Strategy implementation is defined as the classroom teacher describing a specific strategy implemented as a result of their professional development experiences. In many cases, Erin's application of her newly learned professional development came through the implementation of student partnerships with an emphasis on the strategy of discourse. These partnerships were clearly a priority for Erin after her professional development experiences. For example, in describing a task she implemented with an emphasis on student collaboration and discourse in her first journal entry, she stated that she planned a problem solving experience to increase discourse among students. She stated:

The students go out and work with their math partners to collaborate, talk, and solve the problem. At the end, we came back together to share how they solved the problem and define what groups did to solve the problem.

Additionally, in considering what strategies to apply from her professional development session, Erin stated in a follow up from her interview that

I am the kind of learner that focuses on one thing, and I try to determine what stands out most to me. I take a chunk and learn more about it. The chunk I take is not always what everybody else is learning about or trying out. I really look for that chunk that stands out to me the most and I usually identify with something I have been trying to figure out for a while or something I have been trying to grown in as a learner.

In both the journal entries and the interview, Erin frequently mentioned how she applied her learning about student discourse into her daily math block. With her kindergarteners, she made it a priority to not just tell students the appropriate way to talk to each other about math, but she also planned for and took the time to show students how productive discourse about math can happen in their classroom.

Relevance. Another theme that arose throughout the process of analyzing journal entries and the interview data with Erin was that of *relevance*. For the purpose of this study, relevance is defined as the professional development teachers receive as being useful and

meaningful to their daily work. The interpretive codes of reflection, peer collaboration, and transformation supported the development of this theme. Undoubtedly, Erin truly valued the time that she had with colleagues to learn new instructional practices, bounce ideas off them, reflect with them, and to learn from them in order to take action. Most importantly, she felt the professional development she was receiving was relevant to the daily work of her classroom. Hightower et al. (2011) support the idea of tight alignment and suggests that effective professional development must be aligned to the content in which the teachers are teaching. Additionally, they also cite the importance of teachers having the opportunity to work in teams within the same school for an extensive period of time on issues directly impacting their daily work. This level of relevance will bring meaning to the professional development experience of the classroom teacher.

Reflection was one of the interpretive codes that emerged throughout the data collection process with Erin and tied to the theme of *relevance*. Reflection is defined as the classroom teacher reflecting upon past practice and being thoughtful how to improve their current instructional practice. Some of the descriptors included individual reflection, vertical team, and collaborative reflection. As I built a relationship with Erin during the interview process, I noticed that she was always very reflective about her current instructional practices, newly acquired instructional practices, and how she could intentionally use these practices to support student learning in her classroom. It also became clear that reflection allowed her to process how to make her new learning different and of higher quality for her students. In her last journal entry, she reflected upon her professional development conversations with other teachers and noted:

I realized that as a teacher I have not been purposely planning activities that provide

my students the opportunity to experience productive struggle. In the past, I thought learning opportunities that my students were successful at with little struggle were quality lessons. However, this professional development has taught me that those lessons might be good lessons, but they are not quality lessons because they are not providing the opportunity for the student to make significant growth.

Erin was also very appreciative to have the time to reflect upon these issues with her colleagues from different grade levels and viewed them as very supportive throughout her professional development experiences. Reflecting with her colleagues also provided a deeper sense of *relevance*. For example, while she described having a strong understanding of the content standards that she currently taught, she also reflected upon the importance of her professional development experience with these teachers from other grade levels in the interview and stated:

What this experience has really helped me with is that since the team I'm working on has all grade levels except for one, it let me see where my standards are in kindergarten and how they grow to first grade and then second, third, fourth, and fifth.

Another interpretive code that emerged throughout the data collection process and aligned to the theme of *relevance* was peer collaboration. Collaboration is defined as the classroom teacher working with other colleagues to improve instructional practice and student outcomes. Descriptors that developed the code of peer collaboration included teacher observation, vertical teams, content approach, and grade level collaboration. As stated previously, Erin felt as if she has a strong understanding of the content standards that she teaches for her grade level. However, she did learn from seeing how other teachers approached the teaching of those standards. During the interview, I asked Erin what kept her motivated as a part of this action research team. She responded by saying,

I think the new understandings and seeing how others do it. Something that I am really good at might not be something that someone else is, but they can help me

grow in an area that I can be better at.

In reference to a peer observation lesson, Erin added later in the interview that “seeing what it could be from being able to work with her and collaborate with her, its stretching my understanding and my growing to come back and want to do that in my own classroom.”

Throughout the interview and journal entries, it was also clear that having the opportunity to collaborate with other teachers was a valuable part of her learning as an adult. I really appreciated how she valued her fellow teaching colleagues and always felt as if she still had a lot to learn from them and truly valued their opinions and knowledge that they brought to the professional development sessions with her. In referring to one of her colleagues during interview, Erin said “being able to work with her and collaborate with her, it’s stretching my understanding and I’m growing which makes me want to come back and try a strategy we talked about.” In understanding the power of teacher collaboration, she also made student collaboration more of a priority in her classroom as well.

The final interpretive code identified through the data was transformation. Transfer of professional development, meaningful, exploring, belief, and lesson design were all descriptors that comprised this interpretive code. For the purpose of this study, transformation is defined as classroom teachers changing their instructional strategies or approaches for a deeper, more meaningful and emotional purpose beyond just themselves. One of the keys to transforming new knowledge into her own classroom was how she viewed the relevance of her professional development. In a follow interview, Erin stated,

any professional development can be relevant to anyone if you have the mind to be flexible with it. When professional development is specific to kindergarten, I am definitely engaged but I also like things not directly aligned to kindergarten. When the professional development is not directly happening in the grade level I teach, it challenges me to think about how this can look in my grade level. I actually often find

more relevance when the professional development is not in my grade level because it forces me to stretch and think about how I can apply it to my grade level.

In both the journal entries and the interview, Erin consistently talked about exploring the use of new strategies learned during collaborative opportunities with peers that support her students in developing an understanding of math. In one of her journal entries she discussed how she was utilizing newly learned concepts in her professional development to provide her students with more opportunities for struggle during her mathematics block. In reference to her action research team, she added “we discussed how productive struggle can help them build critical thinking skills and develop grit.”

A graphing lesson was an example of a transformative practice she designed as a result of professional development with a focus on productive struggle: She commented on the purpose of providing an opportunity for productive struggle:

I created a graphing lesson for the purpose of providing an opportunity for productive struggle. Graphing has always been different for kindergarten because there are so many steps to it. In the past, we mainly talked through what a graph is and colored in a pre-made graph. This year I was much more open with it. This year I really wanted kids to show me how to represent information instead of just coloring a graph. I had them try to figure out how to record it instead of me telling them how to do it. They were all engaged, their graphs all looked different at the end of the lesson and it was just so powerful for them to see each other’s thinking. The struggle gave them more information and deeper learning instead of me just giving them all of the information and telling them what to do. When they have a productive struggle, the learning is more meaningful to them and they seem to hold on to the new learning more.

As Erin continued talking in the interview about the influence of productive struggle on transforming her lessons, she stated since her professional development sessions “I think about how I can support students learning a skill by allowing them to experience productive struggle. I now see lessons without struggle as lessons that missed out on a learning opportunity.”

Efficacy by design. The final theme that emerged within Erin's case study as a result of analyzing her journal entries and interview data was *efficacy by design*. The interpretive codes that developed this theme included student ownership, learning community, and productive struggle. Efficacy by design is defined as the classroom teacher designing learning experiences that increase student confidence about mathematics. Throughout the time in which I collected data, it became clear that she felt the learning experiences in which she was providing her students was positively influencing student confidence. This confidence about mathematics is not always developed by students individually. Individuals do not necessarily rely on their own experiences as a source of self-efficacy. Vicarious experience through conversations about success with peers or with other colleagues serves as an additional source of individual self-efficacy (Goddard et al., 2000). Bandura and Adams (1977) added that when individuals see others struggle through a situation or problem and are successful, they are more likely to believe in themselves when addressing a challenge. While vicarious experiences can be a source of positive impact on individual self-efficacy, it is not as influential as authentically experiencing success or overcoming a challenge. (p. 675).

Throughout my interview and conversations with Erin, she was becoming very proud of the way her students were responding to the instructional practices that she was learning and trying out with them as a member of an action research team. Erin was specifically excited about the way her students were responding through increased confidence with some of the instructional strategies that she recently learned more about at professional development sessions.

Student ownership of mathematics was an interpretive code that related to the theme of *efficacy by design*. Descriptors such as student engagement, student driven collaboration,

independence, and growth mindset were utilized to develop this interpretive code. Student ownership of mathematics is defined as students taking ownership of their own learning as a result of the learning experiences provided by the teacher. As this research study progressed, Erin became increasingly satisfied with the ways her students were taking ownership of their work. As she reflected about the progress her students made during our interview, she shared the influence of a new backwards design model on student learning. Erin commented “this structure has done a lot for them. They don’t need me to help them through. When I go to confer, they are like, “oh, well this is what I am doing. Are you done now? Go away!” Erin also discussed how student confidence has changed students to take more ownership. She noticed,

that they don’t want to back down anymore from their peers anymore when discussing a math problem. Now they are confident in their answers and they stand up for their thinking. Its funny because now it really takes a lot of talking from a peer to really convince them to change their answer. They are just really holding on to their thinking and cannot be convinced that they are wrong which in the end really shows me how much they believe in their thinking.

In one of her journal entries, Erin added that within three weeks of implementing newly learned instructional strategies, her students “are independently problem solving more while also, hopefully, listening closely to their classmates and teachers’ thinking.” In thinking about how her students use to respond to mathematical tasks, she noted a shift in thinking and commented that students use to say “I have to complete this problem but now they say I get to complete this problem. The students are thinking and working harder than before, yet they are preserving and not giving up.” Through the development of this perseverance, Erin stated in a follow up interview that “students are continuing to develop more ownership and confidence in themselves as mathematicians.”

Another interpretive code aligned to the theme of *efficacy by design* was that of learning community. The descriptors utilized for this interpretive code included safe learning environment, cooperation, and open to making mistakes. Learning community is defined as the culture and climate that is established in a classroom and its influence on students. Throughout everything that Erin was learning and attempting to do in her classrooms as a part of this action research time, she was striving to create a safe learning environment that allowed students to take risks and develop as mathematicians. In a follow up interview, Erin reflected upon the influence that the environment has had on her students and stated

The environment is critical to student success. In math, it is usually a right or wrong type of subject. The challenge for kindergarteners is that being wrong can defeat you. However, I try to teach my students that wrong doesn't mean you are done and that we have to keep working until we get it. In kindergarten, you are truly setting a foundation for students that it is ok to be wrong and how to handle it. Additionally, for kindergarteners, this might be first situation in which they are wrong at and it is in front of their peers which can make it difficult. I also have to create an environment that teaches students that its ok to disagree with each other. I teach them that if someone disagrees, it doesn't mean you are wrong but that someone else sees it differently than you.

During the interview Erin also discussed the importance of creating a learning environment that was centered on the students. She elaborated on this idea and in thinking of her students stated that she was driven to “give them the best learning environment they can have. To give them that endless potential and that really high bar to see and ask them “can you get there?” and they do.”

The final interpretive code related to the theme of *efficacy by design* was inquiry. Descriptors for this code included backward design, problem solving, and perseverance. Inquiry is defined as the students having opportunities to explore and discover mathematical relationships through problem solving, hands on learning, peer collaboration, and teacher

facilitation. Throughout the work of implementing a backwards design model that focused on inquiry, Erin began to notice some changes in her students in addition to changes about her beliefs as a mathematics teacher. One of the changes Erin began to notice in her students is their willingness to take more ownership and work through difficult tasks and problems, especially when having the opportunity to work with other students. Erin's inquiry based lessons centered on students having the opportunities to work collaboratively with their peers and work through difficult problems. In one of her journal entries, she discussed how her students were working together through difficult problems in an inquiry based lesson. She elaborated that,

During a focus lesson, I gave my students a pretty difficult task and I asked them to try to solve the task on their own. Some were able too, but not many. We came back and we talked about it as a group. Students shared their thinking and then they went back and tried again. More were able to solve it this time but not all. We came back again and talked some more. I then had them go back and this time they they were able to pair up. As we came back, we talked about how the task became easier to solve when we were working with a partner and how working with a partner can help us work through hard problems.

In another journal entry, Erin continued to discuss the influence that inquiry lessons have had on her students and stated "my students really grasped the concept of being a problem solver. When they experience productive struggle now, most of them persevere. Through this perseverance, Erin noticed that her students were also becoming more confident in themselves as mathematicians and had a stronger belief in their ability to do math. Erin stated that the inquiry process has "had a tremendous impact on my student's confidence."

Case 2 – Shawn

As I walked into Shawn's classroom, my attention was immediately drawn to the classroom environment. It certainly did not look like an ordinary classroom. There was a

couch, lamps, and a multitude of spaces for students to work individually and collaboratively. The lighting of the classroom was very warm and not overwhelmingly bright. As I began my conversation with Shawn, he was very enthusiastic about his students. He talked about the great group of students he had this year and their eagerness to learn, especially with the changes he was making with his math instruction. Shawn is considered European American and is in his third year as an intermediate teacher. He has been in the same building for all three years of his teaching assignment and also serves as a mathematics demonstration teacher for the district. His school serves approximately 498 students, with about 80 percent of those students receiving free or reduced lunch. Additionally, approximately 40% of students are White, 22% Black, 14% Hispanic, 7% multi-race, 11% Asian, and less than 5% Pacific Islander and Indian (Department of Elementary and Secondary Education, 2016).

Shawn holds very high expectations for his students and believes that each of them can achieve at high levels. The themes identified in his data supports my perceptions of Shawn.

Efficacy by design. The first theme discovered in the analysis of Shawn's journal entries and interview data was *efficacy by design*. The interpretive codes of student ownership of math, inquiry, and student engagement were the three interpretive codes connected to this theme. It was apparent that Shawn strongly believed in the importance of his students taking ownership of their mathematics and wanted his students to see themselves capable of doing difficult math. Shawn felt that through supporting his students in taking ownership of their math, they would develop confidence and belief in themselves as mathematicians. Shawn intentionally designed learning experiences that allowed students to do the hard work while he had the opportunity to serve as the facilitator of learning.

Bandura and Adams (1977) state the development of self-efficacy within individuals has four main sources that contribute to how people perceive themselves. These include performance accomplishments or mastery experiences, social persuasion, vicarious experience, and emotional arousal. The source of performance accomplishments or mastery comes from the positive experiences individuals have as they conquer challenges. Designing these positive experiences for students was clearly a priority for Shawn. However, there is a caution in that if the positive experiences result in success and come too easily for individuals, when failure occurs, it is likely to result in a strong sense of discouragement and ultimately impact an individual's self-efficacy in a negative way (Goddard, Hoy, & Hoy, 2000). Bandura and Adams (1977) added that the strong sense of discouragement from failing can be most impactful if it happens frequently and early in the new learning experience. The effects of failing will not be as strong if most of the initial experiences are successful, and the success lasts for a duration of time. While successful experiences are critical in developing self-efficacy, not all successful experiences enhance one's self-efficacy.

The first interpretive code that aligned to the theme of *efficacy by design* was inquiry. Descriptors that supported the formation of this code included the 5E instructional model, problem solving, and backwards design. As a strategy to increase student's confidence in themselves as mathematicians, Shawn focused his efforts on inquiry-based instruction that allowed his students to gain ownership of their learning. He was passionate about his students becoming problem solvers and encouraged them to figure out mathematical relationships instead of standing in front of the class telling them about mathematical relationships. Shawn felt that through implementing a model of inquiry, students would

develop the motivation and confidence to do rigorous mathematics without significant dependence upon the teacher. In one of his journal entries, Shawn reflected about planning for an inquiry lesson, and stated:

I strive in each unit as well as each lesson to look at it backwards. I ask myself the questions: “What do I want students to know, be able to do, and understand by the end of the lesson/unit?” Whatever that goal might be, I design my learning experience following the “We, You, I” model. I like to think of it using the 5E Science model. My first step is to engage the students. This could include a connection from a previous math lesson, real world problem, or warm-up associated with the math students are going to need to be able to do in the explore. The engagement sets the stage for how the rest of the learning is going to go for that day. The second step is Explore. This is where the learning is totally in the hands of the students. They are persevering, using their knowledge to problem solve, trying multiple strategies. This is the step where students are trying to solve a problem using their current level of understanding. I am not in front of the class teaching the strategy, I am not leading the discussion, students are driving the learning. This is the step where I am able to questions, observe, and see the misconceptions that need to be addressed. The next step is Explain. Here, students share their work, explain their thought process, and the learning is wrapped up. This is the “I” part of the “We, You, I” model. The next step is Elaborate or Extend. Students now take their experience, explanations, and new understanding and apply it to a new situation. Evaluate is the last step in the 5E model, however evaluation happens throughout all 4 steps. I have taken this backwards design structure, applied it to my math workshop, and have seen the benefits!

Throughout the process of developing inquiry-based lessons for his students, Shawn noted several obstacles in determining the most appropriate tools for students to use with the inquiry lessons:

I always want to start out with a concrete learning experience when planning my lessons. This is also the way we are learning to plan in our action research team. Sometimes it’s hard to come up with tangible concrete tools for them to use. For example, I used the snap cubes in a previous lesson and that was an amazing concrete tool and experience for students. But with fractions, I don’t have actual tangible concrete things and it becomes the students doing the work with more pencil and paper. It is also difficult when I don’t have my action research team here with me to work through the challenge of trying to figure this out.

Shawn also began to approach the process of designing his inquiry lessons based on levels of concreteness for students. In one of his journal entries, he described his learning of these stages with his action research team.

I have been refreshed on how to take a concept or standard and break it apart at all levels. These levels include the concrete, semi-concrete, semi-abstract, and abstract. Students must be able to create a representation using concrete tools and examples. From there, they can begin to draw that representation the way they built it with the concrete manipulatives. Their next step in developing conceptual understanding of a standard is the ability to create their own representation. Their final step in the progression is being able to apply their understanding in different situations and in different ways.

The second interpretive code aligned to the theme of *efficacy by design* was student ownership of mathematics. Descriptors for student ownership included student driven collaboration, engagement, student reflection, and student confidence. Through the process of developing inquiry based lessons, Shawn began to notice his students were individually and collectively taking more ownership of their learning of the math content. During the interview, Shawn stated

I think they're able to take ownership through on where they are at in their learning. They kind of automatically think "Oh, this is my next step" and ask themselves "What is the next thing I'm going to work at?" Just confidence as well. I think they feel ok with saying "If I do this and work at it for 30 minutes and its completely wrong, oh well." Then they reflect on this sort of thing and learn from it and come back tomorrow to try this, this, and this. I also think they are using each other, so they're not just coming to me, they're using each other and other students are coaching other students.

In a follow up interview, Shawn added his students have taken ownership. He maintained that

in every aspect, and it's sometimes like I don't even need to be there because of the way they are taking ownership. Now they even go and take tools they need with no teacher direction. I am on the edge of the classroom and they are the center of it.

Subsequently, Shawn affirmed his students are taking more ownership, “they are more willing to keep trying. They are confident that there will be a time they will get the answer right and they know that if they keep going they will definitely get it”

Shawn concluded that his students have been taking more ownership and how reflection supported this change within his students. In one of his journal entries, he wrote students

are reflecting on their own work based on the work of others. Yes, they were doing this before, but now they are not just changing their work because it looked different than their peer; they are changing their work because they are seeing the step-by-step progression and understanding their thinking and the thinking of others. Students are also diving in to the tasks and growing confidence in themselves as they take more ownership. They are attempting multiple strategies when solving problems and analyzing the work of their partners and learning how to decompose their task into smaller parts.

The final interpretive code supporting the theme of *efficacy by design* was learning community. Throughout the interview with Shawn and embedded within the journal entries, it was clear that he intentionally created a learning community to ensure each one of his students had access to the math he was teaching. Shawn felt if all students did not have access to the math, they could not participate in the development of a mathematical community. Shawn described during his interview how providing all students access to the mathematics has influenced his learning community. He spoke about their levels of engagement.

Well, they're more engaged for one. They're excited to get started. I think each student is engaged in their own way. It's not just everyone trying to do this one task where maybe it's easy for some people, or its too difficult for some students to start. Everyone has an entry point now because I provide that for them.

In one of his journal entries, Shawn wrote about how his learning community has evolved throughout the duration of this study. He described how they “are constantly pushing

themselves and not shutting down when it gets hard. They are drawing on the strengths of their peers and are comfortable enough to admit when they are completely lost.”

In a follow up interview, Shawn provided an example of how he deliberately develops an entry point for his mathematics lessons so that all students can engage in the learning. . Shawn stated that he

begins by looking at the standard and developing an open ended task for his students. Then, I draw a circle around an aspect of the task that any student in his classroom can immediately do with no help. Next, I give the task to my students and allow them to work independently or collaboratively while I observe, question, and find misconceptions my students might have. Based on what I notice; I can pinpoint next steps for my students. When I see the entry point for each student, it also allows me to differentiate.

Through this differentiation, Shawn was able to establish small groups and allow students to continue collaborating towards a common goal, which he felt was an important element is the success of developing a strong learning community within his classroom.

Action orientation. The second theme pinpointed during the data collection and analysis process was *action orientation*. The connected interpretive codes to this theme included doing the work and planning. Shawn reflected about his past work with students and how his new learning can be incorporated to make learning experiences more meaningful to today’s students. He also communicated the importance of not just planning the work for students, but also personally completing the assignments before giving them to students as a strategy to identify misconceptions and possible strategies the students may utilize to solve the problems. Through doing the work of students and reflecting about past practices, Shawn took more ownership in his planning and became more engaged and motivated to transform his instructional practices.

When internal motivation can be extracted through effective facilitation of learning, the level of engagement of adults can increase. Additionally, Russell (2006) argued that motivation and engagement of adults in the learning process can increase when they have power over the content, input into the process in which they will learn the new information, and are provided some direction with clear outcomes. Ultimately, the goal is for the level of engagement to be so high that the professional development experience can be almost entirely facilitated by the adult learners themselves.

The first interpretive code aligned with the theme of *action orientation* was doing the work. Descriptors such as deconstructing standards, mathematics progression, and use of assessment contributed to this interpretive code. For the purpose of this study, doing the work is defined as the teacher completing the assignments prior to giving them to students. Shawn described how taking the time to do the work of students allowed him to develop a deeper understanding of the standards identified to teach in an upcoming lesson. Further, Shawn described how completing the assignments prior to actually giving them to students supported him in understanding how students might attack the assignment. He indicated in a journal entry that

I need to do the work myself. For example, I need to immerse myself in multiplication situations and try out strategies and use them. This not only gives me an understanding of what I will be requiring my students to do, but reveals the misconceptions that can become my teaching points for my focus lessons.

As Shawn worked through the process of doing the students' assignments before the students, he also discussed the importance of doing the work so that he had a better understanding of where a particular standard is progressing at different grade levels. He elaborated by discussing the process of planning through such comments as:

I need to be able to ask myself what is the next level of this standard? and also “what is the previous level of this standard? This requires work on my behalf by representing the standard from the concrete to the abstract level as well as the grade level before and the grade level after.

The second interpretive code that aligned with the theme of *action orientation* was planning. Intentional planning, vertical team, and student-centered were descriptors that supported the development of this interpretive code. Through my conversations with Shawn and in examining the data collected in the journal entries, it was evident that planning played an important role in his work to improve mathematics instruction for students. In one of his journal entries, he reflected about the importance of intentional planning and stated “in order for students to drive their learning, there is a lot of prep involved! Just because students are driving the learning doesn’t mean there isn’t intentionality involved down to the grouping, problems, differentiated tasks, questions, and tools”. In addition to intentional planning, student-centered was evident in his description of the s planning process. He recorded in his journal,

knowing that students must progress through each step in developing understanding, . . . as a teacher [I] must plan and unpack the content standard at each level. I must be able to identify where a student is and t their next step.

In his interview, Shawn built on the idea of deconstructing standards when planning as a means to be more student centered. He stated

I have to decompose them first and try to understand what its asking the students to do. Then it leads me to breaking it down myself. Then I can learn the misconceptions and really fully understand the standard before I try to show it to the students and teach it.”

Shawn added in his journal, “after any PD, especially math, I find myself planning and diving right in and trying it out in my classroom the next day. I learn something new, plan for

it, and then it becomes part of my instructional practice.” Shawn expressed his motivation for trying out newly learned strategies. He wrote:

I find myself always asking, “What’s my next step?” The second reason I find myself jumping right in the next day, is that I have been exposed to something new and transformational. Going back to how I did “it” before the PD seems pointless; I have seen how it works and how it improves either my skills and knowledge as a teacher, the level of content my students are learning, or the role/level of engagement of my students.

Relevance. The final theme formulated during the data collection and analysis process for Shawn was *relevance*. There were two interpretive codes that aligned to this theme which included peer collaboration and transformation. The relevance of the professional development that occurred with Shawn and his colleagues was not just centered on making sense of the standards and discussing instructional practices, but also supportive of transforming instructional practices for students.

Research by Goe and Stickler (2008) maintained that in order for the professional development to impact the quality of classroom teachers, it occurs over a long period of time, aligns to the content in which the teachers are teaching, and focuses on the pedagogical practices that teachers can utilize in the classroom.

The first interpretive code aligned to the theme of *relevance* was peer collaboration. Descriptors utilized for the development of this code included teacher observation, vertical team, grade level collaboration, and co-teaching. This interpretive code described not only collaboration between teachers and with a consultant, but collaboration amongst students as well. I found it interesting throughout this study that a high level of positive energy was prevalent when the teachers I discussed collaboration with their colleagues and increased

collaboration amongst their students. Moreover, Shawn placed an emphasis on the importance of the structure of collaboration. , Shawn stated:

Well, I think it's really awesome that I get to have one on one time with the consultant, an expert in math. Just having the time to go through and plan the lesson and do the math together is really helpful. After we plan, I get to go and teach it in front of my peers and then have collaboration time with other teachers that are on the same wavelength as me after the lesson. They want the same goal, but maybe get there a different way and we can talk about that. The conversations really help me think and keep me motivated while thinking about my next steps after I have had the professional development.

Shawn wrote about the influence that other colleagues had on him during professional development sessions, "hearing from experts, coaches, and fellow teachers really helps me grow my skill set and knowledge." In a follow up interview, he described the value of peer collaboration through observation. He commented that it is especially powerful

when you can gather input from all of the other teachers, especially when they are observing you teach a lesson. It also helps that the teachers observing you are focused on the same kind of things. The feedback brings so so many different perspectives from different people doing the same thing and it is just really powerful feedback for me.

Transformation was the final interpretive code that became apparent in Shawn's data and aligned to the theme of *relevance*. Some of the descriptors for transformation included student collaboration, meaningful, belief, student motivation, engagement, challenge, and discourse, and student energy. As Shawn continued his journey of professional development experiences throughout this study, he became more driven to provide his students with the highest quality math instruction as he continued to see his students becoming more engaged and excited about math. Specifically speaking to the transformation of student collaboration, Shawn discussed how students were able to make math more relevant through understanding how their peers were attacking math problems. Shawn noted in his journal some of the

change in his students after incorporating more peer collaboration during his math block. He reported the following:

They're more excited to share and explain their thinking. I don't just give them the answer when they are struggling. They're figuring it out together and I just continue to question and question. They're not afraid to share because they are like, oh well, if I'm wrong that awesome because I'm still learning.

Shawn also depicted how the transformation of peer collaboration in his math block resulted in a positive change for students. He wrote "students are talking more, reasoning more, applying more, and understanding at all four levels (concrete, semi-concrete, semi-abstract, and abstract." In a separate entry, Shawn also added that as a result of increased student collaboration

students are also reasoning more! If a situation doesn't make sense, then they work together until it does make sense! They take time to understand the situation, make a plan, carry out the plan, and are open to starting over.

In a follow up interview, Shawn commented that the transformation of student collaboration has supported making the learning more relevant for his students.

When students are trying to solve a problem by their self, it is very easy to give up if the problem is really hard. Through working together, they are helping each other make the learning more relevant through providing different perspectives about the problem and ways to attack it.

Case 3 Nicole

Walking into Nicole's classroom for the interview allowed me to develop an understanding of her values and instructional practices as a classroom teacher. Her classroom was filled with learning charts that supported newly learned concepts which ultimately support her students becoming independent learners. Additionally, Nicole created a variety of spaces for small group collaboration, individual learning,

and comfortable areas with alternative seating arrangements for her students to learn besides a traditional desk and chair. Nicole is classified as European American and is in her fourth year of teaching at her current school, where she has been a primary teacher for all four years. Nicole's professional experiences also included serving as a school volunteer and a teacher assistant in a pre-k setting over the past ten years. The school where she teaches serves approximately 290 students, with about seventy-six percent of those students receiving a free or reduced lunch. Additionally, approximately 49% of students are white, 20% black, 15% Hispanic, and 16% multi-race (Department of Elementary and Secondary Education, 2016). Furthermore, Nicole is also a demonstration teacher in the area of mathematics for the school district

Teacher efficacy. The first theme developed through the analysis of her data was *teacher efficacy* with interpretive codes of student success and developing perseverance. There were certain aspects of Nicole's experiences with students that positively influenced her belief in herself as a teacher of mathematics. For this study, teacher efficacy is defined as the classroom teachers developing a sense of belief that their actions will make a positive academic difference for their students. Friedman and Kass (2002) expressed teacher self-efficacy as "the extent to which a teacher believes that she or he can influence students' behaviors and their academic achievement, especially of pupils with difficulties or those with particularly low learning motivation" (p.675). As teachers engage in the process of transformation and make new meanings from both their previous experiences and new learning experiences, they can begin to cultivate a sense of teacher self- efficacy. As self -

efficacy strengthens for a teacher, self-efficacious behaviors often translate to work with students; those that struggle academically can begin to develop a stronger sense of efficacy leading to increased motivation to learn and seek help from teachers (Ross & Bruce, 2007).

The interpretive code of student success is specified as students being successful with mathematics as a result of the newly learned instructional practices teachers implement in their classrooms. Descriptors such as exceeding expectations, determination, engagement, and student confidence were utilized to develop this interpretive code. Throughout the data collected from Nicole, she was very enthusiastic about the ways her students were responding to and being successful with the instructional practices she was trying out in her classroom as a result of new acquired learning with her action research team. I also made note of the interview data that signaled Nicole was aware of the impact of how her confidence in math has improve over time and her students' success with math was affirming. She stated that it is when her students

have those successes and they're just so proud about it. They're always like "look what I did, look what I did". And so I just love that because I was a student who math was hard for and my teachers weren't always supportive of the mistakes or me not understanding. When my kids feel confident as mathematician that makes me feel good cause I didn't feel that way when I was their age.

Seeing her students develop a sense of a being successful when tackling rigorous problems also boosted her confidence. She wrote in one of her journal entries that

I've also observed each student show a motivation to reach the increase in rigor. Their determination and success challenges me to continue to raise the bar and increase the level of learning taking place while also encouraging authentic learning to take place.

In a follow up interview, Nicole added

my kids from tough backgrounds and in their personal lives may not have seen a lot of success and often have very little confidence in themselves about math. It makes me feel good as a teacher when barriers are being broken down in our classroom and when they see they can do it. I am just never going to give up on them. When they show me they want it bad, I want to work harder to give it to them. Their belief in themselves really increases my confidence and belief in myself

She also noted how her students' developing perseverance contributed to increased confidence. She stated "what I loved about it was they had to strive to just keep going. They were like, "no, I'm not giving up yet, I got this".

The interpretive code of student perseverance also aligned to the theme of *teacher efficacy* with descriptors of student motivation, cooperation, challenge, and engagement which contributed to its meaning. Students that persevere take ownership and do not give up on math tasks or problems that are difficult. During my follow-up interview with Nicole, I asked her to describe what she noticed about students developing more perseverance in the classroom. She replied

They're just really engaged, they're focused for longer, their stamina is longer because they, they really want to figure it out or they really want to show their thinking. They want everybody to see what they're learning and how they're getting smarter and working harder. A lot of times, one of our things that we say in here is if it's not challenging you then it's not changing you. If I'm not challenging them they will be sure to tell me. This is pushing me to be a better teacher. I'm like "okay if they are asking for something harder then I need to make it harder. What can I give them"?

Nicole stated that students were now developing perseverance in a more collaborative way than they have in the past. She described how proud she was of her students for the ways they were coming together as a classroom community to work through hard

problems and become smarter mathematicians. This outcome was also supported in her journal; Nicole wrote:

Instead of coming straight to me when they need support on difficult problems, they ask a peer or inquiry about how their classmate went about solving the problem. This creates a unique opportunity for one student to be the teacher while the other student can be a learner. I am a firm believer that students learn even more from one another than they can from me when I share or model what I've learned. They connect better with one another. They understand more from one another. They grow more with one another. In addition, the level of encouragement they provide one another is unmatched. It very apparent that each child wants the other to succeed which directly ties to our school mission. "As a team, we will succeed,"

Her strong sense of self-efficacy as indicated by student success and perseverance was apparent in Nicole's instructional practices and connected to the relevancy of her teaching. When content is relevant, students are more engaged with learning. Her interactions with peers during professional development helped Nicole address ways to enhance relevancy in her teaching.

Relevance. *Relevance* was another theme that resonated with Nicole's data.

The interpretive codes of peer collaboration and application of professional development clustered to form the theme of *relevancy*. Collaboration was an important element to assist Nicole in applying context to new learning. Marcelo (2009) adds to the importance of professional development having context for teachers through emphasizing the criticalness of professional development activities being very tightly aligned to the daily work of teachers. Nicole truly appreciated the time she had with colleagues to plan for instruction, learn new strategies from them, and develop a deeper understanding of instructional approaches to teach content standards.

The first interpretive code tied to the theme of relevance was peer collaboration. Experiences describing the formation of this code included grade level collaboration, teacher observation, collaborative reflection, and feedback. In one of her journal entries, Nicole reflected upon how the teachers she was collaborating with caused her to improve a specific instructional practice of a share time at the end of her math workshop block. She stated:

After participating and engaging in professional development experiences with the consultant and my fellow math demonstration teachers, I've been able to use their feedback to enhance the share time at the end of my math workshop block. After a lesson that I taught, the consultant and the other demonstration teachers offered suggestions to create intentional share time experiences.

During the interview, she added that peer collaboration makes the learning very relevant to her work as it

allows me to explain my thinking to others, and the feedback that I get is instant. With three of us thinking about all of the strategies that kids could come up with for a problem instead of just me, it gives me so many different perspectives. The collaboration was especially helpful when I was teaching a lesson and the others were observing. This was really powerful. The feedback from peers during this process allowed me to see my whole classroom and collect data on my students that I would not be able to collect if it was just me. We were really able to see where my students were with certain concepts and I would have never known because I can't be all over the place at once

Nicole also expressed how having time with her colleagues on the action research team to collaborate was important part of her growth and essential to working through the implementation of new instructional practices. She stated that the collaboration with her colleagues has

allowed me that time, that time that I need to collaborate with other teachers throughout the district about math in our district and what's working well their kids, what's not working well for my kids and how can we get all kids at the

same place. Also having the opportunity to go watch the other math demonstration teachers has been really beneficial too because they're really great teachers of math and they do these things and I'm like "wow I never thought about that". It's nice that we're able to debrief after those experiences because then you are hearing all these different perspectives

Finally, in one of her written entries, Nicole added to the value of peer collaboration and said "I believe it has been extremely beneficial to have teachers working together at each grade level to truly understand how first grade scholars will continue to grow as mathematicians throughout their elementary experiences.

Application of professional development was another interpretive code that associated with the theme of relevance. Application of professional development included descriptors such as content strategies, peer observation, context of learning, and feedback. It became obvious that Nicole was consistently considering how she could apply her learning from a professional development session to her own classroom. In my interview with Nicole, she discussed how observing other teachers supports her in applying the professional development in her own classroom. She said the observation "allows me to reflect on my own teaching and see what really good math teachers do and how I can bring that back to my classroom to benefit my kids". Nicole also added that observing other teachers supports her in applying new strategies by individually reflecting on the observation and asking herself questions such as:

Am I doing this right? Could I be doing more? Am I giving them too much and not allowing that productive struggle? I think that through this collaboration my thinking continues to change about what I am expecting of my students in relation to the standards.

Nicole expressed in her interview that she really finds meaning in the professional development opportunity for peers to observe her teaching. She commented that peer observations support her in applying learning in this context because

the things that the other teachers noticed were things that I did not see. For example, the teachers would ask me questions about what I am going to do to get my kids to collaborate more because the problem was hard and the students did not want to collaborate with anyone else. I could apply this feedback and approach my next lesson in a different way because I had these different perspectives.

Nicole also spoke about how she applied the learning of and approach to teaching content standards at other grade levels as well. For example, in the interview, she articulated developing an understanding of content standards at other grade levels by stating “this time has allowed me to collaborate with teachers at my grade level and at different grade levels to know where our students are as a district in 1st grade, but also where our students are going in 2nd grade, 3rd grade, and 4th grade”. She suggested that working with teachers in a vertical manner

allows me to see the progression from grade to grade. I can see a strategy I am teaching in first grade and develop an understanding of where it goes through 5th grade. Understanding how I can support students moving on the progression is really important to me. It allows me to differentiate the learning for my students.

For Nichole, relevancy through peer collaboration and application of professional development stimulated her instruction through planned actions.

Action Orientation. The third theme present within Nicole’s data was action orientation discovered through the interpretive codes of doing the work and planning. Nicole was intentional in taking actions to plan and apply the knowledge acquired in professional development. Her actions were a result of motivation to improve

instructional practices through participation on an action research team. Motivation plays a critical role as to why adults engage in new learning experiences. Motivation for participating in adult learning experiences that are not required can include opportunities to raise the level of career gratification, to enhance individual skills in order to increase job performance, and to acquire new knowledge to move into a new career field (Beinart & Smith, 1998).

Planning was an interpretive code entwined to the theme of *action orientation* with descriptors such as deconstructing standards, intentional planning, math progressions, and student centered constructing its meaning. Planning for Nicole included being very intentional about which instructional practices and tools to incorporate in her classroom along with thinking first about the needs of students. For example, in one of her journal entries she stated

After partaking in this professional development experience, I've changed the way I project an entire unit for math. As before, I still think about the big picture for the unit and the standards that are addressed; however, now I think about the upcoming lesson (misconceptions, errors, levels of learning) after I've gathered additional information from my conferring notes with students. I take the time to truly think about what my students need

Another important aspect of planning that was described by Nicole in the interview was being student-centered throughout the planning process. She noted that through intentional planning and projecting her units for math, "it really makes me think about the strategies kids might use before you teach the lesson. . . . you know kind of prepared for what they might do and thinking through that about your students before the lesson".

With an emphasis on thinking about the lesson through the eyes of her students, Nicole said that

it's important to plan ahead for possible misconceptions and errors the students might make. I can think about how child might do this or that because I have seen a pattern with them. I can then guide them to avoid the error before they make it. In planning through the eyes of the students, I always think about the who and the what. The who is the students and the what is what I think the students will do but I also observe what they actually did so that this information can support me in differentiating for my students.

The interpretive code of doing the work was also aligned to the theme of *implementation*. Descriptors utilized to develop this code included identifying misconceptions, utilization of a math progression, and student work. In addition to being intentional with her planning, Nicole described the process of doing the work she is going to expect of her students before she assigns it as a part of her planning process. This concept of doing the work was something that became a focus of her action research team. By doing the work, she felt this process allowed her to gain valuable information prior to engaging her students in the work she is going to expect them to do. She stated in a journal entry that

by doing the work ahead of time, I am able to determine abstract, more sophisticated answers while also thinking about an entry level of learning for each of my students. Using what I learn from my students in a previous lesson, I am able to create more meaningful lessons that meet the unique learners where they are and continue to propel them toward the final goal(s) for the unit

In the interview, she continued to discuss the importance of doing the work that would be expected of her students with her action research team. She described how a planning tool that she recently began using supports intentionally planning for students.

Nichole declared and that the tool supports

breaking it down to what their misconceptions might be, what their errors might be, and then you do the work and you come up with the answers that students would potentially come up with. It really makes you think about the strategies that kids might use before you teach the lesson

As Nicole reflected on her current experience as an action team member, she stated, “I am able to step back and do the work I am expecting of my first grade mathematicians”. It was very clear that an important aspect of transformation for Nicole was being very intentional with planning process to incorporate new tools and instructional practices into the mathematics learning environment in her classroom. In a real sense, Nichole supported *efficacy by design*.

Efficacy by Design. The final theme that was present throughout the collection of Nicole’s data was *efficacy by design*. Nicole’s students seemed to have developed a sense of increased confidence through the changes she was making in her mathematics block. As she talked about her students, she was very proud of how they were beginning to see themselves as individuals who were successful with math and capable of doing difficult math beyond their own grade level. The interpretive codes that developed this theme included student ownership and inquiry.

When individuals experience emotions that are highly stressful in nature, they tend not to have high degrees of success when compared to experiencing positive emotions. Emotions that are negative in nature will also increase the likelihood that an individual will utilize avoidance behaviors as a strategy to not engage in a situation or problem in which negative emotions are associated (Bandura & Adams, 1977). Tschannen-Moran et al. (1998) suggested that modest levels of emotional arousal can actually assist in improving an individual’s performance in meeting a goal or completing a task. However, it is when the emotional arousal becomes too high that it can have a negative impact and not allow individuals to fully utilize their capabilities

The first interpretive code that aligned to the theme of *efficacy by design* was student ownership of math. Partnerships, student driven collaboration, engagement, student confidence, student autonomy, and student reflection contributed to the concepts of student ownership. Through the learning experiences that Nicole created in her classroom, she began to see students take more ownership of their math as their confidence increased. In one of her journal entries, Nicole reflected upon changes in instructional practices as a result of her work with the action research team and how her changes led to more student ownership. She passionately wrote

With the implementation of the new instructional practices I've learned thus far, I've noticed a deeper level of engagement and cooperation amongst my students. The shift from teacher-centered lessons to student-centered lessons has had a huge impact on my scholars. They are taking more ownership of their math and the manner in which they make their learning visible. I have more freedom to confer and learn from my students and they have more freedom to decide how they make their learning known to me and their peers.

As students have gained more ownership in their learning, Nicole noted in the interview that her students

are more confident and willing to take more risks and willing to make mistakes. When they feel that what they have to say is valued, they are more willing to make mistakes and take risks. They have become very confident with their number talk strategies and this has influenced their confidence. This confidence allows them to express their thinking. They don't have a fear of failure

Nicole also discussed how utilizing the "you do, we do, I do" model of instruction impacted student ownership and autonomy with their work as mathematicians. She stated

its asking me to give the kids a little bit more freedom and that's what they need. They need a little bit more freedom to think it through the problems instead of me just saying this is how you do it, now go practice that.

Nicole continued to discuss that through the opportunity to have freedom to think independently, her students are naturally required to take ownership in their work. Through taking more ownership, she believes that students are developing more confidence because of doing the work with less teacher direction and with her always telling them what to do.

The final interpretive code aligned to the theme of *efficacy by design* is that of inquiry. Nicole worked to transform her classroom into one that provided students with a significant amount of time learning through inquiry-based math lessons. Descriptors for inquiry included backwards design, problem solving, and student centered. Nicole felt that through an inquiry based process, students tend take more ownership for their learning which results in improved confidence over time. One of the new inquiry models that Nicole learned as a part of her action research team was called a three-act lesson. In her interview, she described an experience that she felt was one example of how her students were developing confidence in themselves as mathematicians in this inquiry based model. She stated

just the other day we were doing a three-act lesson and it was tough because there were multiple steps involved. What I loved about it is was they had to strive to just keep going. They were like “no I'm not giving up yet, I'm not giving up yet, I got this”. The next day after the lesson, we came back and we started the lesson with revisiting what we knew from our lesson yesterday. The conversations went into a whole new realm of it's okay that we made mistakes yesterday. Yeah we're not getting the right answer but we're still using the strategies that we know and working hard. It was so awesome just to see them say like "Oh I made a mistake", "but did you see the strategy I used?" I mean it's okay I might not have got the right answer but did you see what I did”

In her journal's, Nicole also expressed this transformation to an inquiry model (the you do, we do, I do model) was a challenge, but one worth doing for the benefit of her

students. In reference to the challenge of transforming her lessons to inquiry-based lessons, she added

at this point, I am still trying to figure out what this looks like with my scholars and how I can make it apply to each lesson. After watching this being modeled in a classroom, I am becoming more confident in my own practices. I think with more guidance; I will feel more comfort with this student-centered approach.

This view was supported in Nicole's interview. She emphasized how the student-centered approach of inquiry

is validating all of the hard work of my planning and has really increased my confidence. All of the work I put into it planning and seeing success of my students really tells me that it is all worth it. It makes me feel proud of them and myself. We are all working toward common goal of being mathematicians.

Nicole was progressively witnessing her efforts to improve instructional practice positively influence her students. Through my interactions with her, I noticed how this positive influence was also changing Nicole's belief in herself as a teacher.

Case 4 – Jackie

As Jackie and I were walking down the hallway toward her classroom, I noticed the bulletin board right outside of her classroom. The boards were filled with student work that exemplified the high standards Jackie had for her students. Upon entering the classroom, I again noticed students' work posted throughout the classroom. In addition to student work, Jackie had examples of strategies, standards, and concepts that she taught her students posted throughout her classroom. These examples were utilized as strategies for Jackie's students to become less dependent on her and to develop as independent learners. The seating arrangements in Jackie's classroom also signified her commitment to a student-centered environment. Students in the classroom had a wide variety of places to work above and beyond their own desks. Upon my previous experiences in Jackie's classroom, I noticed

students laying on the floor working, standing up, sitting in small groups, and sitting at their desks. While Jackie could be described as a soft spoken individual, as we engaged in the interview she was enthusiastic and passionate about the mathematics work she is doing with her students.

As I spent time with Jackie in the interview, the more obvious it became that she is a teacher because she is truly passionate about positively impacting students. Jackie would be classified as African American and is currently in her fourth year as a teacher in the building where she currently teaches. Overall, she is in her 6th year of teaching. Her school has 289 students with approximately 76.3% of those students receiving free or reduced lunch. The school's student demographic makeup includes 49.1% White, 14.2% Hispanic, 19.4% Black, 15.2% multi-race, and less than 5% of Asian, Indian, and Pacific Islander (Department of Elementary and Secondary Education, 2016).

Action orientation. The first theme identified in the analysis of Jackie's data was *action orientation*. Actions such as planning and doing the work were the interpretations of some of the data collected within this case. Jackie was very thoughtful about how the incorporation of knowledge learned in her professional development sessions influenced her students. One of the things I noticed throughout my dialogue with Jackie, was she frequently referred to the impact of professional development sessions on her teaching. Not only did she spend a large portion of the interview talking about what she learned, but also how she was using her new knowledge to impact her students. The focus on these new instructional strategies was a sign that she was very pleased with how she was transforming her practices. She also appreciated the dialogue with other teachers that were members of her action research team.

Levin and Rock (2003) studied five pairs of pre-service teachers and their mentor teachers while conducting action research. One of the prominent findings in this study included “participation in the collaborative action research projects provided opportunities for deliberate, focused dialogue about teaching and learning, while revealing important personal and professional understandings about one another” (p. 145).

Planning was an initial interpretive code in Jackie’s journal and interview data used to describe factors that contributed to the theme of *action orientation*. Intentional planning, utilization of assessment, and utilization of a math progression shaped the meaning of planning for Jackie. I was very impressed with the way Jackie became very purposeful about lesson planning as she worked to meet her students’ needs based on where they were with acquiring mathematical concepts. As Jackie discussed student learning, it became clear that she placed a priority on how she could meet the needs of each one of her students. She emphasized developing entry points into mathematics for individual students in her classroom so that each one could experience success. For example, Jackie described a new lesson planning format that she used centered on five practices of orchestrating productive mathematics discussions. These practices included anticipating, monitoring, selecting, sequencing, and connecting. Jackie wrote “the use of the 5 practices has allowed me to do more in terms of planning my instruction. The anticipation phase has been important in regards to knowing the expectations of each standard below and above my grade level.”

Jackie also reflected upon the importance of utilizing a math progression to meet the needs of her students and said “. . . it is my first year in fourth grade, I would have to say just really understanding where they should be coming from third grade and understanding what they already know. The progression has been a great support for me.” In addition to utilizing

a mathematics progression, Jackie also found formal and informal assessments with recording sheets supportive in developing next steps for students. During my interview with Jackie, she described an example of using recording sheets and said “while students are working alone, I have used the recording sheet provided during professional development to track student progress. The recording sheet allows me to see each student’s strength and their misconceptions when solving the problems independently.” Jackie added that based on what she notices on her recording sheet while students are working together, she also “uses the student work to start dialogue between students to find the correct solution.”

The final concept that supported the theme of *action orientation* for this case was doing the work. The three descriptors involved in developing this code included identifying misconceptions, deconstructing standards, and content understanding. Following her professional development experiences, Jackie discussed and wrote about the process of doing the assignments she gives students before she gives it to them. Doing the work assisted Jackie in understanding ways the students might attack a problem while also allowing her to be responsive to the needs of students. Jackie described doing the assignments before giving them to students and wrote that by doing this, it “has allowed me to consider any possible strategies students would use when working to show an understanding of the math standard.” She also noted that completing the work she gives to her students “has allowed me to know the material I have to teach.” Jackie discussed the importance of breaking down content standards to ensure understanding of what she was teaching. She referred to back to the practices utilized for planning and said “the five practices are essential for me when it comes to unpacking the math standards, so that I am are aware of what students should know at each level.”

Efficacy by design. *Efficacy by design* was similarly a theme present throughout the data collected from Jackie and developed through categories of student ownership and the development of a safe learning community. When considering self-efficacy, it is important to understand that it is not a fixed trait of an individual. Rather, it involves one's ability to organize a set of skills into a coordinated action (Bandura, 1982). As Jackie implemented new instructional strategies, she described changes she was noticing with her students due to her new approach to mathematics instruction. These changes included an increase of student's self-confidence about math in addition to the development of more positive attitudes.

The interpretive code of student ownership was discovered through data analysis process and aligned to the theme *efficacy by design*. Student driven collaboration, growth mindset, engagement, and technology contributed to the unique meaning of this interpretive code for Jackie. As Jackie described examples of how her students were beginning to take more ownership in their work as mathematicians, I could understand how their confidence had increased. In one of Jackie's journals, she wrote about some of her struggling students beginning to take ownership of their learning and developing self-confidence. She pointed out that

students who were once struggling with their understanding of math are now taking more risks to use manipulatives in front of their peers. These students are now working toward understanding and not following a rule. These students are now more confident to answer questions because they have a visual to show and prove their thinking.

Jackie expanded on these improvements in an interview. She said that as individual students are taking more ownership, they are also collectively taking ownership. "My students now

have more dialogue about what they are learning from each other through the sharing of their different math strategies.”

Jackie also discussed how her students are taking more ownership in their progress through the incorporation of data notebooks and tracking their progress. She said her students “are owning their growth and constantly thinking about what they can do to get better.”

Jackie perceived the use of technology allowed students to take more ownership of their learning as a result of the level of engagement technology provides. Jackie stated

“technology has been a great benefit in the classroom to incorporate math manipulatives.

Students enjoy using the math manipulatives to show their understanding. The use of

technology has increased their engagement in the math standards.” Jackie too found

opportunities within her classroom to celebrate students as they began to take more

ownership with the work. She mentioned in our conversation that when students are

experiencing success “I find those small moments and make them into big moments so that I

can really help them internalize what they did even more.” For Jackie, interspersing these

moments in her instruction was critical to student success. “Just taking a simple small

moment for them and making it a big moment in front of the class goes a long way with

them”.

Finally, as Jackie has witnessed students begin to take more ownership of their work

individually and collectively, she began to see their attitudes change. In my discussion with

Jackie, she said

it’s like now they believe everyone can learn math at the highest levels. The ones that are maybe in an intervention, or they know that typically math for them is something hard and that now it is just all about effort.

The interpretive code learning environment was also tied to the theme of *efficacy by design*. Descriptors utilized to develop this code included students being open to mistakes, safe environment, and encouragement. The learning environment was an important aspect to Jackie's classroom and was something that I felt she clearly valued and prioritized. During my interview with Jackie, she reflected on the positive norms of a learning environment that were introduced during professional development. She said,

I think this has been really important because with my class I have to keep saying and reminding them of the norms. That's been the really biggest factor. With math, students can see who are the strong students and which students might need help. The kids know. They know who they think is the math kid and who are the ones in the intervention. But if you tell them they can be successful and reinforce that norm in your classroom, every student can achieve at the highest levels. Using the positive norms has been the biggest thing for this quarter.

Jackie also described in her journal how the norms that were developed influenced their learning community in a positive way. She wrote the following:

The students are using the chart in our classroom to not only stay motivated, but to motivate others when they are facing a struggle. Our math community is now a place where everyone believes they are capable of learning at high levels. The positive norms allowed me to think more deeply and my positive attitude toward math is being shared with my students.

The positive and safe learning community that Jackie developed with her students did not only have an impact on her students' beliefs about themselves as mathematicians, but also that mathematics is something that everyone can be good at if they work hard which contributed to perseverance. Jackie also understand her role in developing a positive attitude about math and wrote "the positive norms allowed me to think more deeply about my positive attitude toward math and how it is being shared with my students".

Relevance. The final theme that was present in Jackie's data was *relevance*. The creation of this theme was developed through the interpretive codes of peer collaboration and

transformation. As I analyzed Jackie's data, *relevance* of her professional learning was an important aspect for transforming instructional practices within the classroom. Furthermore, *relevance* is a critical aspect of improving teacher quality which influences student achievement. Rivers and Sanders (2002) noted that when a student has experienced an ineffective teacher or ineffective teachers over a multiple year period of time, there is very little evidence that the child will ever recover academically. Zeichner (2014) echoes Rivers and Sanders and views the quality of teachers as the single most important factor in determining the performance of students. Therefore, having relevance in professional development was not only crucial to Jackie, but especially to her students.

The interpretive code of peer collaboration, influenced by descriptors such as teacher observation, grade level collaboration, and vertical team collaboration described the theme of *relevance* in Jackie's data. Peer collaboration was a time that Jackie valued during her professional development experiences. Jackie described how having the opportunity to collaborate with peers enhanced the relevance of her professional development experience. She said it was good to see

how the students in the other class were using the strategies that their teacher probably showed them and that I knew my students probably were not as familiar with. This helps me bring it back to the classroom. Also, its good because you see what your kids should be able to do. I always want to run back to my classroom immediately and try the same thing to see if my kids can do it.

Jackie also appreciated the opportunity to work with other teachers that taught her same grade level. These teachers gave her insight into the level of work that students in fourth grade should be doing. She said with collaboration, "I feel like it helps provide a norm of what the grade four should really look like, what the kids should be doing. In isolation at one school, you really can't see what is actually happening in the district."

The final interpretive code that supported the theme of *relevance* was transformation, formed through transfer of professional development, meaningful, belief, student success, and student motivation. Within the data collected, Jackie provided different examples of how she applied learning gleaned from professional development experiences to transform her instructional practices. While Jackie provided different examples of how she was transforming her practice, her enthusiasm and energy signaled to me that her changes were more than just using new strategies to just use them. There was an emotional undertone to her voice as she described why she was implementing specific strategies and planning tools. The emotions were one of commitment and passion to do what is best for students, even if it meant that she had to change her previous practices. An example of transformation that Jackie described in a journal entry centered on best practice for her students related to ways to increase student discourse about math, as depicted below.

I have used the five practices of orchestrating productive mathematics discussions in my instruction with students to provide opportunities to increase discourse in the classroom. I believe this format has allowed my students to take risks before waiting for an answer. I have structured my lessons to incorporate one-word problem that will involve multiple steps for students to complete. Students must think deeply now and work toward understanding a math problem before execution.

Beyond applying the five practices to transform her instruction, Jackie also emphasized how she applied the use of technology in her classroom. After a recent mathematics professional development session, she said “the professional development provided a useful website for students to access math tools online. I have used the website many times since the training to show my own thinking when teaching a new skill.” Jackie noticeably wanted to continuously improve her teaching of mathematics and stated that she is always looking for ideas that will make the greatest impact on her students because the students are “what it is all about”.

In conclusion, as Jackie experienced the themes of action orientation, efficacy by design, and relevance, she was able to utilize her learning to begin transforming the learning of her students. These themes were significant to her own growth and development and that of her students as she participated with other teachers in an action research mathematics team.

Case 5 – Madison

Madison was collaborating with her colleagues during a professional development session hosted by the school on the day of the interview. She entered the hallway to meet me and her enthusiastic nature and positive energy about our opportunity to talk about math were indicators of strong passion and confidence as a teacher. As we walked into her classroom, I immediately noticed the print richness of Madison's classroom environment. Madison had colorful charts throughout her room that served as models, examples, and references for the students. The classroom arrangement also signaled the value placed upon student collaboration. Students were arranged in seating groups and not at individual desks. There were also a variety of comfortable spaces for students to work. Madison is European American and in her fourth year as a teacher in the building where she currently works and her 8th year of education. Her school serves 236 students with approximately 59.5% of those students receiving free or reduced lunch. Additionally, the school's student demographic makeup includes 61.4% White, 14% Hispanic, 8.9% Black, 9.7% multi-race, and less than 5% of Asian, Indian, and Pacific Islander.

Action orientation. The theme of *action orientation* was evident throughout my interactions with Madison. As I analyzed the data, it became apparent that Madison consistently utilized the knowledge gained in her professional development experiences. On

several occasions, Madison described specific actions implemented in her teaching based on new knowledge for the purpose of increasing academic outcomes for students. The interpretive codes leading to the development of this theme were doing the work, planning, and strategy implementation. The discussion of the work of her action research team communicated the values of her peers and the math consultant, these collaborative opportunities allowed her access to a large repertoire of teaching strategies.

Engaging teachers in this process of collaborative inquiry, also known as Action Research, is another model of professional development employed by school districts throughout the United States. In defining action research teams, Calhoun (2008) stated that

action research asks educators to study their practice and its context, explore the research base for ideas, compare what they find to their current practice, participate in training to support needed changes, and study the effects on themselves and their students and colleagues. (p. 18)

The interpretive code of doing the work was connected to the theme of action orientation. Madison frequently spent time doing the work she expected her students to engage in as a method to meet their individual needs. Descriptive actions such as identifying misconceptions, deconstructing standards, and examining student work were used to develop this code.

Madison wrote in her journal about the importance of doing the work of her students prior to giving them an assignment. She recorded

by thinking of the mistakes students could potentially make, as well as listing strategies from lower-level thinking to higher level thinking, a significant amount of time is spent thinking and analyzing the progression of the standard, and ultimately understanding the standard.

Additionally, Madison's journal indicated that using different manipulatives prior to engaging students with them helped her understand the relationship between the standards and the manipulatives. Madison wrote

when thinking about these manipulatives and how they relate to understanding the standards, I can assess where my students are and pinpoint misconceptions. It gives me a deeper understanding of how to represent the content at a lower level but also present it in a basic level of understanding it at the concrete level.

Planning resonated the theme of *action orientation* through the descriptors of intentional planning, planning tools, and the use of assessment. Madison was intentional about meeting the needs of her students and thoughtful about many aspects of planning. She described how the utilization of mathematical tasks serve as a form of assessment in order to collect information about her students. She wrote the "task comes before the instruction, showing me just what misconceptions my students have and what instruction they need to obtain mastery of the standard." Madison added that during the tasks, "I can take the information that I am learning about my students, sort it out, identify misconceptions, and then develop next steps with each student." Beyond utilizing tasks as a strategy to collect data about her students, Madison used a pre-planning tool which was introduced during one of her professional development experiences. She described in her interview how the use of a pre-planning tool allowed her to pre-plan for "misconceptions, errors, and strategies that the students will use." With the goal in mind of reaching all learners, Madison stated "I make sure I am teaching and targeting each level of thinking for students."

The final interpretive code supporting the theme of *action orientation* was strategy implementation. The descriptors of this code included content understanding, content approach, mathematical tools, and discourse. The data collected served as indicators that

Madison was trying out new strategies from her professional development sessions. Madison stated upon the completion of a professional development session,

I immediately begin to sit and think about how does this work for me because I'm more of a "I have to sit and process" person and how it would look in my classroom. Then I "jump right in" and go for it. I dive in.

Madison also described why she "jumps right in" and said, "It is all for the kids, I just want to make the best opportunity for them to learn. Learning is messy but it is worth it for me so that it benefits the kids." Madison journalled about trying a new strategy in order to support her students thinking and scripted, "I immediately brought in more manipulatives into my math workshop and encouraged my students to represent their thinking concretely."

Relevance. The second theme categorized in Madison's data was *relevance*, an important dimension of professional development for Madison. Not only was *relevance* critical to her during professional development experiences, but it was also essential to translate the relevance to her students. The interpretive codes of reflection, peer collaboration, and transformation were used in the formation of this theme.

In a national professional development survey, Darling-Hammond et al. (2009) found that more than nine out of ten teachers participated in some sort of professional development activity throughout a school year. However, the variation in the frequency of opportunity and support for continuous learning varied greatly among states and schools throughout the United States. Not only was variation in the frequency of professional development high throughout the country, so was the relevance of the professional development. DeMonte (2013) asserted that some of the common problems with professional development include irrelevance to the daily work of classroom teachers, a disconnection to the curriculum, and required frequency to provide the level of support needed to change teacher practice.

The interpretive code of reflection was illuminated within the theme of *relevance* in data collected from Madison. She frequently reflected about her new learning and how it could be applied in the context of her classroom. Reflections with a collaborative team and individual reflections described this interpretive code. During her interview, Madison described the importance of reflection and said “reflection helps you make sense of the learning yourself and makes me internalize what the learning means to me and to my kids.” Through reflection, Madison was able to see the connections between her learning and applications to her own classroom. While reflecting on an experience with a vertical team in one of her professional development sessions Madison stated “it was eye opening to see what tools different grades used to build number sense and how that progressed to other grade levels and tools.” These types of experiences with vertical teams caused Madison to reflect and think about how her learning was relevant to her own classroom. She wrote “sometimes I need to go back and reflect on whether or not it’s above the standard for what I need my kids to do because I’m wanting to push them.”

The interpretive code of peer collaboration indicated experiences discovered in Madison’s data such as teacher collaboration, teacher observation, and standards in practice. Madison discussed how peer collaboration brings relevance to her work and stated

just opening your doors brings relevance to collaboration. I can talk to a first grade teacher and listen to ideas they are trying out and think about how it can impact the students at my grade level. Just opening your doors for collaboration makes a huge difference for professional development.

Through peer collaboration, Madison was able to increase the level of relevance of professional development experiences. Not only did collaboration increase relevance for Madison, it also was a motivator for her. She described through journaling the power of just

“having the chance to work with other people at your grade level, see what they’re doing in their classroom” was very beneficial. Madison also felt that seeing the content standards applied in the classroom while working with peers enhanced her own understanding of the standards. She communicated the value of observing classrooms with her peers and commented that the value was in just “talking about it, just coming together and making sense of the math”.

The final interpretive code supporting the theme of *relevance* was transformation. Descriptors utilized for the formation of this code included challenge, belief, meaningful, student collaboration, student energy, and student motivation. As Madison began transforming her instructional practices to enhance engagement and relevance, one of the areas she targeted for improvement was student collaboration. In her journal she wrote about the transformation of student collaboration through ensuring all students had an entry point into the lesson. This entry point gave students a focus for collaboration, no matter their current level of performance. As Madison transformed her instructional activities and relevance was enhanced, students showed more energy and motivation. The energy and motivation emotionally captured Madison in a way that made her want to continue to improve her instructional practice. As the transformation of student collaboration has evolved, Madison recorded her students

just love math now. Before it was “ugh, math time”. Now it’s, alright, we’re ready to start math. They have their math notebook and they’re ready to go. They just jump in. They’re motivated. They’re excited. They’re willing to try to be a problem solver and break something down. They love the fact that there is a challenge that they have to solve. They feel its purposeful and intentional for them.

This reaction that Madison was seeing from her students also served as direct feedback to her about the influence that her transformation had on students' perceptions of mathematics.

Teacher self-efficacy. The theme of *teacher self-efficacy* became prevalent throughout the journal and interviews with Madison as indicated by the interpretive codes of student success and student perseverance. As Madison noticed positive changes in her students related to mathematics, her confidence also increased. Improved self-efficacy seemed to garner energy and motivation for Madison to continue her growth as a classroom teacher. However, when teachers are hesitant about their self-perceived ability to reach goals or to overcome a challenge, they tend to undermine their own efforts (Bandura, 1982). Teachers that experience a low sense of self-efficacy can also be more likely to experience burnout. In a study conducted by Skaalvik and Skaalvik (2007), they found a strong correlation between teacher self-efficacy and teacher burnout.

The interpretive code of student success supported the theme of *teacher-self efficacy* and comprised descriptors such as student engagement, student achievement, and student thinking. As Madison observed positive changes in her students, she enthusiastically stated "Now they are getting it. They're persevering. They're working through it. Before they wouldn't do that. Just the fact that you see the change in the kids makes you want to go back for more". Madison's confidence also increased as she noticed students beginning to use metacognitive strategies in math. Typically, this was something only seen in reading or writing. Madison said when her students are led with "a little nugget or a little question, they actually go back and start thinking of how they can change their thinking." Seeing her students think metacognitively and work hard in math made Madison very proud. She said

I was never taught this way, it was always about getting the right answer. Just seeing them grow means more to me than getting the right answer. Watching them not give up is just really powerful to me and boosts my confidence.

The interpretive code of perseverance also accompanied the theme of *teacher self-efficacy*. Behaviors such as risk taking, sense making, and deep thinking were used to describe perseverance. As Madison noticed her students working hard to solve problems and not give up, she felt more successful as a classroom teacher. In my interview with Madison, she described a response that was observed in her students since implementing new instructional practices. She said,

the response I have seen from students after implementing changes in my classroom has been astounding. My students that were afraid to take risks and try to make sense of a problem are now tackling difficult problems and starting to understand them simply because I am asking them to start with a concrete model before moving to other semi-concrete or abstract representations.

Madison also described the use of new instructional strategies learned in her professional development sessions and their influence on her students. She wrote

the response I have received from my students after the implementation has been overwhelmingly positive. Students are now mathematical risk takers in my classroom. Prior to the implementation of some new strategies, students were often times frustrated with tackling such a rigorous problem because they felt the purpose of the task was to quickly get the right answer to the problem. The focus for students was on the end product, not the process.

Throughout the implementation of new instructional practices in her classroom, Madison observed the students becoming more successful and developing perseverance with difficult math problems. As they experienced success, her confidence as a classroom teacher increased.

Efficacy by design. The theme *efficacy by design* was evident throughout my interactions with Madison as revealed through the interpretive codes of student ownership,

inquiry, and learning community. Each of these elements influenced how students saw themselves as mathematicians. Students interactions with instruction that emphasized ownership, inquiry, and becoming a learning community changed students from not seeing themselves very strong in math to viewing themselves as good at math. As this theme developed with Madison's data, I learned the experiences she designed were intentionally created for students to not only develop individual success, but also to see their peers be successful as well.

Individuals do not necessarily rely on their own experiences as a source of self-efficacy. Vicarious experience through conversations about success with peers or with other colleagues serves as an additional source of individual self-efficacy (Goddard et al., 2000). Bandura and Adams (1977) adds that when individuals see others struggle through a situation or problem and are successful, they are more likely to believe in themselves when addressing a challenge. While vicarious experiences can be a source of positive impact on individual self-efficacy, it is not as influential as authentically experiencing success or overcoming a challenge.

The first interpretive code tied to the theme of *efficacy by design* was student ownership. Descriptors for this code included examples such as student confidence, student driven collaboration, and productive struggle. One of the observations Madison made over time was how her students were beginning to work harder than her in addition to taking ownership of understanding their work. Madison wrote,

Students are more engaged in the process in the process of understanding math, and constantly questioning their classmates for clarity. Students enjoy becoming "math detectives" during intentional "catches" that take place during the math task. Students are more willing to dive in and try to figure out the thinking of their classmates, as

well as ask questions, and give group feedback relating to the clarity and precision of the work.

Through the use of technology, Madison noticed greater ownership in student learning and scribed that her students

are creating dialogue with each other and using these tools to dig deeper in math. My students are using the IPADs to create videos of themselves solving a math problem. They tell the direct steps of what they are doing and why. They become experts of the math and essentially create how-to videos to help other classmates develop a deeper understanding of the content.

As students in Madison's classroom continued taking more ownership in their learning as a result of the intentional learning experiences, their confidence as mathematicians increased as well.

Inquiry was another interpretive code used to describe factors related to the theme of *efficacy by design*. Experiences such as flipped model of instruction, rich tasks, multiple strategies, and backwards design were utilized to develop this code. Throughout the development of lessons, Madison frequently used an inquiry based approach for planning. Through utilizing this model, it caused students to think differently about the way they engaged in the mathematics. For example, Madison stated that when she flipped her typical sequence of a lesson, the students initially panicked. She said the kids were like "I don't know how to do this. The math is so hard." Through the use of an inquiry model focused on problem solving, students began to have more access into each other's thinking. This access developed the confidence of her students. Madison stated the access to the math "has allowed my struggling students to jump in and try the problem without shutting down, as well as pushing my higher students that have already solved the problem mentally to step back and think about just how they could represent the problem."

The final interpretive code that resonated with the data and aligned to the theme of *efficacy by design* was learning community. Descriptors of a physical and emotionally safe classroom included, safe learning environment, cooperation, encouragement, and freedom to make mistakes. The learning community in Madison's classroom was important to her as she believed that without a strong, respectful learning community, it would be difficult for students to reach their mathematical potential. In data collected from a written journal, Madison said since her students feel safe, you can see them

getting up and walking around the room to grab various manipulatives to defend their own thinking of a problem, as well as if they either disagree with a classmate, or to help a classmate see their own mistake with their thinking. My students are creating dialogue with each other and using tools to dig deeper in math

Madison added that as her students have come to feel safe in her classroom, she is seeing an increased amount of mathematical discourse amongst her students. She wrote her students are

discussing and sharing their math thinking, students are now willing to critique and justify their own thinking as well as the thinking of their classmates. Students are more engaged in the process of understanding math and constantly questioning their classmates for clarity.

Madison was not only committed to developing the confidence of her students as mathematicians, but also to ensuring an emotionally safe environment. Throughout my interactions with Madison, it was clear she was deeply committed to improving her instructional practices in order to provide her students with the best learning experiences she knew how.

Case 6 – Christy

The first thing I noticed in Christy’s classroom was the organization of her classroom environment. Inviting spaces for students to work throughout the classroom were colorful and cozy. The spaces were intentionally designed for her students, not for her. As Christy and I began talking prior to the formal the interview, it was apparent that she had a passion for mathematics and a a love of learning was also evident in her voice. While Christy has only been in her current school district for a few years, her eagerness to gain as much knowledge as possible through professional development opportunities is commendable. Christy would be described as European American and is in her third year as a primary teacher in her current school, with a total of thirteen years in education. The experiences Christy has had in education include working in both private and public schools. The school where Christy currently works has 370 students with 54% of those students receiving free or reduced lunch. Additionally, the school’s student demographic makeup includes 63% White, 18% Hispanic, 10% Black, and less than 5% of Asian, Indian, Multi-race, and Pacific Islander (Department of Elementary and Secondary Education, 2016).

Action orientation. *Action orientation* was a theme that was present in the data collected from Christy. This theme was formed through the following categories of meaning: planning and strategy implementation. Christy was very purposeful when implementing new strategies acquired from professional development experiences. Most importantly, Christy wanted to ensure the strategies implemented would have a positive impact on her students. Christy was also reflective about how the strategies learned in professional development supported the school district’s adopted resources. I was impressed by the way Christy was

self-directed following professional development experiences. Christy did not need anyone to push her to try new instructional practices, rather she was very motivated to do so internally.

Merriam (1996) specifies leaders of adult learning should focus efforts on developing the characteristics of learners that are self-directed and not dependent on external forces to enhance their own learning. Self-direction is critically important given the expedited rates of change in professions, there will likely never be enough classes or opportunities for adults to engage in all the necessary learning to keep pace with their fields. Therefore, adults must be self-directed and take individual responsibility to engage in the process of life-long learning (Russell, 2006). Developing this self-direction through internal motivation is critically important to the process of adult learning.

Planning was an interpretive code that discovered in the data collected from Christy. Planning consisted of several descriptors including intentional planning, reflection, and the use of assessment. Christy wrote how she has been able to take several ideas from her mathematics professional development and incorporate them throughout her planning process. In one instance, Christy described a new planning tool that was introduced and discussed her process of utilizing this tool. She recorded

the final tool that I am still using from the first session is the strategy sheet. I love this tool to pre-plan and do the work first, just like we do for reading and writing. The idea is to think of every strategy and misconception students may have before teaching it to them has been so beneficial, especially for our number story work.

Christy also shared that a new student strategy sheet in one of her professional development sessions influenced her planning. She stated

even though the strategy sheet is a lot of work and takes a lot of time, I can see how my kids are doing right in the moment and this has caused me to be more intentional as I plan for and work with my students.

Christy continued to describe how the use of her new planning tool supported her instruction before the initial teaching of a new concept to her students. She commented “it helps you understand the misconceptions you may come across while teaching and the potential struggle that may come with the group work.”

While some of the strategies Christy planned were designed for all of her students, her intentions were to utilize specific strategies that supported the learners struggling with a certain concept. In one instance, Christy wrote about introducing the new strategy of number paths, She recorded in her journal,

the number paths that I introduced from session two have helped a few students get a clearer understanding, helping them navigate the number line on assessments better. They respond better to each number being in its own box versus the linear increments on the number line.

Another dimension of planning apprehended in Christy’s journal data was the manner she utilized information gathered from her students during a lesson to intentionally plan the next steps of instruction. Christy described how she observed this teacher strategy at one of her professional development sessions. She recorded

a few students who were unsure how the cubes related to the apples. These are students that I may have overlooked if it was not something I had noticed at our training. I could take them aside and practice multiple number stories and allow them time to show their thinking.

Christy verbalized in a follow up interview that she plans specific learning experiences as a strategy to understand the strengths and weaknesses of her students. An example of utilizing a math tool to assess these areas was described by Christy as a strategy

to see where students were with base 10 block, instead of using whatever tools, I was intentional on having them use base 10 blocks on a double-digit sheet. This allowed me to see exactly where each student was at in relation to their understanding of base 10. From here, I could plan the next steps.

It appeared that Christy was appreciative of learning about ways to plan for engaging her students in new and different ways. Hence, strategy implementation was connected to this goal.

Strategy implementation was the second interpretive code I used to describe factors that contributed to to the theme of *action orientation*. Descriptors such as mathematical tools, content understanding, and content approach clustered to form strategy implementation. Christy felt the professional development was strongly related to her work; therefore, she naturally used the strategies learned in her own classroom. Reflection upon past approaches to using specific strategies and how those strategies are different today as a result of her professional development was also noted throughout Christy's data.

While Christy discussed the implementation of new strategies in her classroom, she did not feel the professional development was helpful for understanding the content standards at a deeper level. When I asked Christy a question about her professional development experiences in relation to learning the standards, she responded in the following manner,

I feel like as far as the content standards, I felt like I was kind of strong with them. But supporting the content standards with new and fresh strategies for the kids with more inquiry and problem solving with the standards is probably the best way the professional development experience has supported me

I perceived her communication as understanding the content standards at a deeper level would require engaging her students in critical and higher order thinking skills and working with other teachers would be beneficial to her growth in this area.

Collaborative opportunities supported Christy in applying new strategies, especially when peer observation was embedded in the professional development experience. Christy scribed

The opportunity to work with other teachers, outside of your school, is very beneficial. It allows you to be introduced to new teaching methods and find things working and not working for other teachers and students. The collaboration is usually genuine and informative. We broke into groups and our group focused on 1. MD.2 which is to express the length of an object as a whole number of length units, by laying multiple copies of a shorter object end to end. We were introducing measurement in another class. Although I cannot say it helped me understand the standards better, it did make me more aware of how other teachers teach it.

While Christy was not required to apply new strategies learned, her purpose was clear. She said

I feel the strategies are what are best for kids. I want my kids to build number sense, have inquiry based opportunities and just do what is best for my kids. They are what is most important and I want to do what is most effective. I have loved seeing the aha moments and that keeps me going.

Christy shared an example of a new strategy being used in her classroom to hold all her students accountable for their learning. The new strategy was “some hand signals that work great. Every student is held accountable for every question with the hand signals and they all feel like they have a part in the learning. It also allows for quick and easy formative assessments.” Christy cited another example of a new strategy being applied in her classroom and wrote

this last session we talked about number paths, so I brought those in and showed my students how they were different than number lines. I feel like I wasted so much time teaching them how to jump before they count. It literally takes over a month in first grade to them to know they can't start counting until they make a jump. All of that time I could have used it on something else like a number path. It only took me 11 years but I got it now

As evidenced in the data, Christy was someone who was very intentional about her actions to apply her new learnings to the context of her own classroom. She was highly motivated to ensure her students had access to the best strategies that would support their

learning. Such motivation is connected to self-efficacy, Christy's awareness and belief that she can impact student learning.

Teacher self- efficacy. The final theme examined in Christy's data was *teacher self-efficacy*. The interpretation of this theme was described by experiences such as student success and collaboration. Throughout her professional development experiences, the data examined uncovered specific experiences that positively influenced Christy's confidence. As Christy witnessed how her students were responding to her instructional practices, her confidence level continued to grow stronger. Within the school context, teacher self-efficacy refers to the level of teachers' desire and persistence to utilize instructional strategies that they believe will have the most influence on the achievement levels of their students (Overbaugh & Lu, 2008). The more classroom teachers believe that they can impact others, the more effort they are likely to give in accomplishing their goals (Tschannen-Moran et al., 2001). Bandura and Adams (1977) expand on this idea by noting that when teachers have strong self-efficacy they are more likely to persevere when facing difficult challenges and obstacles.

The interpretive code of student success resonated in the data gathered and tied to the theme of *teacher self-efficacy*. Four interpretive codes were revealed throughout the enumerative content analysis process. These codes were student engagement, student motivation, growth mindset, and student confidence. As Christy's students became more successful, her confidence increased. In a discussion with Christy, she stated seeing her students successful

makes it so rewarding and makes me want to try more new things. When I see how well it works, I am more motivated to get better. There is nothing better about teaching than to see your teaching work for your kids.

The influence of student success as it related to Christy's confidence was also articulated when she said

my motivation comes from the kids, like when I try something new that I saw in a professional development session and then try it out in my own classroom and to see my students excited about their learning. Then, that gets me excited about their learning which is probably the biggest motivator.

I noticed during my interaction with Christy the power of reciprocity. On several occasions during the interview, she discussed her emotions being a result of her students emotions. For example, she described the reciprocal effects of student motivation and said

when they are motivated, I am motivated. I get motivated when I have some students that did not like math and now that I see them excited and they want to work harder. This really boosts my confidence as a teacher. Anytime your hard work pays off, it makes the job so much more rewarding and builds your confidence.”

Christy added her motivation and increased confidence is also derived from witnessing students show enthusiasm for math. She noted during an interview:

It could just be the difference in the way we teach math now or the growth mindset. I don't know what specifically it is. I really only have one friend right now that doesn't get excited for math. It's kind of like science with the little guys. They get so excited about science. They're usually really excited to do math, because they know there's going to be some kind of activity that they're going to be working on. It's fun.

While Christy described her motivation is derived from observing the confidence of students which results in positive changes in learning, her confidence also changed by noticing the increase in student engagement. Christy wrote in her journal that since the beginning of the school year “the most important noticing is engagement. The students are excited for the number story activities.”

Another example within the data that demonstrated how Christy was motivated by student success is embedded in journal entry. She wrote:

We did some number path work, because I've always done number lines. We talked about number paths this last time. They just seem to really get it so much more than jumping on a number line. The whole time I've been teaching first grade I've used a number line, probably because of the curriculum that we've been using. The number paths just made so much more sense, and it seems something really silly, just having them in a block instead of a measurement with the number line, and just to see their excitement makes me excited.

While Christy valued peer observation for learning new strategies to help her students experience success, her sense of efficacy was also a result of collaborating with her peers. Peer collaboration was the final interpretive code used to describe factors that contribute to the theme of *teacher self-efficacy*. Collaborative experiences such as grade level collaboration, peer observation, and vertical teams were identified in Christy's data/. Christy truly valued the opportunity to work with colleagues throughout her school district. Collaboration supported her development of confidence as a classroom teacher, as the opportunities to learn new strategies from peers were abundant. During her interview, Christy highlighted the importance of collaboration with other teachers and how it affected her professional development. She said,

I love talking to the other teachers and watching their classrooms. I think that's a big part of my learning, to watch other kids that I don't know so well and see how they react to some of the same things I am going to do in my own classroom. Just having the time to collaborate with the other teachers about what they're doing and why they're doing.

In a follow up interview, Christy added collaboration

validates your hard work and what you have been thinking. When you come together with a group of people, it really helps. Through collaboration, you can get 5-6 new ideas and those ideas help build your confidence as you work with your students. We are also working together toward a common solution. There is no better part to collaboration than learning something new and having the chance to talk about how to make it work in the classroom.

She was also very thoughtful about the value of peer collaboration in helping her discover what works for students. Christy wrote in her journal “the opportunity to work with other teachers outside of your school is very beneficial. It allows you to be introduced to new teaching methods and find things working and not working for other teachers and students.” Finally, Christy summarized her thoughts about the value of collaboration and said “every learning experience makes me a better teacher and shows me new ways to help students that might be struggling with specific skills. The collaboration with other first grade teachers is also a very valuable asset and allows me to grow as a learner”.

Answering the Research Questions: Cross Case Analysis

Within this section, I report the findings from the cross-case analysis and the answers to the research questions. The cross-case analysis allowed me to denote the themes moderately or strongly represented in each of the two data sources. I also narrate the findings of this study in relation to the research questions that guided my inquiry. The answering of the research sub-questions assisted in answering the central question: How do teachers, who participate on a mathematics action research team, perceive their experiences with professional development?

Through consistently revisiting the data, each one of the themes were scrutinized, re-examined, and questioned by myself and the participants in order to ensure validity and reliability of the data along with accuracy in reporting of the themes. As I analyzed the individual interview data in conjunction with each of the journal entries, I developed a clear picture of how the participants perceived their experiences with professional development as a member of a mathematics action research team. Upon completing the process of coding the journal entries and the individual interviews, there were four combined themes that were identified in the data. As previously discussed, these four themes included *action orientation*, *teacher self-efficacy*, *efficacy by design*, and *relevance*. However, as I viewed the data through separating the journal entry and the individual interview data, the journal entries revealed three themes, which were *action orientation*, *efficacy by design*, and *relevance*. The individual interview data resulted in three themes which included *action orientation*, *teacher self-efficacy*, and *relevance*. Table two outlines where each of these themes were discovered in the data.

Table 2

Cross Case Themes

Theme	Journal Entry	Interview
Action Orientation	X	X
Teacher Self Efficacy		X
Efficacy by Design	X	
Relevance	X	X

Upon the completion of the cross-case analysis and answering the research questions, I conducted a focus group interview with the participants. One of the main purposes of the focus group interview was to ensure validity of the findings. The focus group was also an opportunity for participants to provide any other interpretations of the data shared with them. Through the focus group interview, I was also able to share the results from each research question as a measure to support validity and to identify any discrepant data. The discussion with the participants also involved any related themes that I may have missed during the course of this research study.

In the following section, I answered each one of the sub questions for this study. Within each research sub question, I also provided focus group data to further support findings or discrepant data identified in journal entries, individual interviews, and focus group interview. The focus group data supported my ability to further detail rich description, confirm themes, and look for discrepant data – data that does not fit or outliers. I conclude

with a discussion centered on the central question as the data embedded within the sub questions supported answering the central question.

How do teachers perceive their professional development experiences in relation to understanding the mathematical content they teach?

The participants in this study perceived their professional development experiences in relation to content understanding as supportive. This was not only true for the content of their current grade level, but also other grade levels as well. For most of the participants, the greatest benefit came from developing an understanding of the content standards in the grade level above and below the one they currently teach. This finding was confirmed in the focus group interview when Madison stated “understanding the content above and below my grade level really helped when I conferred with students. I had a much better understanding of how to support each student where they were and how to help them move forward”. Christy added “I felt like I already knew the standards at my grade level so getting to know standards at other grade levels was really helpful”. I was somewhat surprised by this as I anticipated the participants would have felt as if they developed a much deeper understanding of the standards they currently teach. However, most of the participants felt confident in their understanding of their grade level standards. Since each teacher has such a wide range of student needs, the participants felt that the most valuable time spent interacting with the content standards was when they were with grade level teachers from different grades.

Several of the participants explained seeing other teachers teach the standards was also very beneficial in their learning. In the focus group interview, Jackie mentioned “seeing other teachers teach gave me insight into the different ways other teachers approached the standards”. Since each teacher approached the standards differently with their students, they

could see first-hand how other teachers interpreted the standards. In addition to the interpretation of the standards, the teachers were also able to see how other teachers selected specific strategies for teaching the content standards. Through the study of this research question, I learned the importance of teachers building shared knowledge about content together and not in isolation. When shared knowledge is built, the collective capacity of the team increases as well.

What do teachers do to apply what they have learned in their classroom?

As I studied the data in relation to this research question, the participants took specific actions toward applying what they learned in a professional development session to their own classroom. These specific actions were typically centered on a planning strategy. While the participants used a variety of different planning tools, each one had a method to document their new learning in the form of a lesson plan. Even though the participants utilized a variety of methods, each one was very intentional about their decisions to incorporate new learning. Erin discussed her process for applying her professional development.

I am the kind of learner that focuses on one thing, and I try to determine what stands out most to me. I take a chunk and learn more about it. The chunk I take is not always what everybody else is learning about or trying out. I really look for that chunk that stands out to me the most and I usually identify with something I have been trying to figure out for a while or something I have been trying to grown in as a learner .

An interesting concept that was discovered during this study was doing the work. In different contexts, each participant shared how they incorporated their newly learned knowledge into a practice of completing student assignments. The participants felt that by doing their own assignment in the context of newly learned instructional strategies, they would have a better understanding of how students might use newly learned strategies they

were going to introduce. The participants also discussed how completing their own assignment allowed them to think about the lesson through the lens of their students. The value of doing the work of students was confirmed in the focus group interview when Jackie stated “doing the work allowed me to understand the spiral of our elementary math program. By doing the work I was able to see where the math is going and make connections to the math program”. Through thinking about the assignment through the lens of their students, the participants could act upon any revisions that would need to be made in order to ensure all students had access to the mathematics. In the focus group interview Shawn added “doing the work allowed me to be prepared for the different strategies my students might use along with identifying any misconceptions that they may develop through doing the assignment. When I can predict these as a teacher, I am in a better position to help them”.

How do teachers experience motivation for transforming for transforming their instructional practice as a member of a mathematics action research team?

The participants in this study experienced motivation through seeing their students become successful and collaborating with peers. A common message from the participants was that the more successful they saw their students becoming with math, the more they were motivated to continue becoming better teachers of math. Seeing students become successful ranged from increased student confidence and working through difficult problems to increased student achievement. The participants discussed how the more successful their students were, the more motivated they were to continue becoming better themselves. Some of this success within their students was their willingness to persevere through rigorous problems. As the participants noticed this behavior with their students, it positively impacted their motivation and confidence in themselves. Nicole stated:

my kids from tough backgrounds and in their personal lives may not have seen a lot of success and often have very little confidence in themselves about math. It makes me feel good as a teacher when barriers are being broken down in our classroom and when they see they can do it. I am just never going to give up on them. When they show me they want it bad, I want to work harder to give it to them. Their belief in themselves really increases my confidence and belief in myself.

During the focus group interview, student's success as a motivator for teachers was also confirmed. Christy stated "what motivates me the most is when I have a group of students that come to me in the beginning of the year and do not like math. As the year goes on and I see that they develop a love for math and are successful, this is really motivational to me".

The participants also strongly valued the opportunity to collaborate with other teachers. Collaboration not only motivated the participants to try out new instructional strategies, but it also served as an avenue to acquire new content knowledge and support their confidence in understanding the content standards. The participants communicated how collaboration in the context of peer observation was also motivational. Through having the opportunity to observe their peers teaching, the participants were able to closely examine how specific instructional practices were impacting other students. In the focus group interview, Shawn stated "being able to watch other teachers and see how their strategies are impacting students was very motivational. When you see students responding to strategies with more engagement and excitement, it makes you want to go back to your room and try the same strategies".

As I reflected upon answering this research questions, I was also able to deeply understand the power of reciprocity. Through the process of students being successful, the teachers became more motivated and their confidence in themselves increased.

How do teachers that participate on a mathematics action research team perceive their experiences with professional development?

In answering the central question of this research study, the participants perceived their professional development experiences in three influential ways. The participants felt their experiences with professional development supported their self-improvement as a math teacher, their motivation, and individual confidence.

Collaborative opportunities through professional development were perceived as a structure that was supportive to the participant's improvement as a math teacher. The participants felt that during their collaboration time with other teachers, they were able to gain valuable insight into the knowledge of other teachers. The concept of self-improvement was supported in the focus group interview when Madison stated "it was really helpful to be in a similar situation as our students in the classroom when we were learning with our teams. This structure allowed us to learn and struggle in a similar way as our students. This helped me understand what our students go through during the process of learning". The participants also felt the collaboration opportunities provided a chance for multiple lenses to be examining the same challenge. These multiple lenses supported the participants in deepening their understanding of the challenges they were trying to address along with developing capacity for possible solutions. While collaboration supported the participants in improving their practices, it also served as a motivation for them. The participants frequently discussed and wrote about the influence that peer collaboration had on their motivation to become better. This motivation was derived from acquiring knowledge and resources from their peers that assisted them in meeting the needs of their own students. In many ways, the resource of collective knowledge served to motivate the participants as they collaborated.

One of the concepts not identified within this research question and was spoken about by a participant in the focus group interview was teacher internal motivation. Erin addressed this idea and stated “I was motivated through myself. I want to get better at teaching. You have to be willing to take be courageous and take risks. If you don’t, you’re not going to grow as a teacher”.

As capacity for addressing challenges in the mathematics classroom was developed, the participants also began to gain confidence in themselves as teachers. I noticed that their confidence often centered on their ability to meet the needs of all learners and not just a certain group of students. Several of the participants discussed their ability to provide all students in the classrooms with access to the math they were teaching. In the focus group interview, Jackie added “when we collaborate as teachers, we all bring so many different perspectives that it really helps you feel confident that through the work of your team, you are going to have the strategies to meet the needs of all students”. As students experienced success, the confidence of the participants increased.

Summary

The purpose of this heuristic case study was to develop a thick, rich description of the perceptions of teachers in relation to their professional development experiences as a part of a mathematics action research team. Throughout this study, I have found it fascinating how intentional and reflective classroom teachers must be when they apply newly learned information from a professional development session back in their own classroom. It was very evident that the teachers often gain confidence and motivation as they see their students developing confidence in themselves as mathematicians. In many ways, the confidence of the classroom teacher was positively impacted when the confidence of the students increased.

Finally, collaboration was a critical element in the process of teachers transforming their instructional practices. Frequently throughout this study, the participants discussed the value of working with other teachers to gain new ideas and to understand the perspectives of other teachers either at their own grade level or at different grade levels.

CHAPTER 5

CONCLUSION AND RECOMMENDATIONS

The purpose of this heuristic case study was to extensively explore central question and sub-questions which were created to explore teacher perceptions of their experiences as a part of a mathematics action research team. The opportunity to conduct this research as an emerging researcher allowed me to develop my research skills through the process of a heuristic case study technique with a qualitative design. Throughout this process, my understanding of how teachers perceived their professional development experiences as a part of a mathematics action research team was strengthened. I was also fortunate to deepen my understanding of how teachers transformed their instructional practices because of their professional development experiences.

Moustakas (1990) suggested that “in heuristic methodology one seeks to obtain qualitative depictions that are at the heart and depths of a person’s experience--depictions of situations, events, conversations, relationships, feelings, thoughts, values, and beliefs” (p.28). While the qualitative depictions that I have provided are not conclusive in nature, they do provide the reader with potentially new knowledge centered on professional development. The descriptions of the themes throughout this study provide clear explanations for how the participants perceived their experiences with professional development.

Leadership for Change

Leadership for Relevance

School districts continue to face the growing challenge of improving student achievement as diversity increases; educators must maintain a focus on improving the quality

of our teachers. Therefore, leaders must engage teachers in high quality learning experiences that meet the needs of an increasingly diverse student population in public schools. As the changing demographic and cultural diversity within our schools continue to grow, so must our commitment to preparing teachers through professional learning.

For leaders to successfully influence transformation, many leaders must overcome a fundamentally flawed belief. This is the belief that classroom teachers are not a significant contributor to student achievement. Rather, some leaders place the emphasis on creating the right organization of the school that is not dependent upon the quality of teachers. This type of thinking places more of an emphasis on purchasing materials and programs that are thought not to be dependent upon teachers, as the teachers will just need to read lessons from a pre-packaged program (Sparks & Hirsh, 2000).

Instead of attempting to continuously replace one professional development model for another, building leaders will first need to consider how to fix the models and structures that currently exist within their organization (Hill, 2009). To improve connects to the daily work of classroom teachers, research by Goe and Stickler (2009) maintained that in order for the professional development to have an impact on improving the quality of classroom teachers, it is important that it occurs over a long period of time, has strong alignment to the content in which teachers are teaching, and focuses on the pedagogical practices that teachers can utilize in the classroom.

Hightower et al. (2011) concurred with the necessity of tight alignment and cite the importance of teachers having the opportunity to work in teams within the same school for an extensive period of time on issues directly impacting their daily work. This level of relevance will bring meaning to the professional development experience of the classroom teacher. In

five of the cases, collaboration was identified as a means to support relevance in professional development experiences. The participants felt that when they had the opportunity to collaborate with other teachers and learn from their experiences and knowledge, the experience was relevant to their own role as a classroom teacher.

As the learning experiences for the participants were relevant to the context of their classrooms in five of the cases, transformation also influenced the theme of relevance. Participants that worked to transform their practice did so for a deeper purpose beyond themselves. While some of the transformation involved learning structures, many of the transformations described in this study also included specific learning experiences and strategies for students as well. Throughout this study, a connection between relevant professional development and teacher transformation of instructional practices evolved.

Leadership For Action

With the classroom teacher having such a strong impact on student achievement, it is critical that leaders responsible for the development of teachers are acutely aware of the factors that must be addressed for successful transformation to occur. When leaders are not aware, the consequences for students can be devastating. Rivers and Sanders (2002) noted that when a student has experienced an ineffective teacher or ineffective teachers over a period of three years, there is very little evidence that the child will ever recover academically. Therefore, if principals are not willing to hold themselves accountable to ensure that students have access to high quality teachers, the results for students can be devastating.

As teachers engage in a transformative process of learning, simply acquiring new knowledge is often not enough to transform instructional practice. Therefore, it is important

that teachers have strong leadership to support them through the process of change. Jason (2000) stated that strong transformational leaders “are open to change and, more fundamentally, embrace its prospect since they realize that school improvement is inextricably connected with the personal and professional development of themselves and their staffs” (p.2). This support can enhance the teacher’s ability to apply new knowledge in the context of their classrooms.

With the expedited rates of change in professions, there will likely never be enough classes or opportunities for adults to engage in all the necessary learning to keep pace with their fields. Therefore, leaders must develop adults that are self- directed and take individual responsibility to engage in the process of life- long learning (Russell, 2006). While some adults are motivated to learn and to enhance their understanding or work related performance for a variety of reasons, this is not necessarily true of all adults. Beinart and Smith (1998) noted that some adults state that nothing would motivate them to seek new learning experiences. The older the adults, the more typical this was seen.

As district and building leaders consider supporting teacher transformation, understanding adult motivation is vitally important. Motivation and engagement of adults in the learning process can increase when leaders give them power over the content, input into the process in which they will learn the new information, and are provided some direction with clear outcomes. Ultimately, the goal is for the level of engagement to be so high that the professional development experience can be almost entirely facilitated by the adult learners themselves (Russell, 2006). For this discussion, the *action orientation* of the participants in this study demonstrated a close relationship to the research of adult motivation. The

participants engaging on action research teams had choice over topics of learning along with input in the learning process.

Moreover, *Action orientation* was the only theme that was represented in all six cases and was identified journal entries and the individual interviews. The participants frequently commented on their intentionality to incorporate newly learned concepts and strategies from their professional development back into their own classroom plans. Teacher planning developed through different avenues for the participants. Some participants developed plans with vertical teams, some planned with grade level teams, and some planned individually. However, each participant commented on the value of having the opportunity to plan with other teachers, regardless of the grade level they taught. While there was no consistent template that each participant used to incorporate their newly learned ideas in their classroom, each one was reflective and thoughtful about ensuring the incorporation of their new knowledge would make sense to their students.

Leadership For Teacher Self -Efficacy

School district and building based leaders must understand the role of teacher-self efficacy and its power to transform instructional practices. Marcelo (2009) stated that throughout the past several years, professional development is finally being seen by school districts as a model that is long term and systemically planned by school districts. He also stresses the importance of the professional development experience enhancing the individual self-efficacy of the classroom teacher. Guskey (2002) added that when teachers observe academic improvements in their students, their self-efficacy is impacted in a positive way. However, for teachers that are involved in professional learning activities but do not see changes in the achievement of their students, their self -efficacy is diminished.

The importance of leadership to develop the self-efficacy of classroom teachers cannot be understated, especially teachers working with at-risk students. The forum for Education and Democracy describes at risk students in urban schools as “school dependent children”. Pazant (2011) stated, “for these children, schools must be a place where the adults take individual and collective responsibility for ensuring that they achieve to high levels” (p. 73). Pazant (2011) also pointed out that “school leaders played a key role in shifting teachers from focusing on the challenges facing students to raising their expectations of themselves in helping children push past those obstacles” (p. 76).

Leaders must understand that as teachers engage in the process of transformation and assimilate meaning from their previous experiences and new learning experiences, they can begin to develop a new sense of teacher self- efficacy. As the self -efficacy strengthens for a teacher, those self-efficacious behaviors often translate themselves into their work with students (Ross & Bruce, 2007).

In the three cases that demonstrated teacher self-efficacy as a theme, it was evident that as the participants gained new knowledge or ways to prepare for math instruction, their confidence increased. An interesting aspect to these three cases was that as students developed confidence in themselves as mathematicians, the teachers noticed their confidence increased as well. This dimension of self-efficacy was not one that I anticipated but one that I am very interested to learn more about in the future.

Interestingly, the successes teachers described that influenced their confidence had very little to do with success on any type of standardized assessment. Rather, it had to do with students engaging deeply in mathematics, working together, and developing positive perceptions about themselves as mathematics. Several of the participants described how

seeing their students begin to believe in themselves that they can be good at math had a very positive impact on their self-confidence as teachers.

The participants of this study also discussed the opportunity to work with other teachers at their like grade level or different grade levels allowed them to gain access into their perspectives, ideas, and strategies for increased student learning. As participants gained new knowledge from their peers, their confidence increased as they felt that had a larger repertoire of teaching strategies to draw from. Additionally, having the opportunity to spend time observing other teachers was also a way in which teachers built their confidence through collaborative opportunities.

Leadership For Efficacy by Design

Central Office and building leaders have the opportunity to create conditions within their buildings that influence the efficacy of their staff and students. Through a transformational leadership approach, the principal creates a condition within the school culture in which diverse points of view are heard, respected, and valued. In creating these types of culture, students and staff are encouraged, not discouraged, to present their individual opinions. While there are individual factors that contribute to the level of individual teacher efficacy, there are also certain characteristics of a school that leaders can influence in relation to individual teacher self-efficacy. A school culture that has a strong emphasis on academic achievement, leadership that listens and responds to the needs of teachers, and a culture that supports risk taking and innovation all contribute to a higher level of teacher self- efficacy (Moran & Hoy, 2001).

Leaders seeking to transform the efficacy of their learning community must facilitate the process of change as a strategy for teachers and students to gain new insights from one

another that may not have happened if such a collaborative culture was not established (Jason, 2000). These insights can influence the efficacy of not just the teachers, but also the students. Hallinger (2003) added that the collaborative approach leaders can take may also have an impact on the commitment of staff who understand the alignment “between what they are trying to accomplish and the mission of the school. These changes are conceived as *second-order* effects in the sense that the principal is creating the conditions under which others are committed and self-motivated” (p.338). Leaders must understand this self-motivation can perpetuate short-term and long-term success, ultimately influencing the efficacy of the individuals that make up the learning community.

Participants in this study re-designed learning experiences which indicated the level of influence they experienced from professional development sessions; students were provided more autonomy to take control of their own learning both individually and collaboratively. As the participants noticed the development of increased ownership of learning among their students, they also observed a positive change of student self-efficacy as well.

Engaging students in the process of inquiry during mathematics was also a concept that identified in several of the participants’ data sources and influenced efficacy. While there were a variety of different inquiry structures that the participants referred to using, they each experienced the element of discovery for students. This element of discovery is in stark contrast to a traditional mathematics lesson in which the teacher tells students about a concept or strategy and then assigns them problems to practice it. Through a model of inquiry, the participants noticed changes in the level of engagement and student energy

regarding mathematics, ultimately resulting in them working harder to learn and understand the concepts they were being taught.

It is often not surprising to see a significant number of students who do not like mathematics subject or feel as if they are not good at math. Therefore, the development of a community of learners in which students felt safe to take risks, safe to share their ideas, and felt comfortable to make mistakes was a hallmark of the work for several of the participants in this study. Through the development of a positive learning community, students increased their confidence as mathematicians and were not fearful that they would be embarrassed in front of their peers.

In the next section of this chapter, I have outlined four recommendations for district and building level leaders. These recommendations are grounded in the idea that relevance of professional development is the foundation for supporting teachers in transforming their instructional practices. Upon the foundation of relevance, each recommendation serves as a consideration when planning professional development for teachers with the goal of transforming their instructional practices.

Recommendations

Based on the findings of this heuristic case study, I offer several recommendations to both district and building leaders who are passionate about supporting the transformation of teaching practices of teachers. My recommendations are based on the foundation of relevance. As leaders plan learning experiences for their teachers, relevance is critical to success. When learning experiences are not relevant to the current work of classroom teachers, the likelihood of transformation is not very strong. The graphic below illustrates a summary of my recommendations.

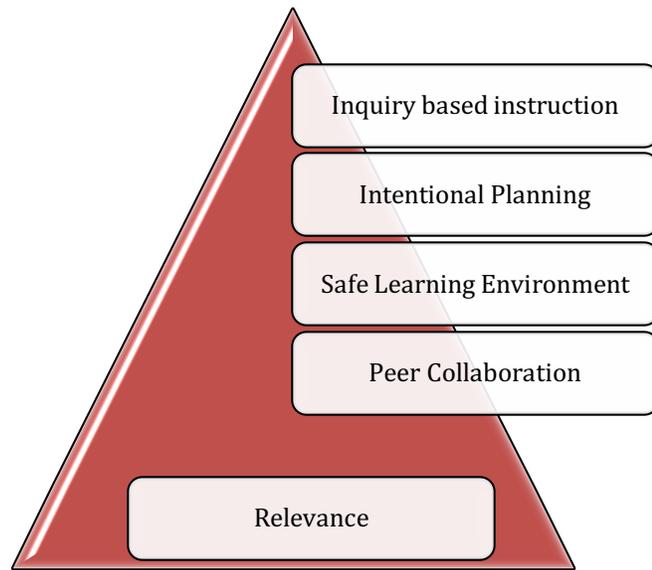


Figure 1. Recommendations

Prioritize Peer Collaboration

The opportunity for classroom teachers to have time built into the school day to collaborate with a focus on teaching and learning is critically important to the transformation of mathematics instructional practices. Collaboration can look a variety of different ways including like grade level collaboration and vertical team collaboration. Each one however serves a purpose and it is important to be intentional with the purpose of collaboration.

Grade level collaboration should focus heavily on the teachers closely examining and developing an understanding of the mathematical standards in which they are responsible for teaching. In conjunction with working toward understanding the standards, it is also important for teachers to view the standards being taught in the context of a real classroom with students. Not only does this allow teachers to gain ideas of strategies that other teachers use to teach students the standards, but it also gives teachers some insight into the

misconceptions and challenges that students may face with certain strategies or standards. Through a model like the Japanese lesson study, teachers can also have a support system of other teachers as they take risks to incorporate new strategies in the context of their classrooms. A Japanese lesson study model also allows teachers to receive feedback from their peers about the effectiveness of their strategies or on any other topic of interest to them..

While grade level collaboration can provide a significant amount of learning opportunities for teachers that support transforming their teaching practices, vertical team collaboration can as well. One of the major contributions of vertical team collaboration is that teachers can develop an understanding of how a standard progresses up to their current grade level and also grade levels beyond their own. Through developing this understanding, classroom teachers are better equipped to meet the needs of all learners, as each one of them comes to the classroom in a different place on the learning continuum.

Most importantly, building administrators and central office leaders need to place a priority on developing effective systems of collaboration for their teachers. If leaders are genuinely supportive of teachers transforming their instructional practices, committing to finding the time to do it must be a priority.

Establish a Positive and Safe Learning Environment

For many individuals, math has been the subject where they perceive that success may not be attainable. However, this does not have to be the case for the generation of students that are being taught today or in the future. As research about learning has evolved, it is now clear that all students have the ability to become smarter and to be good at math. The uphill battle that educators have is ensuring mathematics is taught in a way that students develop understanding. This is often different way than the way most older generations were

taught. Therefore, educators must be willing to establish an environment in the classroom where teachers may sometimes be learning right along with the students. While this sounds different than what many people outside of education believe should be true, educators must own up to this reality and make our classrooms a safe learning environment for all, including the teacher.

A positive classroom environment is one in which students feel safe. By safe, I do not mean physically, but rather emotionally safe. Examples of practices in an emotionally safe environment for culturally diverse students includes emphasizing community building and actively teaching social and emotional skills. This emotionally safe environment is critical, especially in math. As many of us have experienced, many students fear giving a wrong answer in front of their peers during math class. This fear evolves into students not being willing to take risks, collaborate with their peers, and ultimately avoiding difficult math classes as they progress throughout their school. As students avoid these classes, they are also steering away from potential career opportunities that are mathematics oriented.

Therefore, it is especially important for the classroom teacher to establish positive norms and a culture in which students are free to make mistakes without humiliation, progress is recognized, student discourse and collaboration is valued, and students are praised for their efforts of perseverance.

Intentional Planning

In many ways, planning and plan time have received negative connotations by administrators and central office leaders over the past several years. This is especially true at the secondary level where teachers often have more plan time than elementary teachers. However, planning can play an integral role in the transformation of math instructional

practices of classroom teachers. Therefore, it is important that teachers are taught how to plan in a way that will support the transformation of their practices.

One of the ways that teachers can enhance the process of planning is through utilizing a template that aligns to the philosophy and vision of their school district or themselves as teachers of mathematics. For example, two of the participants in this study utilized a template centered on the five practices that increase student discourse. There are many templates that exist, but it is important that teachers find and utilize one that matches either their districts philosophy of teaching and if the district does not have one, then their own individual philosophy.

Planning with two or more teachers that teach the same grade level is also important when supporting teachers in transforming their mathematics instructional practices. Through planning with others, teachers can gain insight into different perspectives and experiences of other teachers that are teaching the same standards. These teachers can use each other to share ideas, identify potential student misconceptions, and even to share the results of how their students are responding to their instructional practices. Through this type of dialogue, teachers can develop plans together that can ultimately provide students with strong learning experiences.

Utilizing assessment in the planning process is also important to being an intentional planner. I would recommend that classroom teachers utilize performance assessments or rich tasks at the beginning of every unit of instruction. Through analyzing the ways in which students are interacting with the standards, teachers can gain valuable insight into potential teaching points that can serve as valuable tools in the process of planning. I have often thought that this work needs to come first in the process of planning because otherwise

teachers are planning lessons for what they think students might need and not what they know students need.

Develop an Inquiry Based Model

As humans, many of us are curious about the world around us. Humans have an innate desire to explore and figure things out. With this inherent desire, it is important educators capitalize on this for not just our students, but for our teachers as well.

Teachers are very smart and hard -working individuals. They are also the ones in our school system that are closest to those our schools are designed to serve, the students. Therefore, educators must establish inquiry based models of learning for our teachers so that they can serve not only as teachers, but also as researchers. Earlier I mentioned the Japanese lesson study model, which is just one of many models to consider. There are a variety of action research models that provides structures for teachers to closely research the effect their instructional practices are having on students. The greatest benefit to utilizing an inquiry model with teachers is that they are the ones who ultimately take ownership in their learning and therefore more likely to transform their teaching practices.

While I cannot over-emphasize the recommendation to develop an inquiry based learning model for adults, I recommend this for students as well. As with the adults, students are naturally curious and strive to develop an understanding of the world around them. When students are the ones developing an understanding of mathematics through an inquiry model, they are more likely to engage deeply in mathematics, be more engaged, understand the mathematics, and have a positive self -image about themselves as mathematicians. The challenge educators have in implementing an inquiry based model for students is that it looks and feels very different than what many of us have experienced. However, it is time for us to

get over this and pull ourselves out of our comfort zone to provide students with the best learning experiences in mathematics that educators know they are capable of planning and implementing.

Suggestions for Future Research

This study examined the experiences of six teachers in a diverse suburban setting as they shared their perceptions of professional development as members of an action research team. From the conduct of this study, I have several suggestions for future research are in order. These would include increasing the scope of this work, utilizing a mixed approach to examine quantitative impact, and incorporating the perspectives of leaders of the buildings in which the teachers are working.

Increasing the scope of this work could prove to be invaluable to leaders, researchers, and policy makers throughout the world. Through increasing the scope, I am referencing having a much larger number of participants, focusing on urban schools, and incorporating all levels within a K-12 school system. As many school districts throughout the United States and the world are seeking ways to improve the mathematics skills of students in order to compete in this global society, I believe expanding the scope of this work would attract the needed attention on quality mathematics professional development that supports the transformation of teaching practices.

Measuring the quantitative impact of professional development experiences would be another recommendation for future research. In the era of accountability, many school district leaders and policy makers want to see “evidence based professional development.” Unfortunately, this evidence must often be defined as student performance on standardized assessments. However, I do not believe educators need to shy away from this reality but do

need a clearer picture of what types of professional development experiences influence teacher transformation and ultimately positively impact student achievement.

Finally, I would recommend the voices of the building leaders where professional development is taking place should have a role in action research. While in this study the teachers felt they were transforming their practices, I often wondered if the building leader felt the same way. Ultimately, the building leader has to support this work or transformation of instructional practices may never happen. Therefore, examining the role of the building leader in the process of transformation can provide another lens to this research that would support school leaders in understanding their role in supporting teachers to transform their instructional practices.

Final Thoughts

Through utilizing the process of heuristic inquiry, I incorporated my experiences as an educator to make sense of the data collected throughout this study. My experiences made a significant difference in understanding and establishing patterns within the data. I interpreted and reported the data using language familiar with educators throughout the world. In utilizing the heuristic approach, I learned the value that can be added to a research study when the researcher has experiences with the phenomena. The experience with the phenomena allow the researcher to bring context to the data and therefore interpret it in a way that is relevant to potential interested audiences.

As a student growing up in Northwest Indiana, I was one who had a very difficult time understanding math. As I have continuously studied student learning and mathematics, I have come to believe that my difficulties were not a result of my ability, but rather how I was taught math. As time went on my math anxiety prevented me from ever considering a variety

of careers because I was afraid that I would have to take a higher-level math course in high school and college. While I would not have chosen any other career than the one I have chosen and love today, I do not want the options to ever be limited for the students that I am responsible to serve. Through this research study and throughout my experiences in education, I am convinced that all students can excel at mathematics if the educators are willing to transform their instructional practices in ways that will support student understanding of mathematics. When educators commit to doing this, no longer will there be a day where students believe what I use to believe, which, is some kids are good at math and some are not. No longer will there be a day in which future opportunities are limited for students because the adults resist change.

APPENDIX A
DISTRICT CONSENT FORM

Request to Conduct Research
2016-2017

Name of Applicant: Chad Sutton

Employee of North Kansas City Schools? Yes No

If yes, location and position: Assistant To The Superintendent Pre k -8

Is the research in fulfillment of graduate program requirements and/or in partnership with an external organization (e.g., university, college, business, industry, agency, etc.)? Yes No

If yes, name of external organization and lead contact person:
External organization: UMKC

Lead Contact Person and Position: Dr. Loyce Caruthers, Associate Professor

Purpose of research: To examine teacher perceptions of professional development as a member of a mathematics action research team

Submission Requirements

1. A copy of the complete application submitted for formal approval by a human subjects review board. This application should include, at a minimum:
 - a. A brief summary of the purpose and scope of the research including:
 - The extent to which the research addresses and/or aligns with the goals of the school district
 - Potential benefit of the research to positively impact district, building, or classroom practice
 - b. A brief summary of the research methods including:
 - Participants
 - Selection process
 - Remuneration procedures (if applicable)
 - Assurance of confidentiality of participant identification
 - Consent and assent procedures and documents
 - Activities related to the research, including proposed survey, interview, and/or assessment questions/instruments
 - Extent of intrusiveness/disruption regarding classroom instruction
 - Time/effort requirements of participants
2. Evidence to demonstrate that the proposed research has been formally approved through a human subjects review process.
3. Assurance from the researcher that building principals, teachers, students and/or their parents may opt out of participation without consequence even with approval by the district team.
4. Assurance from the researcher that results will be communicated back to the district upon completion of study. (**Anticipated date of completion:** December 2016

Signature of Executive Director of Data and Accountability: Dr. Jill Pugh

Team Review Date: 8/29/2016 Approved: Not Approved:

Signature of Deputy Superintendent: J. M. Hackett

n/a C.D. Date: 8/29/16

Signature of Principal(s) of building(s) impacted by research study _____ Date _____

A copy of this form must be returned to NKCS Executive Director of Data and Accountability with all necessary signatures before approval can be granted to conduct research.

APPENDIX B
PRINCIPAL PARTICIPANT RECRUITMENT

September 20, 2016

Dear Colleagues,

I am currently beginning the research phase for my doctoral dissertation entitled, **ELEMENTARY TEACHER PERCEPTIONS OF MATH PROFESSIONAL DEVELOPMENT ON MATHEMATICS INSTRUCTION**. This study will provide insight into how professional development can support teacher transformation of their math instructional practices. I would like to ask for your help with participant recommendations for this study. In order to collect rich data for this study, please think of teachers who:

- a. Are reflective about their classroom instructional practices
- b. Are currently engaged in mathematics professional development through the North Kansas City School District
- c. Are learners and frequently try out new instructional practices after professional development sessions.
- d. Are currently a Kindergarten through 5th grade teacher

If teachers choose to participate in this study, they will be asked to respond to six journal entries, consent to one in person interview, and consent to one focus group interview involving all of the participants in this study. The study will last from approximately October 2016- October 2017.

As the researchers, we will do our best to keep the information that teachers share confidential, but this cannot be totally guaranteed. Persons from the University of Missouri-Kansas City Institutional Review Board (a committee that reviews and approves research studies), Research Protections Program, and Federal regulatory agencies may look at records related to this study to make sure we are doing proper, safe research and protecting human subjects. The results of this research may be published or presented to others. Teachers will not be named in any reports of the results, nor will the school or school district be identified. Rather, pseudonyms will be used in place of names of individuals, schools, and school

districts. Although audio recordings will be used for precise interviews, no audio will be used in publications or presentations. If teachers decide to leave the study early, which they may do at any time, all data collected will be destroyed at that point. All of the data collected and utilized for this study will be kept in a locked cabinet in the Principal Investigators office, Dr. Loyce Caruthers, for seven years after the completion of this study.

e. Participation in this study is voluntary at all times. If teachers choose not to participate or to withdraw their participation, they may do so at any time without any penalty. If teachers think they have been harmed in any way as a result of this study, they may contact the Institutional Review Board at 816-235-5927. While every effort will be made to keep confidential all of the information that teachers complete and share, it cannot be absolutely guaranteed. Individuals from the University of Missouri Kansas City Institutional Review Board (a committee that reviews and approves research studies), Research Protections Program, and Federal regulatory agencies may look at records related to this study for quality improvement and regulatory functions.

f. Please email me the name, grade level, and current school of the teacher(s) that you feel should be considered as participants for this study. Please email me their name, grade level, and school by September 27th. I would like to thank you in advance for your assistance with this research project.

Sincerely,

Chad Sutton

APPENDIX C
TEACHER RECRUITMENT LETTER

Dear Colleague,

My name is Chad Sutton and I am a Doctoral Student at the University of Missouri Kansas City. I am also the Assistant to the Superintendent for Pre-k through 8th grade here in North Kansas City. The reason for my email today is that you have been recommended by your Principal to participate in my research study entitled “Elementary Teacher Perceptions Of Math Professional Development On Mathematics Instruction”. Your Principal has recommended you for this study because you are an individual who is reflective, are currently engaged in mathematics professional development with North Kansas City, and like to try out new instructional practices or ideas learned at professional development sessions.

I would like to invite you to participate in this research study. The goal of this study is to identify specifically what types of professional development experiences support the transformation of a classroom teacher’s math instructional practices. The risks to you for participating in this study are minimal, no greater than those you encounter in daily life. The study will last from approximately October 2016- October 2017.

If you choose to participant in this study you would be asked to do the following:

1. All participants will be asked to write two journal entries after their first mathematics professional development session in the 2016-17 school year. Journal entry prompts will be provided. The journal entries would be conducted at a time that is convenient for you and would be a minimum of one typed, single spaced page in length. One journal entry will focus on your professional development experience and one will focus on student response to newly learned instructional practices in math. Upon the completion of the journal entries from all participants, approximately 6-8 participants will be asked to do the following through the remainder of the research study:
 - g. A. Complete 4 additional **journal entries** that you would submit to me in response to provided journal prompts centered on your professional development experiences in math. These entries will be completed following a math professional development session in which you attend. Additionally, the journal entries would

be conducted at a time that is convenient for you and would be a minimum of one typed, single spaced page in length. One journal entry will focus on your professional development experiences and one will focus on student response to newly learned instructional practices in math. I will be the only person reading the journal entries and the journal entries will remain secure and confidential.

- h. B. Participate in one **individual interview session** with me regarding your instructional professional development experiences in math. All interviews would be conducted at a time that is convenient for you. Interviews would be scheduled for forty-five (45) minutes. Interviews would be recorded using a digital recording device, and these records would remain secure and confidential.
- i. C. Participate in **one focus group interview** with the other research study participants. This focus group interview will be a follow up to the individual interviews and will focus on your professional development experiences with mathematics.

The journal entries, interviews and focus group interviews would be conducted between now and February. As the researchers, we will do our best to keep the information shared confidential, but this cannot be totally guaranteed. Persons from the University of Missouri-Kansas City Institutional Review Board (a committee that reviews and approves research studies), Research Protections Program, and Federal regulatory agencies may look at records related to this study to make sure we are doing proper, safe research and protecting human subjects. The results of this research may be published or presented to others. As a participant, you will not be named in any reports of the results, nor will the school or school district be identified. Rather, pseudonyms will be used in place of names of individuals, schools, and school districts. Although audio recordings will be used for precise interviews, no audio will be used in publications or presentations. If teachers decide to leave the study early, which you may do at any time, all data collected will be destroyed at that point. All of the data collected and utilized for this study will be kept in a locked cabinet in the Principal Investigators office, Dr. Loyce Caruthers, for seven years after the completion of this study.

Participation in this study is voluntary at all times. If you choose not to participate or to withdraw their participation, you may do so at any time without any penalty. If you think that you have been harmed in any way as a result of this study, you may contact the Institutional Review Board at 816-235-5927. While every effort will be made to keep confidential all of the information you complete and share, it cannot be absolutely guaranteed. Individuals from

the University of Missouri Kansas City Institutional Review Board (a committee that reviews and approves research studies), Research Protections Program, and Federal regulatory agencies may look at records related to this study for quality improvement and regulatory functions. Each participant completing the first two journal entries will receive a \$5.00 gift card to Starbucks. The 6-8 participants that continue to participate in this study throughout its duration will receive \$35.00 Visa Gift Cards.

If you would like to talk further with me about your participation in this study, feel free to email me or to contact me at 816-674-9120 at any time. **If you could, please let me know by September 30th if you are or are not interested in participating in this research study and I thank you in advance.**

Sincerely,

Chad Sutton

APPENDIX D
TEACHER PARTICIPATION CONSENT FORM

Consent for Participation in a Research Study

Elementary Teacher Perceptions Of Math Professional Development On Mathematics Instruction

C. Chad Sutton

B.A. Northwest Missouri State University, 1999

M.ED. University of Missouri Kansas City 2001

Ed.S. University of Missouri Kansas City 2011

Request to Participate

You are invited to participate in a research study to share your perceptions of professional development experiences as a member of a mathematics action research teams. The researcher in charge of this study is Chad Sutton, Doctoral Candidate, University of Missouri Kansas City. The study team is asking you to participate because you are a teacher who is receiving mathematics professional development through the North Kansas City School District. Research studies only include people who choose to take part. This document is called a consent form. Please read this consent form carefully and take your time making your decision. Additionally, the researcher will go over this consent form with you and answer any questions that you may have. This consent form explains what to expect: the risks, discomforts, and benefits, if any, if you consent to be in the study.

Background:

You are being asked to participate in this study because you have identified yourself as a teacher who is:

1. Reflective about your classroom instructional practices
2. Are currently engaged in mathematics professional development through the North Kansas City School District

3. Are a learner and frequently try out new instructional practices after professional development sessions.
4. Are a Kindergarten through 5th grade teacher

As a participant in this study, you have been asked to take part in this research study because of the experiences that you have with professional development.

Purpose

The goal of this study is to identify aspects of professional development experiences that support teachers in transforming their mathematics instruction. This study will also provide insight into professional development experiences that do not support teachers in transforming their instructional practice. The risks of participating in this study are minimal, no greater than those encountered in daily life.

Procedures

If you decide to participate in this study, you will be asked to respond to six journal entries, consent to one in person interview, and consent to one focus group interview involving all of the participants in this study. The study will last from approximately October 2016- October 2017.

You and five other teachers are being invited to participate in writing six individual journal entries from October 2016 through February 2017 that will be submitted as attachments to the researcher regarding professional development experiences and the implementation of new instructional strategies. Journal entries can be completed at a time that is convenient for you and emailed to the researcher. You will send the journal entries to the researcher within two weeks of participating in a professional development session. Three journal entries will focus on your professional development experiences. The other three journal entries will focus on student response to instructional practices. You will be asked to use a pseudonym in place of your name on the attached journal entries. Journals will be uploaded to a file, "journal entries" with identifiers being eliminated. Emails will be deleted from the computer immediately. A master list of participants with their pseudonyms for further data collection and analysis will be kept on a password protected computer and the researcher will be the only one with access to the list.

You will also be invited to participate in one individual interview session with the researcher regarding their professional development experiences while on a mathematics action research team. The interviews will be conducted at a time that is convenient for you and will closely follow a mathematics professional development session that you have attended. Interviews will be scheduled for forty-five (45) to sixty (60) minutes. You will use your selected pseudonym during the interviews. Interviews with you will be recorded using a digital recording device. If you do not want the interview recorded, the interview can be completed without recording. You will review the transcriptions of the interview before data are analyzed. Following data analysis, recordings will be destroyed. The transcription of the interviews will be kept on a password protected computer and paper copies kept in a locked file.

You will be invited to participate in a focus group interview conducted by the researcher to inform participants of the themes identified in the interviews and journal entries. The session will allow all participants to discuss the themes identified in the data and expand on their meanings. The focus group interviews will be conducted at a time that is convenient for you and the other participants. The focus group interview will be scheduled for forty-five (45) to sixty (60) minutes. The focus group interview will be recorded using a digital recording device, and these records will remain secure and confidential on a password protected computer. Once the transcription of the focus group is completed and reviewed by you and the other participants, the recording will be destroyed. A paper copy of the transcription will be kept in a locked file. After the study is over, all files will be kept in a locked filing cabinet in the researcher's advisor's office for 7 years.

Risks and Inconveniences

There are no known physical, social, or economic risks associated with this study; there is also no risk of criminal or civil liability. You may however, feel uncomfortable describing the experiences you have had with past and present professional development. In order to minimize these risks, all participation, including conversations, are voluntary and may be discontinued at any time for any reason.

Confidentiality is a potential risk of this research study. In order to reduce this risk, pseudonyms will be used in place of your name on all data collected from you. A master list of participants with their pseudonyms for further data collection and analysis will be kept on a password protected computer and the researcher will be the only one with access to the list. All interviews will be conducted in a location that is determined by you and that you feel will

best support your confidentiality throughout this study. Finally, all digital recordings will be destroyed upon the completion of data analysis.

This research is considered minimal risk. That means that the risks of taking part in this research study are not expected to be more than the risks in your daily life. There are no other known risks if you choose to take part of this study.

Benefits

There are no direct benefits to you participating in this study. Indirectly, however, your experiences may lead to a better understanding of how school districts and best support teachers in transforming their instructional practices through professional development.

Fees and Expenses:

All participants will be compensated with a \$50.00 Visa gift card

Alternatives to Study Participation

The alternative is not to take part in the study

Confidentiality

As the researcher, we will do our best to keep the information you shared confidential, but this cannot be totally guaranteed. Persons from the University of Missouri-Kansas City Institutional Review Board (a committee that reviews and approves research studies), Research Protections Program, and Federal regulatory agencies may look at records related to this study to make sure we are doing proper, safe research and protecting human subjects. The results of this research may be published or presented to others. You will not be named in any reports of the results, nor will the school or school district be identified. Although audio recordings will be used for precise interviews, no audio will be used in publications or presentations. If you decide to leave the study early, which you may do at any time, all data collected will be destroyed at that point. All of the data collected and utilized for this study will be kept in a locked cabinet in the Principal Investigator's office, Dr. Loyce Caruthers, for seven years after the completion of this study.

Contacts for Questions about the Study:

You should contact the Office of UMKC Social Sciences Institutional Review Board at 816-235-5927 if you have any questions, concerns or complaints about your rights as a research participant. You may call the research Chad Sutton at (816) 674-9120 if you have any questions about this study. You may also call him if any problems arise.

Voluntary Participation

Participation in this study is voluntary at all times. You may choose not to participate or to withdraw your participation at any time without any penalty. If you think you have been harmed in any way as a result of this study, you may contact the Institutional Review Board at 816-235-5927. While every effort will be made to keep confidential all of the information you complete and share, it cannot be absolutely guaranteed. Individuals from the University of Missouri Kansas City Institutional Review Board (a committee that reviews and approves research studies), Research Protections Program, and Federal regulatory agencies may look at records related to this study for quality improvement and regulatory functions.

APPENDIX E
TEACHER JOURNAL RESPONSE QUESTIONS

Directions: Please respond to each prompt and return to me within two weeks of completing a mathematics professional development experience sponsored by the North Kansas City School District (Math Solutions or Dr. Haistings). Please respond with a minimum of one single spaced, typed page for each set of prompts:

The first set of prompts include: (the typed answer to both of these question should total a minimum of one single spaced, typed page)

4. As a result of your most recent mathematics professional development experience, how has this experience supported you in developing a deeper understanding of mathematical content standards?
5. How have you gone about transferring your recent professional development experience into your mathematics instruction with students?

The prompt for the second entry includes: (the typed answer to this question should total a minimum of one single spaced, typed page)

1. How have your students responded to the instructional practices you have learned and implemented as a result of your recent mathematics professional development?

APPENDIX F
TEACHER INTERVIEW PROTOCOL

Opening Introduction & Description of Project: As a part of my research study, I am collecting data from participants through individual interviews. I am going to ask you a series of questions and audio record your responses with my iPad. Upon transcribing the interviews and the developing your case, I will send the data back to you in order to review for accuracy. All of your responses will be kept confidential and will only be used for the purpose of this research. Additionally, your identity will not be revealed in my findings. If there are additional questions that I have after analyzing the data, I will arrange a time to conduct an additional phone interview. Let's get started.

1. How has participating on this team supported you in learning the mathematical content standards for your grade level?
2. What specific experiences keep you motivated while participating on this Action Research Team?
3. How do you apply what you have learned in your Action Research Team into your own classroom?
4. How have your students responded to the instructional practices you have learned as a part of a mathematics action research team?

APPENDIX G
FOCUS GROUP PROTOCOL

Opening Introduction & Description of Project: As a part of my research study, I wanted to bring the themes identified throughout your cases back to you for discussion. This discussion will assist me in ensuring accuracy of the data along with considering your additional interpretations to the data presented. All of your responses will be kept confidential and will only be used for the purpose of this research. Additionally, your identity will not be revealed in my findings. Lets get started!

5. Based upon the themes that I presented to you, are there any themes that do you not agree with? Why?
6. Based upon the themes that I presented to you, which themes do you most strongly agree with? Why?
7. Based upon the themes that I presented to you, do you feel that there are any other potential themes of mathematics professional development that support teacher transformation that were not identified? Why?
8. How has participating on a mathematics action research team supported you in transforming your teaching practices in mathematics?

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