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Mentor Preparation: A Qualitative Study of STEM Master Teacher Professional Development

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MENTOR PREPARATION: A QUALITATIVE STUDY OF STEM MASTER TEACHER PROFESSIONAL DEVELOPMENT

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MENTOR PREPARATION: A QUALITATIVE STUDY OF STEM MASTER TEACHER PROFESSIONAL DEVELOPMENT

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Abstract

The No Child Left Behind Act of 2001 has required districts to staff all classrooms with highly qualified teachers. Yet, retaining certified teachers in the profession has been a national concern, especially among new teachers who leave at alarming rates within their first three years. This comes at a heavy cost to districts financially and in trying to maintain highly qualified status, but also to the continuity and effective education of students. Mentoring has been identified by many researchers as a plausible solution to reducing attrition rates for beginning teachers.

In this dissertation, I conducted qualitative research to explore and understand the perceptions of STEM (science, technology, engineering, and mathematics) Master Teachers' mentoring professional development in the context of the Master Teacher Academies program situated at Desert State University (pseudonym), a large institution located on the Texas-Mexico border. Additionally, I examined the reported teaching self-efficacy of STEM Master Teachers (mentors), as well as that of their novice teachers (mentees). Another purpose of the study was to investigate the forms and elements of interactions between these mentors and their mentees. Participants of this study were Texas certified Master Mathematics or Master Science Teachers, and their novice mathematics or science teacher mentees; all of whom teach in a high need U.S. Mexico border city school district serving a student population that is over 93% Hispanic. A grounded theory approach was used in examining and analyzing mentor and mentee perceptions and experiences through case studies. A constructivist framework was utilized to derive findings from interviews and the review of documents and contribute a diverse context and population to the literature. The study reveals conclusions and recommendations that will benefit educators, universities, school districts, and policy makers in regard to teacher mentor preparation.

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Chapter 1: Introduction

A brand new high school science teacher steps into her classroom with excitement, anticipation, and optimism. It is the first day of school and she is pleased and grateful to have been assigned a mentor from her campus to support her transition to this new career. Little did this novice know, her mentor was less than qualified to mentor (or even to teach). The mentor would actually impede her development as a new teacher with negativity, harsh criticism, and failure to assist in classroom management, pedagogy, or content. She explained in an interview:

> When I first started I had uh a bad mentor. She had only been teaching for two years, and it was my first year. And uh, it was hard—like she would walk into my classroom and tell me everything that I was doing *wrong*. Which, you know, you're supposed to I suppose. But then, uh, since it was part of the …[alternative certification] program, I had to go and see *her* teach too. And her classroom wasn't any better than mine. So I—it was really hard for me to take what she was saying *seriously*, or take it to heart because she wasn't implementing what she was critiquing *me* on.
>
> So that was really hard. We had a lot of issues. I ended up uh—a math teacher ended up being my unofficial mentor. She's the one that showed me classroom management, you know. And *that's* the most important thing in teaching. I think…as long as your class is under control, you'll get something done. So she really, really helped me out with uh, the classroom management and stuff like that. And just showing me the ropes. But my official mentor was not very good. Just, I don't know why she was here. She ended up quitting the next year. So [chuckles] so I'm glad I had that math teacher to help me, ah—someone to fall back on. Cuz [sic] I would have probably quit too if she—if I didn't have that support. (Participant 8, January 27, 2014)

Luckily, this novice teacher advocated for herself and did not end up as the one-third of new teachers who leave the profession within their first few years. This mentee's story will unfold in more detail later.

What follows is my research of mentorship in secondary schools to include participant perceptions of STEM mentor preparation, mentoring and teaching self-efficacy, and interactions between mentors and their mentees.

The No Child Left Behind Act of 2001 has required U.S. school districts to staff every classroom with a highly qualified teacher. This mandate poses an issue, not so much in *finding* highly qualified teachers, but in *keeping* them. More than one third of new teachers leave the profession within three years (Darling-Hammond, 2003; Ingersoll & Smith, 2003). This comes at a heavy cost to districts financially, but also to the continuity and effective education of students. Teachers who leave are often replaced by new, inexperienced teachers; further perpetuating the situation. Mentoring has been identified by many researchers as a plausible solution to reducing attrition rates for beginning teachers.

Evertson & Smithey (2000) report that new teachers who worked with mentors in a formal induction program were better able to manage instruction, establish routines, and keep students engaged in academic tasks than new teachers paired with mentors who had no formal opportunity to develop their skills as mentors. The mere presence of a mentor, however, is not enough. Consider this excerpt from an interview conducted as part of this study:

> Although she was very helpful in regards to kinda [sic] giving me, uh, this is so-and-so here who works here, this is how our gradebook works, very *basic* level, I don't think I was given the initial *foundation* to really help kind of develop a beginning teacher. (Participant 1, November 19, 2013)

Mentors must be equipped with appropriate knowledge and skills to effectively fill the mentor role. What warrants more research is *how* mentor teachers are prepared; what perceptions mentors hold of their preparation; and what elements of teaching and mentoring self-efficacy exist in mentor preparation. Investigating and understanding current mentor preparation practices can inform the design and enhancement of programs that prepare mentors.

Hope in Mentoring

Mentoring has been proposed as a way to "stem the tide of new teachers leaving the profession due to dissatisfaction with workplace conditions and a school culture lacking in support for novices" (Darling-Hammond, 2003; Davis, Resta, Higdon, & Latiolais, 2001; Johnson & Birkeland, 2003; Kauffman et al., 2002; quoted in St. George & Robinson, 2011). Teachers also list leaving education due to "difficult work assignments, unclear expectations, inadequate resources, isolation, role conflict, and reality shock" (Anhorn, 2008). When considering it takes a minimum of three to seven years of teaching experience to become proficient (Barrera, Braley, & Slate, 2010), it is alarming that teachers are leaving the professional before ever reaching the level of proficiency. These teachers may be replaced with more new teachers who are not proficient, who may also choose to quickly leave the teaching field. And the cycle continues. It is important to note, however, that "beginning teachers who have access to intensive mentoring by expert colleagues are much less likely to leave teaching in the early years" (Darling-Hammond, 2003, p. 11). This is the case of the novice teachers of this study and their stories will be revealed later.

Sticking with the profession is not the only challenge new teachers face. They are held to the same standards of more veteran teachers that they work with. Additionally, there is great pressure in knowing that "improving student achievement boils down to the teacher" (Wong,

2004, p. 41). Research by the National Commission of Teaching and America's Future concluded that quality teaching is critical to student success and "what teachers know and can do is the most important influence on what students learn" (NCTAF, 1996, p. iv). These pressures coupled with high levels of accountability may negatively affect a beginning teacher's beliefs in self-efficacy. Consider this excerpt from an interview with a high school science mentor:

> You know we're right now so much under the gun with testing. That you know, we don't enjoy teaching anymore. It's all about..*how* did the kids do? And I am *all* about analyzing data. Don't get me wrong. I mean I'm an empirical scientist. I love numbers and I need to know where kids are growing and who's dropping the ball and what can I do to fix it? It's just that I always feel like we get through this analysis. We never go back to address the *weakness*. It's like we have to keep moving forward because we *gotta* [sic] cover the curriculum…[and] a lot of the teachers that I have mentored…they kind of *doubt* their teaching a lot. And um, and I don't know if it's because they are new teachers that they don't feel like they're doing it right? Or, how do I know that I'm doing it right? And so there's a lot more self doubt. (Participant 3, January 11, 2014)

These pressures affect teacher efficacy, which is the intellectual activity by which one forges one's beliefs about his or her ability to achieve a certain level of accomplishment (Bandura, 1977). Efficacy belief is a major basis of action, and people guide their lives by their beliefs of personal efficacy (p. 3). A teacher's efficacy belief could affect their instructional practice in the classroom. Teaching efficacy, therefore, has a direct link to the way students perform (Dembo & Gibson, 1985; Woolfolk & Hoy, 1990; quoted in Yost, 2002). This begs the question, how does one go about building the efficacy of new teachers, while encouraging them to also stay in the field so they may grow and strengthen their craft?

Brennan, Thames, & Roberts (1999) found that participation in a mentoring program is valuable to the novice teacher in that it positively affects teacher efficacy. Evertson and Smithey (2000) found that new teachers who worked with mentors in a formal induction program were better able to manage instruction, establish routines, and keep students engaged in academic tasks than new teachers paired with mentors who had no formal opportunity to develop their skills as mentors. Take, for example the following account of reflective practice between one mentee and his mentor in regard to applying a new strategy in the classroom:

> Being able to figure out that right combination of uh, compounding a strategy and the activity together. Uh, hopefully it will come with more *experience* and I'll be able to mesh them together. Um because I do find that out sometimes, I'll call [my mentor] and I'll tell him, "Oh yeah I was trying out *this* strategy and it kind of didn't work, but I should have tried this". He automatically knew, oh yeah you should have just tried that one, kind of thing. Um, but it's one of those things where he doesn't uh butt in in the sense and say, "Alright, do this strategy with this because this is the way it *should* work". Uh, he lets me explore that on my own and find out oh it didn't work out, it didn't pan out the way I thought it was going to pan out in my head. So, I think I learned *more* that way than him just spoon feeding me the stuff…He'll let me make my mistakes. (Participant 7, January 17, 2014)

Many educators, including those participating in this study, support mentoring as one strategy for reducing the attrition rate of beginning teachers and as one key to successfully inducting new teachers into the profession (Gilles & Wilson, 2004). Numerous studies document the:

> Benefits of mentoring to support beginning teachers as they enter the teaching profession (Evertson & Smithey, 2000; Lindgren, 2005). Huling-Austin (1992) linked novices'

> success in the classroom with mentor support. Other studies associate mentoring with reduced attrition, demonstrating that a mentor's assistance can affect a new teacher's decision to remain in the profession as he or she grapples with the difficulties of a new career (Boreen, Johnson, Niday, & Potts, 2000; Evertson & Smithey, 2000; Gold, 1996; Smith & Ingersoll, 2004). (Bradbury, 2010, p. 1050)

It is imperative to invest in the development of novice teachers and to offer support, especially early in their careers.

Mentoring programs have gained attention in across the nation. Take the state of Texas, who began encouraging mentoring for all beginning teachers in 1989 to encourage and facilitate retention (SEDL, 2000). By 1990, mentoring became a requirement in Texas for alternatively certified teachers. And in 1991, Texas mandated that all teachers receive mentoring during their induction year (SEDL, 2000). In 2014, the Texas Education Agency still recommends the assignment of a mentor to any teacher with less than two years of experience.

Texas has also chosen to invest in Master Teacher certification. This response from the Texas legislature and the Texas Education Agency is one method for impacting highly qualified teacher preparation by focusing on the mature teacher as well as the novice. Desert State University's Master Teacher Academies were subsequently created to support teachers in achieving Master Teacher certification. The Master Teacher Academies program is:

> A master level program that prepares teachers with three important benefits: (1) They will have completed all of the coursework required for Master Teacher Certification from a Texas State Board of Education approved Master Teacher preparation program. They will be eligible to take the Master Teacher certification test and if they pass it, apply for Master Teacher Certification with the State of Texas. (2) They will have completed

> roughly one-third of the coursework towards a Masters of Education degree from the [Desert State University] College of Education. (3) They will have received a series of content-related workshops that complement the graduate education courses and train them in areas such as multi-disciplinary science-mathematics-technology connections; teaching STEM content to special needs populations; integrating robotics, podcasting, and cyber-resources in STEM teaching, etc. They will also have had their tuition paid for between four and six graduate courses over the two years, and have received $120 per year support for textbooks, a small stipend for each workshop, and approximately $400 in technology such as probes, data collectors, robots, etc. (Master Teacher Academies website)

The Master Teacher Academies also include instruction and a practicum component to prepare participants to mentor novice classroom teachers.

The issue facing the nation of high early attrition rates of teachers must be addressed. Researchers advocate for mentoring programs as a solution that will not only increase the number of novice teachers who remain in education, but also increase novices' knowledge and skills. Teachers are under extreme pressure for high performance in the current accountability system and the effects on teacher self-efficacy must also be considered. Again, mentoring has been identified as a way of helping novices cope. The nation is looking more closely at the creation and support of teacher mentoring efforts, including the state of Texas and its Master Teacher initiative.

Context of the Study

The purpose of my study was to investigate the preparation of mentor teachers involved in a program of study that prepares current educators for future mentor roles as Master Science,

Technology, or Mathematics teachers in the state of Texas (the Master Teacher Academies, or MTA). The setting for my research is a large city on the Texas-Mexico border. I gathered first-hand accounts of educators who have completed the STEM Master Teacher Academies program at Desert State University to conduct a series of case studies.

In this research, I work reflexively within a cultural perspective made available to me (Hammersley & Atkinson, 2007) through fifteen years of experience in public education as a teacher and administrator. I am self-aware of myself as a writer, thinker, and researcher—raising the question of what preconceptions, presuppositions, and genre assumptions I bring to bear in this task (von Glasersfeld, 1995). I have a passion for STEM teacher mentoring as a crucial component to ensuring a quality education for all students. I bring my experience as a mentee when I began my teaching career; and also as a mentor to novice teachers later in my career. During my tenure as a campus administrator, I witnessed a new perspective of the need for enhanced teacher mentoring to support novices. I worked closely with teachers (both novice and veteran) who demonstrated low levels of teaching efficacy. I saw teachers leave the profession within their first few years, and witnessed the negative effects on student learning and teacher morale as a result. At the time of this study, I was serving in a district-level position assisting with the oversight of mentoring and professional development of teachers and administrators. My experiences position me as a researcher who is neither objective nor subjective, but reflexive.

My primary goal in this research was to produce knowledge (Hammersley & Atkinson, 2007) of effective mentoring preparation. I investigated teachers' perceptions of their mentor preparation in a mature, established program—the Master Teacher Academies at Desert State University (pseudonym) located on the Texas-Mexico border. I focused specifically on the

STEM (science, technology, engineering, and mathematics) strands of the Master Teacher Academies. I interviewed completers of the Master Teacher Academies program to investigate their perceptions of mentoring experiences of teachers in schools of Borderland Independent School District (pseudonym) where they currently work. I interviewed the mentee teachers of the mentor participants to better understand mentor and mentee roles, and their interactions and practices. I triangulated interview data by reviewing documents to include teaching self-efficacy surveys, records from the Master Teacher Academies, academic transcripts, and various pertinent resources from the Texas Education Agency. Throughout the investigation, I considered the unique situations in which STEM area mentors and their teacher mentees are situated in public schools in a border city. I recognized my role as an active participant in the research process and considered my own presuppositions and experiences; and continually worked to make the familiar unfamiliar in order to suspend my preconceptions (Hammersley & Atkinson, 2007).

With my findings, I intend to contribute to the literature a different perspective of a previous study conducted by Gilles and Wilson (2004). My perspective included secondary STEM mentors and teachers and was within the context of a Southwestern border city; as opposed to the Gilles and Wilson sample from the Midwest who were primarily elementary teachers. My study provides a unique perspective in that it was conducted with STEM Master teachers who were prepared in, and who work with, a population that is unlike most of the United States (see Chapters 3 & 4). I feel my experience as a teacher, instructional specialist, and administrator in the state of Texas serve as a solid background to help me relate to my subjects, conduct interviews, and understand the demands of mentoring and teaching.

Significance of the Study

With the Nation's efforts to continue and enhance mentoring programs for beginning teachers, it is important to develop deep understandings of how mentor teachers perceive their professional development for the role as mentor and to explore the elements of their self-efficacy related to teaching in their content and mentoring. I chose to explore the perceptions of these particular STEM Master Teachers because STEM teaching positions are typically hardest to fill (see Table 2.1) and because of this region's diverse teacher demographic. My participants represent a unique group and, therefore, contribute voices that are sparse in the current literature. This study contributes STEM-specific perceptions of both mentors and mentees to the literature and will, therefore, enrich the research base in STEM Master Teacher preparation. This qualitative study includes the perceptions of five mentor and three novice (mentee) math and science teachers. Research questions guiding this investigation were:

1. What are the teaching and mentoring self-efficacy elements of Texas certified Master Teacher mentors created under an approved Texas program?

2. What are the impacts on teaching self-efficacy of novice teachers mentored by Texas certified Master Teacher mentors created under an approved Texas program?

3. What are the forms and elements of interactions between Texas certified Master Teacher mentors created under an approved Texas program and their novice teacher mentees?

Limitations

My research consisted of a series of eight case studies of STEM mentors and their mentees. Studying my participants in detail provided critical insights to understand deeply the

particulars and generalities involved in the complex process of mentor preparation and the intricacies of mentoring and mentor/mentee relationships. My research plan was altered from one of mixed-methods, incorporating qualitative and quantitative measures; to one of qualitative because I recognized that qualitative case study methodology was better suited to the in-depth perceptions and conceptual understandings I was seeking in my participants. Instead of the generalization of my findings, my target was to study and understand the characteristics of the particular situations investigated (Hammersley & Atkinson, 2007) in the Master Teacher Academies.

My intentions were to focus on all four STEM areas of education (science, technology, engineering, and mathematics), however, Desert State University's Master Teacher Academies do not offer an engineering route (nor does the Texas Education Agency offer an engineering Master Teacher certification). Although a technology Academy and certification do exist in Texas, none of the teachers meeting the criteria had pursued this strand. Hence, data represent math and science teachers. My sample was not equally representative of math and science: four of the five mentor teachers taught science and one taught math. From the novice teacher (mentee) sample, two taught math and one taught science.

The sampling criteria for this study presented another limitation. I sought the perspectives of those who had experienced the MTA in its entirety, to include completing the end goal of obtaining Texas Master Teacher certification from the State Board for Educator Certification (SBEC). Teachers who had not yet completed the MTA program were excluded, as they had not experienced all aspects of the MTA. Teachers who completed the MTA program but had not obtained Master Teacher certification were not included in the solicitation for participation.

Organization of the Manuscript

The introduction of this dissertation provides a synopsis of background information on teacher mentoring and the context of this qualitative study. Chapter two provides a synthesis of current literature relevant to mentoring in education. Chapter three details the research methodologies that were utilized in this study. Chapter four presents the findings of the study. Chapter five provides a summary analysis of findings and recommendations based upon these findings.

Definition of Key Terms

Constructivism- the idea that individuals make meaning of knowledge within a social context and as a result of interactions with others (St. George, & Robinson, 2011, p. 28)

Mentoring/mentorship- a supportive, nurturing process in which a more skilled/experienced person teaches, sponsors, encourages, counsels, models, and befriends a less skilled/experienced person for the purpose of promoting the latter's professional and personal development (Anderson & Shannon, 1988)

Mentor- an experienced teacher who assists, coaches, consults with, collaborates with, and guides…teachers to support their transition from novices to successful educators committed to the profession (St. George & Robinson, 2011)

Mentee- a less experienced teacher who works in collaboration with or has been assigned to someone who acts as their mentor

MTEBI- Mathematics Teaching Efficacy Belief Instrument

Novice teacher- typically, a teacher with five or less years of teaching experience

Self-efficacy- a judgment of one's ability to organize and execute given types of performances (Bandura, 1997, p.21)

STEBI- Science Teaching Efficacy Belief Instrument

STEM- Science, Technology, Engineering, and Mathematics

TExMaT- Texas Examinations for Master Teachers

Conclusion

Our nation's schools are facing the challenge of retaining new teachers while also bringing new teachers to levels of proficiency in an expedient manner. Not an easy task, but current research supports mentor teachers as a strategy to meet both goals. With increased emphasis placed on teacher mentoring, we must examine the state of mentor preparation and use the findings to make future decisions in planning and improving upon programs. Texas initiatives for teacher mentoring have resulted in the origination of the Master Teacher certifications. Institutions such as Desert State University are working prepare teachers for these certification. I use the Master Teacher Academies program as the context of my qualitative study. I bring my related experiences and background to my research, and maintained reflexivity as I conducted my study. In this chapter, I have identified the significance of this study to the success of teachers, and also in its contribution to the literature. Limitations were identified, as well as key terms.

Chapter 2: A Review of Related Literature

Introduction

In the last decade, science, technology, engineering, and mathematics (STEM) education has become a national concern. As domestic and world economies become increasingly dependent on science and engineering, it is critical that Americans possess science, technology, and mathematics skills in order to benefit from or contribute to our knowledge-based society (National Research Council, 2007). On various international assessments (e.g. Trends in International Mathematics and Science Study—TIMSS; Program for International Students Assessment—PISA), American students traditionally score below international competitors; demonstrating the United States' lack of scientific and mathematics literacy (Brown et al., 2012, p. 657). Ingersoll and Perda (2010) add:

> Recent high-profile reports from organizations such as the John Glenn Commission (National Commission on Mathematics and Science Teaching for the 21st Century, 2000), the National Research Council (2002), and the National Academy of Sciences (2007) have directly tied mathematics and science teacher staffing problems to a host of educational and societal problems—to the inability to meet student achievement goals, to low U.S. educational performance compared to other nations, to the minority achievement gap, to national economic competitiveness, and even to the security of the nation. (p. 564)

Figure 2.1 presents these ties. The National Research Council contends a key factor for improving K-12 STEM education and ensuring that students receive a twenty-first-century education is improving teacher quality, as this is firmly linked to student achievement.

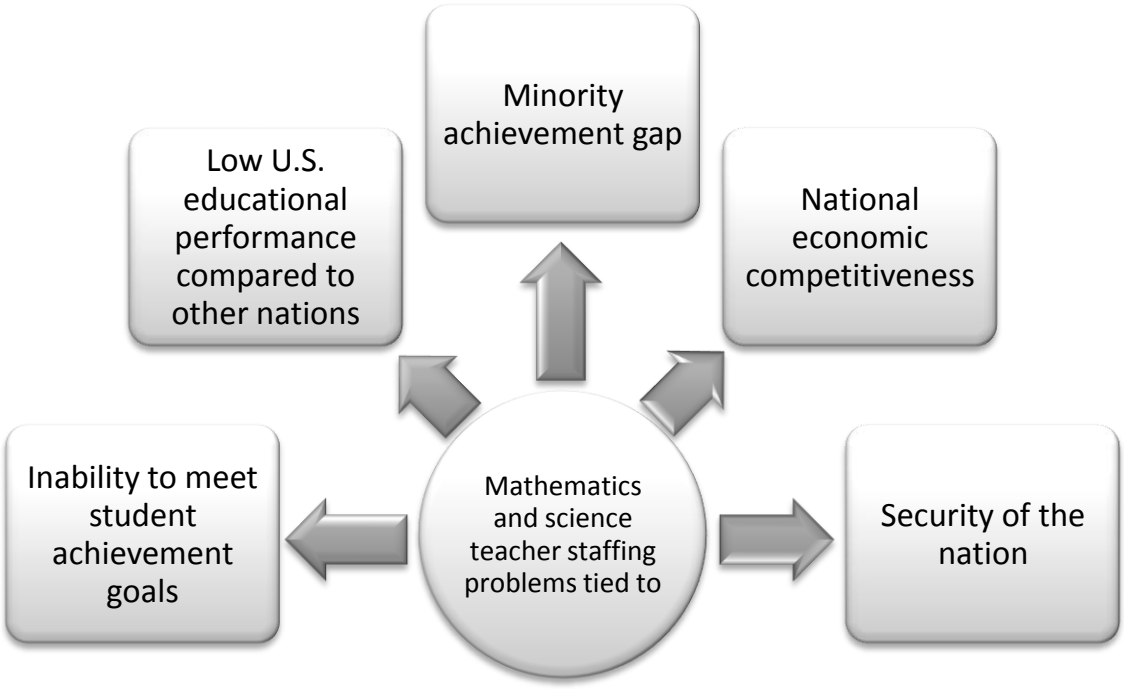

Figure 2.1 Education and societal problems tied to mathematics and science teacher staffing problems (Ingersoll & Perda, 2010)

Examining another layer of the issue, we see that America's schools are "struggling with a growing teacher dropout problem that is costing the nation over $7 billion a year. It is draining resources, diminishing teaching quality, and undermining our ability to close the student achievement gap" (National Teaching Commission on Teaching and America's Future, 2007, p.1). The consequences of high teacher turnover are particularly dire for our nation's low-performing, high-poverty schools which see a higher teacher turnover rate (50 percent higher) than low-poverty schools (Darling-Hammond & Sykes, 2003; Ingersoll & Smith, 2003). Many of these schools struggle to close the student achievement gap because they never close the teaching quality gap—they are constantly rebuilding their staff" (Darling-Hammond & Sykes, 2003, p. 2).

Between one-third and one-half of new teachers leave the profession within five years (Darling-Hammond, 2003; Smith & Ingersoll, 2004). The turnover rate for Texas public school teachers in their initial three years costs Texas $329 million a year. This is equivalent to $8,000 per beginning teacher who leaves (The Texas Center for Educational Research, 2000). Darling-Hammond and Sykes (2003) explain:

> Churn among novices also reduces education productivity, since teacher effectiveness rises sharply after the first few years in the classroom (Hanushek, Kain, & Rivkin, 1998; Kain & Singleton, 1996). It drains affected schools' financial and human resources. These schools, which typically can least afford it, must constantly pour money into recruitment and professional support for new teachers, many of them untrained, without reaping benefits from the investments…Most important, the constant staff churn consigns a large share of children in high-turnover schools to a parade of relatively ineffective teachers. (Darling-Hammond & Sykes, 2003, p. 16)

Why are teachers leaving the profession? Several factors can be found in the literature: salaries; working conditions; preparation (or lack of); inadequate or absence of mentoring support in the early years; beginning teachers being held to the same expectations, from day one of their careers, as veteran teachers; isolation due to novices being fearful to ask questions, as they do not want others to see what they don't know; being overwhelmed by the demands of the job or by inappropriate teaching assignments or excessive teaching loads; disappointment with colleagues who failed to support them as they struggled to teach; and principals that were arbitrary, abusive, or neglectful (Darling-Hammond, 2003; Heller, 2004; Johnson & Birkeland, 2003).

Teachers that are needed the most and those considered to have the most potential, are also the most likely to leave. Johnson and Birkeland (2003) reported trends in who leaves teaching most quickly—high school math and science teachers, young women, and people with high standardized test scores (p. 586). Hallam, Chou, Hite, and Hite (2012) also report that highly academic credentialed teachers (degreed from top ranking universities or with high grade point averages) are more likely to leave teaching altogether, while strong education credentials (e.g. teacher certification, endorsements, National Board Certification) are more likely to stay but move from school to school (p. 245).

Opportunely, a number of studies have found "well-designed mentoring programs raise retention rates for new teachers by improving their attitude, feelings of efficacy, and instructional skills" (Darling-Hammond, 2003, p. 11). Flynn and Nolan (2008) listed the following positive outcomes of new teacher mentoring programs: (a) easing the transition of new teachers from preparation to practice, (b) reducing teacher attrition, (c) helping new teachers become more effective earlier in their careers, and (d) increasing job satisfaction (p. 173). See Figure 2.2. Thus, mentor teachers have been called upon to support novice teachers in two worthy goals: one is in meeting their needs to curtail teacher attrition, and the second is to assist with developing new teachers into highly effective teachers as quickly as possible. In this study, you will meet some of these mentors and learn their perspectives on their mentor preparation and practice as mentors.

With an awareness of the potential benefits attached to mentoring programs, many states in the U.S. have mandated all beginning teachers to initiate their work under the tutelage of a mentor. It is important, therefore, to understand the multiple aspects of mentoring and to carefully consider the preparation of mentors who will be guiding and helping new educators

develop. Teacher mentoring is a complex, multi-faceted phenomenon that incorporates the efforts of multiple participants in order to function effectively. This review of teacher mentoring

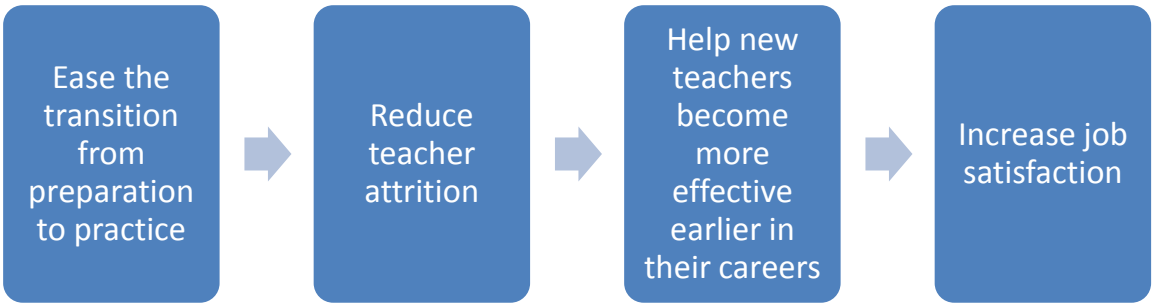

Figure 2.2 Positive outcomes of teacher mentoring programs (Flynn & Nolan, 2008)

literature, therefore, incorporates numerous aspects: definition of mentoring, the state of mentoring in the U.S., mentor roles, the need for and benefits of teacher mentoring, and theoretical frameworks in which to conceptualize teacher mentoring. Also included are forms and models of mentoring, studies of mentor preparation, criticisms of mentoring and mentor preparation, teaching and mentoring self-efficacy, best practices in mentoring, and mentor preparation. Finally, the Texas Master Teacher Program is included as it pertains to the context of the current study. Figure 2.3 presents a semantic overview of the multiple facets of teacher mentoring addressed in this review.

Definition of Mentoring

One can find several variations of the definition of mentoring in the literature. Ingersoll & Strong (2011) write "mentoring is the personal guidance provided, usually by seasoned veterans, to beginning teachers in schools" (p. 203). Anderson and Shannon (1988) offer a more

thorough definition of mentoring as "a supportive, nurturing process in which a more skilled/experienced person teaches, sponsors, encourages, counsels, models, and befriends a less skilled/experienced person for the purpose of promoting the latter's professional and personal development". Kwan and Lopez-Real (2005) add that "mentoring can be seen as comprising an

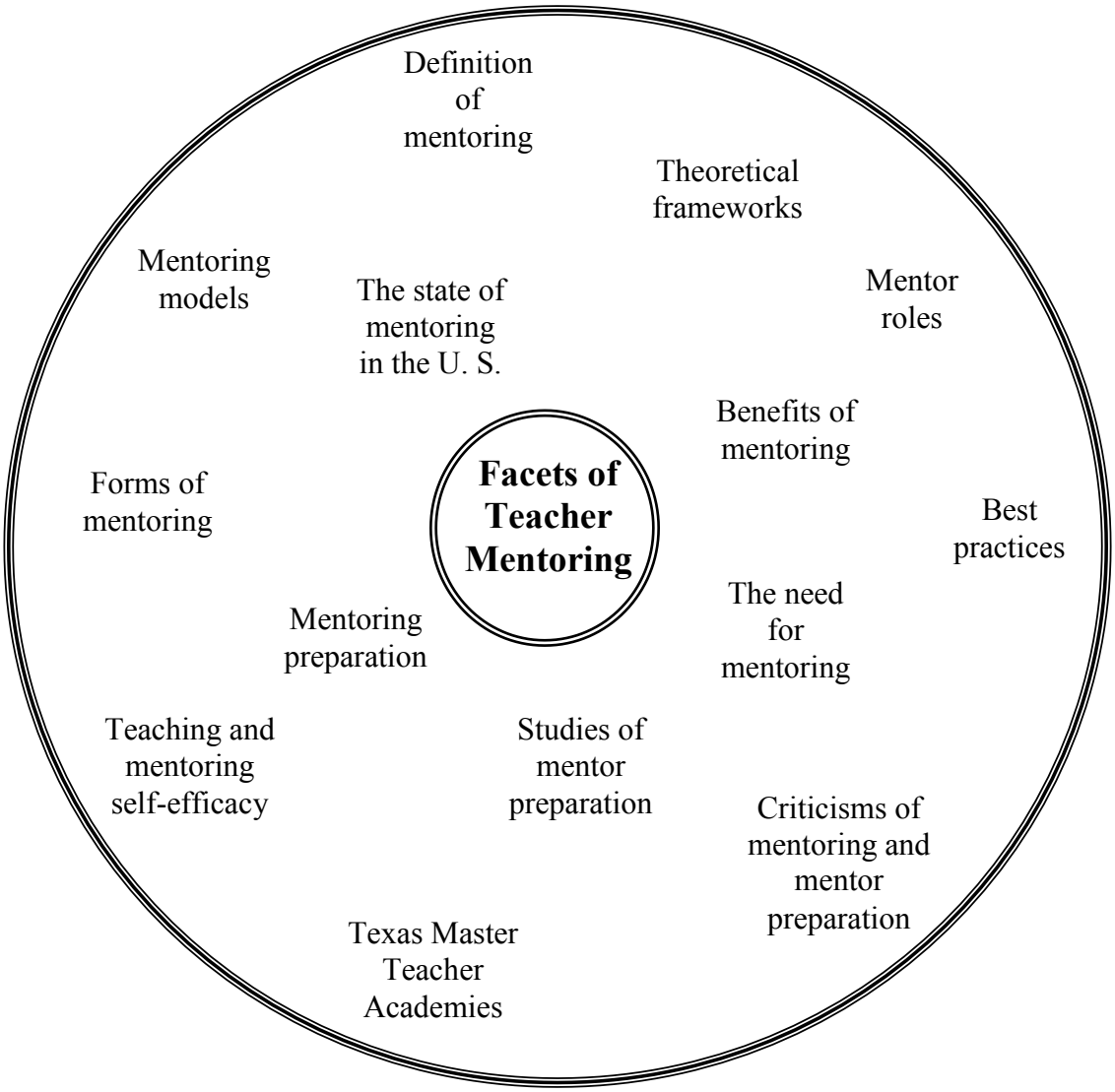

Figure 2.3 Facets of teacher mentoring from literature

important duality; it is both a relationship and a process" (p. 276). "In its most familiar form, mentoring involves pairing an experienced teacher with a novice teacher for the purpose of inducting the novice into the culture of the teaching profession" (Koballa et al., 2010, p. 1073). In Chapter 4, participants explain their expectations and perceptions of what a mentor does and what processes and relationships are included in mentoring according to their experiences as a mentor and/or mentee.

The State of Mentoring in the U.S.

Induction programs, which often include mentoring as the key component, have increased nation-wide in order to provide support to beginning teachers as they hone their teaching skills, and to encourage novices to remain in the classroom. Additionally, mentoring programs are "being used with the goals to improve teacher quality, meet national curriculum standards, and promote higher student achievement" (American Association of State Colleges and Universities, 2006).

Today, more than half the states mandate that new teachers participate in some form of induction or mentoring (Goldrick et al., 2012, p. iii). Of the states that require mentoring for new teachers, though, most mandate only the first year; while only eight states require two or three years (Education Week, 2014). While these states are moving in the right direction, Goldrick et al. caution that:

> Simply requiring that new teachers be assigned a mentor without regard to mentor or program quality will not accelerate new teacher development, reduce teacher attrition or significantly impact student learning. Too many states that mandate induction do so in the absence of key policy elements like dedicated funding, strong program standards or mentor selection and training requirements. (p. vi)

Ongoing mentor training and support has been determined crucial to mentor program success. Yet, of thirty-one states requiring mentor training, only 15 require mentor training plus ongoing mentor professional development; and state policies do not detail expectations for its content or delivery (Goldrick et al., 2012, p. 10-11). In the broad term "support" for new teachers, therefore, several things should be taken into account, such as the role of a mentor. In this study, I focus on the Texas reaction to the need for mentoring and investigate the perceptions of mentors and mentees who are an active part of this phenomenon.

Mentor Roles

Conceptualization of the roles of mentors is not commonly agreed upon by researchers or practitioners in the field (Stanulis, & Ames, 2009; Bierama, & Merriam, 2002). Hall, Draper, Smith, and Bullough (2008) sought to describe the perceptions mentor teachers hold of their roles and responsibilities as mentors. Their findings suggested that "not only did the mentors hold views of mentoring that were different from those held by teacher educators, but they held views of mentoring that were different from each others'" (p. 342). Researchers have "documented striking differences in the way mentor teachers conceived of and carried out their work [and] they linked these differences in mentor perspectives and practices to differences in role expectations, working conditions, program orientations, and mentor preparation" (Feiman-Nemser, 1996, p. 3). Thompson et al. have concluded that "mentoring needs to be located in the context of other support channels…with clear role and function definitions" (p. 313).

In some situations, mentors are placed in an evaluative role; while other mentors focus primarily on emotional support and acquainting the novice with the facilities available. Kajs (2002) articulates the importance of mentors and mentees exchanging ideas upfront regarding their roles and expectations. When both parties reach an understanding, there is a greater

likelihood for professional growth and satisfaction for both parties. The role of the mentor, therefore, is dependent upon the context, the needs of the novice teacher, and subject to particular program expectations. Participant 4 discusses this adaptive practice on page 114. Chapter 4 will expand upon the mentor and mentee participants' expectations of their roles as mentor or mentee, as well as the expectations they hold of each other.

The Need for Mentoring

Student education is negatively affected by high teacher turnover and unstable educational programs (Darling-Hammond, 2003). Over the past two decades, student enrollments, teacher retirement, and the demand for and hiring of teachers have increased; resulting in secondary schools reporting hiring difficulties in mathematics or science (Ingersoll & Perda, 2010). See Table 2.1 on page 18. "While the nation actually produces far more new teachers than it needs, some specific teaching fields do experience shortages [including] teachers of mathematics and physical science, two of the three subjects in which No Child Left Behind mandates student exams" (p. 4). So, two content areas with the highest levels of accountability also are the ones hardest to fill with highly qualified teachers.

Teacher shortages in mathematics and science are attributed to different factors. Increased enrollment has been particularly acute in regions of the country, such as the Southwest, that are experiencing elevated birthrates and immigration (Johnson, Berg, & Donaldson, 2005, p. 5). Fuller (2008) documented:

> A longtime shortage of math and science teachers in Texas is getting worse…[and even] worse for districts in need of science teachers, especially high school science, where districts are only able to fill 20 percent of their teaching vacancies with fully qualified

teachers. Thirty to 35 percent of teachers assigned to math and science classes are already teaching outside their field. (¶ 1)

Indeed, the state of Texas has experienced shortages in math and science fields every year since the 1993-1994 school year, as seen in Table 2.1 below.

Table 2.1 Texas Teacher Shortages in Math/ Science Fields Since the 1993-1994 School Year (U.S. Department Of Education Office of Postsecondary Education, 2013, pp. 123-124)

School Year	**Texas Math/ Science Field Shortages**
1993-1994	Mathematics (7-12) Science (7-12)
1994-1995 and 1995-1996	Mathematics (Middle/High School) Science (7-12) All Sciences
1996-1997	Earth Science Life Science Mathematics
1997-1998 through 2013-2014	Mathematics Science

Compounding the issues of teacher turnover and hard-to-fill positions, the nation is seeing an increase in less experienced teachers than in past decades. The proportion of teachers with five or fewer years' experience rose from 18 percent in 2005 to 26 percent in 2011 (National Center for Education Information p. 19). According to the Texas Education Agency, the percentage of mathematics and science teachers in the Texas public school system with zero to nine years of teaching experience each school year since 2007-2008 has been greater than fifty percent. Table 2.2 delineates the percentage of teachers at each increment within the 0-9 year span (Texas Education Agency, 2013).

Fortunately, researchers such as Athanases et al. (2008) and Wang (2008) have found that with careful mentoring, new teachers have more opportunities to develop effective teaching skills and can focus on individual and low-performing students early in their careers. There is

growing recognition that well-prepared and supported mentors can influence, shape, and challenge the practice of novice teachers in educative ways (Norman & Feiman-Nemser, 2005) and meet the needs of novice teachers for increased retention and quickened attainment of quality skills. Matching mathematics and science teachers, who are difficult to find in the first place, with a trained and qualified mentor could be a solution to breaking attrition patterns. For instance, the mathematics and science teacher participants (mentees) interviewed in this study actually attributed their choice to remain in the teaching profession partially to the support they received from their mentors (see pages 120 and 141).

Table 2.2 Teaching experience of mathematics and science teachers in the Texas public school system since school year 2007-2008 (Texas Education Agency website, April 2013)

	Percentage by Years of Experience										
Year	All 0-9	0	1	2	3	4	5	6	7	8	9
Mathematics											
2011-12	55.0	4.7	5.6	5.8	6.4	6.6	6.3	5.6	5.3	4.46	4.28
2010-11	57.3	6.5	6.3	6.7	7.0	6.8	5.8	5.5	4.4	4.31	3.98
2009-10	57.5	6.9	7.5	7.6	7.1	5.9	5.8	4.6	4.5	4.06	3.60
2008-09	57.1	7.8	7.9	7.4	6.3	6.1	5.0	4.9	4.4	3.84	3.63
2007-08	57.3	8.7	8.0	6.9	6.8	5.2	5.2	4.7	4.2	3.90	3.59
Science											
2011-12	55.8	4.7	5.8	5.9	6.6	6.9	6.4	5.6	5.3	4.47	4.23
2010-11	58.5	6.8	6.5	7.0	7.2	6.8	5.9	5.4	4.5	4.29	4.05
2009-10	58.9	7.3	8.1	8.1	7.1	5.9	5.8	4.5	4.4	4.14	3.49
2008-09	58.4	8.4	8.5	7.5	6.3	6.0	5.0	4.8	4.5	3.77	3.70
2007-08	58.9	9.4	8.5	7.1	6.7	5.3	5.2	4.8	4.2	3.99	3.72

Benefits of Mentoring

Mentoring programs "are an effective way of improving the skills of beginning teachers as well as increasing their retention rate" (Barrera et al., 2010, p. 72). LoCasale-Crouch et al. (2012) suggest that comprehensive induction for new teachers that includes regular meetings with a mentor and structured learning opportunities will support the development of the novice's skills and abilities more rapidly hence minimizing the time it takes to reach the level of more

experienced peers (p. 305). Hallam, Chou, Hite, and Hite (2012) identified several benefits of mentoring as well:

> When beginning teachers participate in mentoring programs, retention is substantially increased because they experience improved support, better working conditions, and increased job satisfaction (Brill & McCartney, 2008; Flesch, 2005; Guarino, Santibanez, Daley, & Brewer, 2004; Ingersoll, 2007; Ingersoll & Smith, 2004, Ingersoll & Strong, 2011). Increased teacher retention results in a more experienced faculty, which affects student performance (Fullan, 2006; Ingersoll & Strong, 2011). In addition, improved retention enables an organization to develop and implement effective induction and professional development programs and maintain quality collaboration and instructional programs necessary to sustain student learning (Darling-Hammond & Bransford, 2005; Guin, 2004; Ingersoll & Strong, 2011). (p. 246)

These findings are summarized and presented in Figure 2.4. "Quality mentoring should result in improved student learning, better mentee teaching skills and more effective teachers, as well as more and deeper mentee reflection" (Arnold, 2006, p. 119).

Moreover, participation in a mentoring program is valuable not only to the novice teacher, but the veteran teacher mentor as well, in that it positively affects teacher efficacy for both (Brennan, Thames, & Roberts, 1999). Teacher efficacy, defined as intellectual activity by which one forges one's beliefs about his or her ability to achieve a certain level of accomplishment (Bandura, 1977), has a direct link to the way students perform in the classroom (Dembo & Gibson, 1985; Woolfolk & Hoy, 1990). Mentoring has been found to benefit the mentor with expansion of knowledge, skills, and confidence levels (Mutchler, 2000; St. George, & Robinson, 2011).

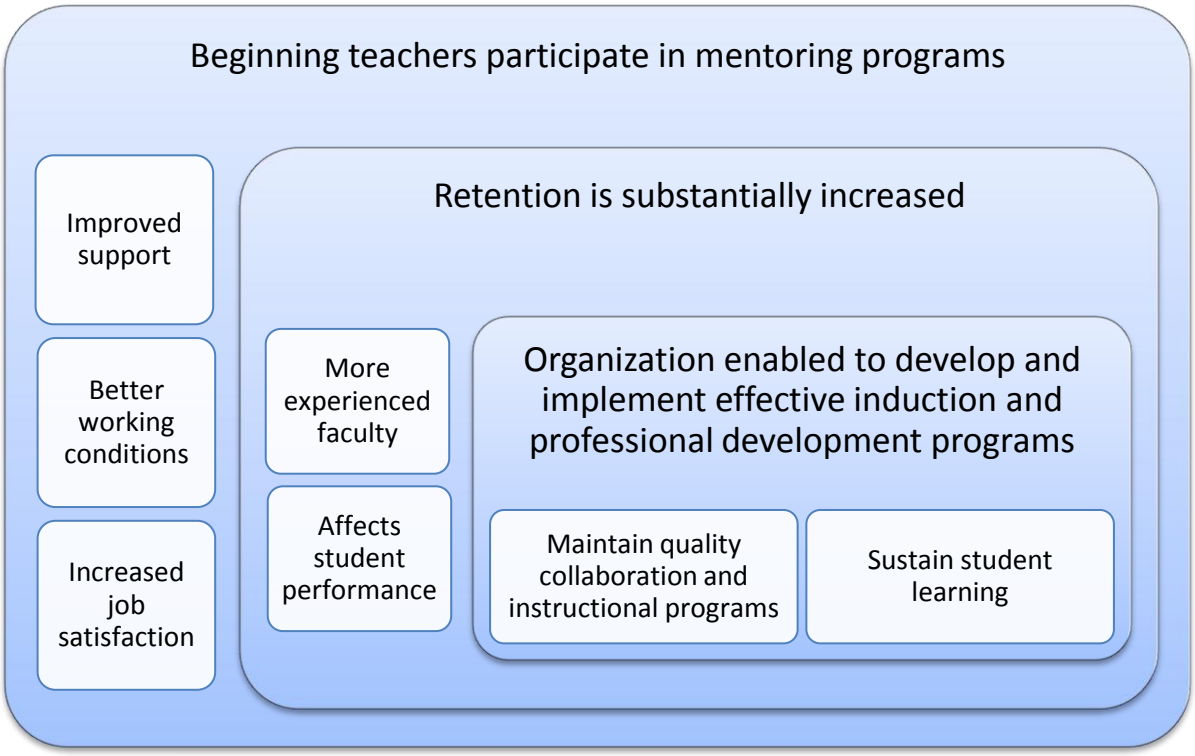

Figure 2.4 Benefits of beginning teacher mentoring. Source: Hallam, Chou, Hite, & Hite, 2012

Mentors discover leadership abilities within themselves, gain understanding and awareness of the competencies they are held to, and have a heightened interest in innovative practices. "Veterans need ongoing challenges to remain stimulated and excited about the profession. Many say that mentoring and coaching other teachers creates an incentive for them to remain in teaching as they learn from and share with their colleagues" (Darling-Hammond, 2003, p. 12). Mentors benefit from mentoring experiences by being more "aware of their own learning styles which results in being better able to formulate effective learning strategies. The more reflective and self-aware mentors become about teaching and learning, the more effective they become at supporting their mentees" (Fabian & Simpson, 2010, p. 120).

Theoretical Frameworks of Mentoring

Multiple theoretical underpinnings in mentor development have been identified in the literature. For example, the theory of reflective practice calls for mentors to reflect on their mentoring practice, while simultaneously fostering reflection in novice teachers they work with. This can be seen in mentoring practices of Participant 4 (p. 100). A critical-theory perspective of the preparation of mentors "disparages prescriptive and imposition, favouring [sic] ideologically grounded action, revealing hidden assumptions, and posing critical questions" (Athaneses et al., 2008, p. 748). Mentoring that addresses such issues would include mentors working as change agents, collaborating with new teachers toward the development of philosophies and actions of reform. The neo-Marxist perspective resists reproduction of inequalities in schools and would hold mentors also as change agents. This contrasts traditional transmission frameworks which utilize lectures and formulaic activities to teach mentoring in a routine, concise way.

More prevalent in the literature is mentoring framed as fundamentally grounded in social constructivism—"the idea that individuals make meaning of knowledge within a social context and as a result of interactions with others" (St. George, & Robinson, 2011, p. 28). Bandura (1977) provided this framework for mentoring as a social function with his social learning theory which provides a basis for how human behavior is learned. "Indeed, mentoring is a social function in embracing new members…and securing their success as they develop in their professional careers" (Irby, 2013, p.121).

In the social constructivist perspective, the goal is construction and reconstruction of contexts, knowledge, and meanings through discourse communities. The learner's role is to participate in a system of practices that are evolving; and knowledge is co-constructed (Green & Gredler, 2002, p. 55). In other words, "learning is not confined to the individual's mind

(Marshall, 1996). Instead, learning is viewed as distributed among the participants (Bredo, 1994)" of the community of practice (Green & Gredler, 2002, p. 57).

Drawing of the work of Rorty (1991) and von Glasersfeld (1989), I paraphrase Savery and Duffy's (1996) characterization of the constructivist philosophical view in three primary propositions:

1. **Understanding is in our interactions with the environment.** What we understand is a function of the content, the context, the activity of the learner, and, perhaps most importantly, the goals of the learner. Since understanding is an individual construction, we cannot share understandings, but rather we can test the degree to which our individual understandings are compatible. This implies that cognition is not just within the individual, but rather it is a part of the entire context, i.e., cognition is distributed.
2. **Cognitive conflict or puzzlement is the stimulus for learning and determines the organization and nature of what is learned.** In a learning environment, there is a stimulus or goal/purpose for the learner being there. The learner's goal is the stimulus for learning, and the primary factor in determining what the learner attends to, what prior experience the learner brings to bear in constructing an understanding, and what understanding is eventually constructed. In other words, the goal of the learner is central in considering what is learned.
3. **Knowledge evolves through social negotiation and through the evaluation of the viability of individual understandings.** The social environment is critical to the development of our individual understanding as well as to the development of the body of propositions we call knowledge. At the first, or individual level, other

> individuals are a primary mechanism for testing our understanding. Collaborative groups are important because we can test our own understanding and examine the understanding of others as a mechanism for enriching, interweaving, and expanding our understanding of particular issues or phenomena. Other people are the greatest source of alternative views to challenge our current ones and hence serve as the source that stimulates new learning. The role of the social environment also is to develop a set of propositions we call knowledge. All views, or constructions, are not equally viable. We seek viability and test understandings to determine how adequately they allow us to interpret and function in our world. (pp. 136-137)

These propositions can be applied to the teacher mentoring context of this study. Mentors were prepared in a social learning environment and participants described and highly valued the collaborative groups and social environment in which they constructed knowledge. As you will also see later, mentees in turn identified constructivist knowledge building and collaboration with their mentors as a strong support in their transition to the teaching profession. Social construction of knowledge is pivotal in mentor preparation and:

> The impact of the socialization process on individual perspectives and understandings has been well documented (e.g., Erickson, 1991; Sarason, 1981; Bandura, 1977; Lortie, 1975; Kuhn, 1970). Constructivist theory and socialization theory can be interpreted as being deeply embedded in…professional development models for teachers (Craven, 1998, p. 2) to include mentor preparation and mentoring of novice teachers.

Of the various theoretical frameworks applied to the study of mentoring, social

constructivism is one of the most prevalent. Learners (here, mentors and mentees) construct knowledge through interactions with their environment (collaboration between mentors and between mentees and mentors).

Forms of Mentoring

Mentoring has been described in various forms that offer a range of support to best suit the needs of the novice teacher. Some are more rigid, some more informal; and some are traditional while others are transformative. A synopsis of varied forms of teacher mentoring from the literature is included below.

Voluntary vs. Mandated Mentoring

Mullen (2011) differentiates mentoring as voluntary or mandated. Voluntary mentoring would offer a personal approach in a long-term professional relationship, is informal, and helps to develop the whole person. Mandated mentoring, on the other hand, "incorporates top-down, state-driven reform at the relationship level between veteran teachers and novice teachers" (p. 64). Mandated mentoring is formal, required (for both the mentee and the mentor), and driven by goals to instill systemic reform for improved achievement.

Educative Mentoring

Educative mentoring is a particular type of teacher support that focuses on the professional growth of novices through their work with experienced veterans and prioritizes reflection and continued growth (Feiman-Nemser, 2001). This support helps novices use their own practice as a site for learning as they work together with mentor teachers in cothinking relationships (Feiman-Nemser, 1998). Mentor support in educative mentoring aims to meet immediate needs of novice teachers while focusing on long-terms goals for growth (2005).

There exists a culture of equity in which mentors value the unique ideas of the beginner while developing with them shared visions of good teaching practice (2001).

E-mentoring

E-mentoring is a growing area of mentorship involving the use of electronic media to conduct correspondence between mentors and mentees. With the expanded use of social media in both personal and professional realms, e-mentoring is a venue of mentoring that deserves exploration. Thompson, Jeffries, & Topping (2010) define e-mentoring as "a relationship that is established between a more senior and/or experienced individual (mentor) and a lesser skilled or inexperienced individual (mentee or protégé), primarily using electronic communications, and is intended to develop and grow the skills, knowledge, confidence, and cultural understanding of the protégé to help him or her succeed" (p. 305). E-mentoring "provides learning, advising, encouraging, promoting, and modeling, that is often boundaryless, egalitarian, and qualitatively different than traditional face-to-face mentoring" (Bierama and Merriam, 2002, p. 214).

Tools and structures for supporting e-mentoring include email, telecommunications, discussion boards, blogs, listservs, websites, and social media (Columbaro, 2009). Although it lacks nonverbal components of face-to-face communications, there are a multitude of advantages to e-mentoring that still adhere to social constructivism. For example, social cues that may normally inhibit communication between individuals of diverse status are concealed. Participants may take their time in constructing replies, removing the pressure of immediate responses. "E-mentoring provides a strengthened pool of mentors in a specific area of expertise without the restraints of geographical boundaries" (Williams and Warren, 2007, p. 10). Bierema and Merriam (2002) add that e-mentoring offers a 'safe' context in which relationships may form

between diverse parties, providing the potential to "erode some of the traditional power dynamics that tend to structure mentoring relationships" (p. 220).

Mentoring Models

It is helpful in understanding the multiple facets of mentoring, to examine some of the diverse models found in the literature. Jones and Brown (2011) described several models including their own Complete Adaptive Systems (CAS) Mentoring model:

Traditional Model—transmission-based perspective of mentoring built around the mentor imparting knowledge, information, or support and the protégé at the receiving end. The difference in status and relationship between participants is hierarchal in nature and the flow of knowledge is downward from mentor to novice.

Reciprocal Model—emphasizes the collaborative nature of the mentoring relationship. The mentor is not perceived as the person holding the power. Instead power is shared as the mentor demonstrates a willingness to concede authority and the protégé to develop it (Harvey et al., 2009). Expertise, and therefore power relationships are unequal, but both have equity in the relationship; and both participants are understood to gain from the relationship.

Reverse mentoring—this type of mentorship occurs when the young and technologically adept mentor more senior colleagues.

Peer Mentoring—protégés are encouraged to use multiple mentors and take responsibility for their own learning (Mavrinac, 2005). Participants may utilize social networking as a tool in which protégés can seek developmental assistance from a set of people rather than one.

Complete Adaptive Systems (CAS) Mentoring—based on complexity thinking and systems theory and, thus, allows for complex, dynamic relationships within a perceived structure. CAS's key concepts include non-linearity, emergence, the edge of chaos, and unpredictability, offering a far more flexible and appropriate approach to mentoring. CAS stresses that adaptive quality of systems in the mentoring relationships are never fixed. This accounts for the school context in a much clearer and richer way- all systems are nested within other larger systems. (pp. 404-411)

Other mentoring models from the literature include:

Apprentice, Competency, and Reflective Models

Simmie and Moles (2011) examined different models of mentoring and devised their own productive mentoring framework. They looked at the apprenticeship model, characterized as one in which the mentor acts as a role model. In the competency model, the mentor is a systematic trainer and instructor of pre-defined competences. The reflective practitioner is a critical friend and co-inquirer; and the humanist incorporates personal, social, and emotional development. Considering the strengths and weaknesses of these models, and their desire to bring about positive change in education, Simmie and Moles formed the productive mentoring framework.

The productive mentoring framework considers "that space where critical thinking, caring, and professional agency achieve confluence together [and] that the work of any educator is always within the wider context of society with its social and political mores and needs" (p. 470). The productive mentoring framework was implemented in an academic study of mentors participating in a master's level qualification program. The results indicated that implementation of the productive mentoring model would require an all-encompassing team of teachers and administrators to discourse regularly on teaching, learning, and caring with an ongoing

connection to a broader social learning network, in order to overcome the barriers mentors experience in trying to change the mind-set and culture of their school contexts.

New Teacher Center (NTC) Induction Model, Santa Cruz, California; The Educational Testing Service's Pathwise Framework Induction Program; and Teachers for a New Era Project of the Carnegie Corporation of New York

The American Association of State Colleges and Universities (2006) highlighted three "promising" mentoring models. The central element of the NTC Induction Model is one-on-one mentoring by a carefully selected and highly-trained mentor. First and second year teachers participate, and mentors are released from teaching duties to work with novices. Other mentor duties include formative assessment and program evaluation. A network of support is in place for new teacher and mentors, with an expectation that teaching be collegial.

The Pathwise Framework Induction Program is a comprehensive mentoring program that supports beginning teachers, as well as mentors. Structured tasks are completed by novices with their mentors to hone their skills. There is an online communication component to enhance the mentoring experience.

Teachers for a New Era Project treats the teaching professional much like the medical field in that beginning teachers serve two years of residency. With the goal of improving practice, this time entails mentorship and supervision from a higher education institution to confer with, observe, and guide new teachers.

Texas Models of Mentoring:

Beginning Teacher Induction and Mentoring (BTIM)—competitively funded by the Texas legislature, The Beginning Teacher Induction and Mentoring (BTIM) program has three goals: (a) increase beginning teacher retention, (b) improve beginning teacher performance, and (c)

improve overall student achievement; with an additional aim to provide support and training to mentor teachers and administrators (ICF International, 2009, pp. 1-2). The BTIM program targeted school districts across the state with high rates of teacher attrition and beginning teachers, high rates of teaching outside the field of certification, or high rates of beginning teachers in shortage areas. Grantees of the BTIM program were required to implement programs that "utilized adult learning strategies and prepared the mentor to assist their beginning teacher in classroom management, instructional pedagogy, student achievement, and collecting and analyzing data" (p. 2). Requirements of mentor teachers included weekly meetings with their mentee, regular observation and assessment of mentees, provision of feedback and strategies for improvement, and planning with mentees. Campus administrators were expected to support mentors with regular meetings. Evaluation of BTIM found positive results in beginning teacher retention rates. Beginning teachers attributed their decision to remain in teaching, in part, to their experience with their mentor (ICF International, 2009).

Texas Beginning Educator Support System (TxBESS)

Another Texas-based model for mentoring new teachers was the Texas Beginning Educator Support System (TxBESS). TxBESS grouped twenty-two performance standards of teaching into four clusters: Planning for Learner-centered Instruction; A Classroom Environment That Promotes Equity, Excellence, and Learning; Instruction and Communication; and Professionalism. These performance standards were accompanied by the TxBESS Activity Profile (TAP) which "provides a structure for reflection in which mentors and other support team members guide beginning teachers to reflect on their own teaching practice" (Texas State Board of Educator Certification, 2005, p. 3). The TAP is a self-assessment that can be used by the

teacher and their mentor to prioritize needs for professional development. The Texas Education Agency is not currently funding TxBESS.

Diverse models of teacher mentoring span a broad spectrum of levels of support and ways of implementation. With such diversity, schools and districts might find a model that best suits their needs for novice teacher support. What still remains to be deeply explored and understood, however, is the detailed processes of preparing the mentor to conduct their role in these various models.

Studies of Mentoring Preparation

Of the studies regarding teacher mentoring discussed in the literature, most regard the impact of mentoring on the novice teacher. Some, however, do focus on the perspective of the mentor and his/her development. Here, a small sampling of these studies are discussed, starting with Athanases et al. (2008), who studied four action-research cases of new induction leaders attempting to develop curriculum for new mentors of novice teachers. Their results included three themes to inform mentor development: the need to adapt generic mentoring scaffolds to local contexts; the merits of grounding mentor curriculum in student learning; and the values of equipping mentors with inquiry skills to study ways to adapt mentor curriculum as needed (p. 745).

Athanases, Abrams, Jack, Johnson, Kwock, McCurdy, Riley, & Totaro (2008) have found that mentor preparation programs lack "well-conceptualized curricula to develop new mentors to guide teachers" (p. 745). In a qualitative study investigating mentor professional development, Gilles and Wilson (2004) utilized focus group interviews to gather data from twenty-five teachers participating in the University of Missouri Teaching Fellowship Program. They utilized constant comparative analysis methods and found five themes in regard to the

participants' perceptions of their mentor professional development: (1) new aspects of learning/ retooling; (2) expansion of their role beyond Fellow mentoring; (3) changes in their teaching worldview or understanding the 'big picture;' (4) insights regarding the process of mentoring; and (5) an understanding of the impact of the program on themselves (p. 92-93). These themes could be used to develop appropriate curricula for mentor teachers.

Hall, Draper, Smith, and Bullough (2008) conducted a mixed-methods study of 264 mentor teachers' perceptions of their roles and responsibilities and contrasted their understandings with a normative view of mentoring, commonly embraced by researchers. The end goal was to help university-based teacher education programs identify, select, and prepare mentor teachers who better support the university's vision of mentoring. Hence, the Mentoring Self-Efficacy Instrument (MSEI) was developed to measure six aspects of mentoring: general mentoring relationships, classroom teaching practices, quality feedback, mediation, impact, and school organization (p. 329). Their findings suggest lack of shared understanding between university teacher educators and public school teachers about the roles and responsibilities of mentoring. "Confusion about roles and responsibilities undermines efficacy. Therefore, the results…point toward a fundamental need to reconsider not only mentor selection processes, but especially the nature of the interaction that takes place among university faculty, experienced mentors, and pre-service teachers" (p. 343).

Hallam, Chou, Hite, and Hite (2012) conducted a three-year mixed-methods comparative study of mentoring models from two neighboring school districts. Data collection methods included surveys and interviews. Findings indicated that district coaches were not as effective in supporting beginning teachers as in-school mentors or collaborative teams.

Stanulis and Ames (2009) conducted an action research study of one mentor and her two mentees as part of a pilot induction program between a university and a school district. The partnership utilized an educative mentoring approach which provided "substantial and targeted preparation" (p. 28) to participating mentors. The mentor preparation included study groups and six days of professional development within a school year. A case study of one of the program participants shed light on the experiences of a teacher learning to mentor. The findings include the necessity of mentors to have their own "time to learn about, discuss, try out, and reflect upon how…conversations are put into practice" (Helman, 2006, p. 80; quoted in Stanulis, & Ames, 2009). Additionally, the authors concluded guiding the learning of colleagues involves strategies related to adult learning and interpersonal skills, situated within a variety of political, cultural, and historical contexts" (p. 30).

In the systematic evaluation of implementation and outcomes of the 2007-2008 BTIM program (see Figure 2.5), the research team created the BTIM Evaluation Logic Model. This model listed each key area in which data was collected and used to inform the evaluation. At the core of the BTIM model is the mentor-beginning teacher relationship. Mentor training is influenced by personal characteristics, as well as campus support. Mentor training and mentee characteristics influence the core relationship. The relationship and school support influences beginning teacher induction and subsequent experiences of an educator. Compiling all experiences affect the ultimate outcomes: teacher retention and student achievement (ICF International, 2009, p. 3). A mixed-methods study ensued to construct a comprehensive picture of the BTIM program.

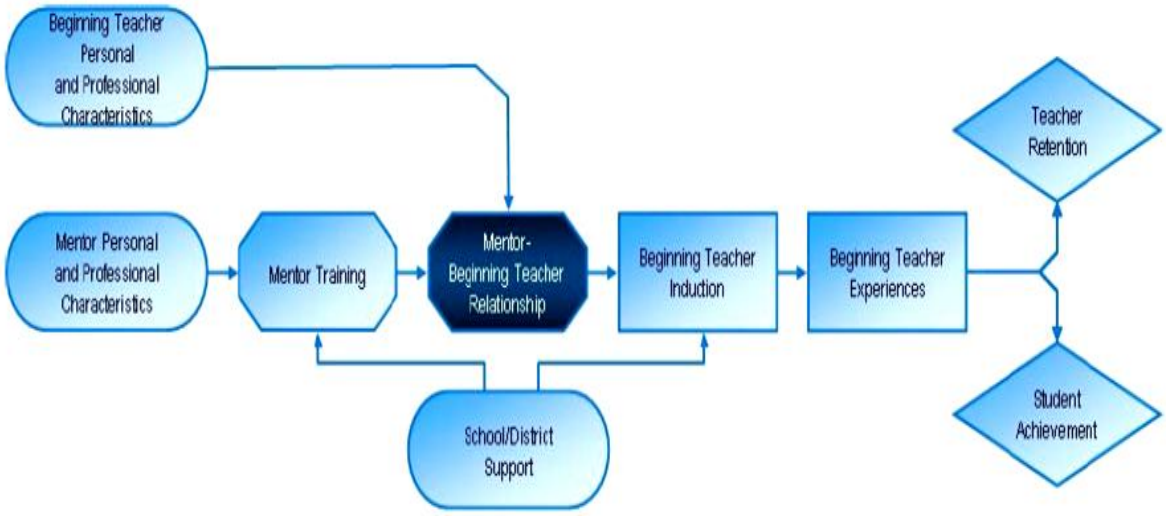

Figure 2.5 BTIM Evaluation Logic Model (ICF International, 2009, p.3)

Some teacher mentoring studies incorporated an administration of or construction of a specific instrument to gather data. A selection of such instruments follow.

Teacher Mentoring Assessment Instruments

Various assessment instruments provide empirical data from a variety of aspects of mentoring, such as the "Mentoring Skills Inventory to assess mentors' preparation; the Ideal Mentor Scale to study mentoring styles; the Mentoring Self-Efficacy Instrument in primary education, the Student Teacher Expectation Scale to determine the student-teachers' expectations of the role of the cooperating teacher; and the Mentor Teacher Role Inventory (MTRI) to investigate perceptions of student teachers regarding mentor roles" (Koc, 2011, pg. 194). These tools can offer valid and reliable data for program successes and weaknesses, allowing future program replication and targets for improvement.

Yet another study included the development of the Mentoring for Effective Primary Science Teaching (MEPST) instrument (Hudson, 2007), which focuses on five factors for

mentoring: personal attributes, system requirements, pedagogical knowledge, modelling [sic], and feedback. The instrument indicates the mentees' perception of existing mentoring practices and may aid in determining mentoring needs.

I contribute the findings of my study now to the literature and include the voices of mentors and mentees specific to mathematics and science fields in the context of the Master Teacher Academies. I share mentor participants' perceptions of factors that influenced their learning and mentoring efficacy beliefs. I also add to existing literature the details of a mature, well-established collaboration between a school district and university that has successfully implemented an effective mentoring program.

Criticisms of Mentoring and Mentor Preparation

This section reviews teacher mentoring research conducted through a critical lens, beginning with Simmie and Moles (2011) who argue that mentoring reproduces the cultural inequities present in education. They explain that mentors are expected to:

> Help beginners implement "best practice" and adopt the language and culture of the local site as quickly as possible. When mentoring is seen in this way it serves to reproduce rather than to reconsider curriculum, pedagogy, and the structural arrangements of schooling—arrangements in which inequities based on race, culture, and gender are deeply embedded. (pp. 183-184).

In a similar aspect, Bradbury (2010) cautions that "while providing emotional support and technical advice may be important components of a mentoring relationship, focusing on only that narrow view limits the possibility for widespread reform" (p. 1053). Carden (1990) "questions contemporary notions of mentoring, asking whether mentoring 'sanctions an elitist patron system

that…maintains a status quo based on accumulation of advantage and replication of exploitive hierarchical systems'" (p. 276; quoted in Hansman, 1998, p. 68).

Wang (2001) expresses parallel concerns in that mentoring encourages novices to replicate existing models of teaching instead of implementing more reform-based philosophies. This is illustrated in findings by Carter and Francis (2001). Novice teachers were observed following the teaching styles (even mimicking exact body language and vocabulary) and curriculum precisely as modeled by their mentors without ever questioning its effectiveness. The fear is, without active reflecting on their own teaching, it will lead to continued implementation of current routines and the stifling of professional growth.

Shulman's (1987) critique of highly generalized teaching principles stripped of considerations of subject matter, context, learners, and purposes beyond those easily tested can be applied to mentor preparatory curriculum. "What roles do subject, context, and learners play in curriculum that programmes [sic] use to develop mentors?...Mentor development without attention to deep subject matter means an implicit curriculum in which such issues are not central to mentoring work" (Athanases, 2008, p. 747).

A logistically positioned criticism of mentoring is the amount of time involved and dedicated to mentor/mentee relationships and interactions. Requirements of a significant amount of time are necessary to build relationships, collaborate, plan, and reflect in order to grow professionally (Forsbach-Rothman, 2007; Feiman-Nemser, 1996; Arnold, 2006). Teachers have worried that "a lot of mentor-mentee meetings were rushed and held between lessons in 'snatched time'" (Arnold, 2006, p. 121). "Stealing time" from a packed day may build resentment in a mentor relationship (121). Mentors also report requirements of their time to

develop skills and strategies to offer assistance to their mentees. In short, mentoring demands a commitment of time to be effective; and teachers may argue that this is time they do not have.

It is important to remain cognizant of criticisms present in the mentoring literature in order to make advances in mentor preparation and program development for professional growth. In developing agents of change, who move beyond reproduction of the status quo toward improvement for student and teachers, it is important to examine current mentoring practices with a critical eye.

Teaching and Mentoring Self-efficacy

Self-efficacy refers to "beliefs in one's capabilities to organize and execute the courses of action required to produce given attainments" (Bandura, 1997, p. 3). Bandura (1997) explains "weak efficacy beliefs are easily negated by disconfirming experiences, whereas people who have a tenacious belief in their capabilities will persevere in their efforts despite innumerable difficulties and obstacles. They are not easily overwhelmed by adversity" (p. 43).

When applied to teachers, the self-efficacy (or teacher efficacy) construct has been associated with teachers' instructional practices and attitudes toward students (Deemer & Minke, 1999, p. 3). Four factors found to be significantly associated with teacher self-efficacy are: receiving positive feedback on teaching performance, collaboration with others, parental involvement in the school, and school-wide coordination of student behavior (Tschannen-Moran, Hoy, & Hoy, 1998, p. 221). Teachers' efficacy beliefs are crucial because:

> Efficacy beliefs help determine how much effort people will expend on an activity, how long they will persevere when confronting obstacles, and how resilient they will prove in the face of adverse situations—the higher the sense of efficacy, the greater the effort, persistence, and resilience. Efficacy beliefs also influence individuals' thought patterns

> and emotional reactions. People with low self-efficacy may believe that things are tougher than they really are, a belief that fosters stress, depression, and a narrow vision of how best to solve a problem. High self-efficacy, on the other hand, helps to create feelings of serenity in approaching difficult tasks and activities. As a result of these influences, self-efficacy beliefs are strong determinants and predictors of the level of accomplishment that individuals finally attain (Pajares, 1996, pp. 544-545).

The impact of teacher efficacy has been studied in multiple contexts. For example, Gibson and Dembo have analyzed how teachers of high and low perceived efficacy manage their classroom activities:

> Teachers who have a high sense of instructional efficacy devote more classroom time to academics activities, provide students who encounter difficulties with the guidance they need to succeed, and praise their academic accomplishments. In contrast, teachers of low perceived efficacy spend more time on nonacademic pastimes, readily give up on students if they do not get quick results, and criticize them for their failures. Thus, teachers who believe strongly in their ability to promote learning create mastery experiences for their students, but those beset by self-doubts about their instructional efficacy construct classroom environments that are likely to undermine students' judgments of their abilities and their cognitive development. (Bandura, 1997, p. 241)

Smith and Huinker (2000) report "highly efficacious teachers have been found to be more likely to use inquiry and student-centered teaching strategies, while teachers with a low sense of efficacy are more likely to use teacher-directed strategies, such as lecture and reading from the text" (p. 195).

Novice teachers' decisions to remain in the profession are tied to their sense of classroom efficacy. Based on a longitudinal study of fifty new teachers in Massachusetts, Hohnson and Birkeland (2003) report that new teachers' sense of efficacy—the feeling that they were teaching students well—strongly affected their decisions to change schools or to exit the profession altogether. Induction has been posited as one way in which schools may help novices develop efficacy and thereby retain them in the classroom (Johnson, Berg, & Donaldson, 2005, p. 87).

Self-efficacy beliefs can affect one's behaviors. Since teachers' behaviors in the classroom have a direct effect on student learning and success; it is important to consider what influences and can alter a teacher's self-efficacy. Mentoring is one factor that is reported to have the possibility of influencing teaching efficacy and, therefore, calls for further examination. This study looked at the perceived efficacy of teachers in the classroom and different components of teaching efficacy are discussed in Chapter 4.

Best Practices in Teacher Mentoring

As states increase mentoring and induction programs to support novice teachers, it would be wise to be aware of the practices found in the literature that have positive impact and results in order to benefit teacher development. This section contains a summary of best practices to guide mentoring efforts.

ICF International (2008) proposes four actions for beginning teacher mentoring programs to "not only keep teachers in the classroom, but also increase student achievement and reduce school costs" (p. 2). Best practices suggestions are:

1. Create a school culture and community that supports the new teacher mentoring and induction program. Implement and fully communicate program policies and procedures. 2. Utilize suggested elements of successful beginning teacher induction

> and mentoring programs. Use grade and subject as key matching criteria between mentors and beginning teachers. Remove within-school constraints and logistical barriers. 3. Increase opportunities for national-sponsored induction and mentoring programs by using federal funds to support state-level programs. 4. Engage in outcome research to understand the effects of induction and mentoring, such as increased teacher retention or improved student outcomes. (pp. 2-4)

Flynn and Nolan (2008) found that the following school-based programmatic components and processes matter in mentoring programs:

> (a) mentor selection and matching- careful consideration of certifications and building assignment, skills, and qualities; (b) campus principals and coordinators charged with fostering mentor/mentee relationships by ensuring scheduled time to meet and plan, and to observe one another; (c) training and support for mentors and mentees- mentees have fewer preparations, do not get the most difficult classes, and are free from non-instructional duties their first semester; (d) annual orientation for principals in regard to the key role they play in the success of mentors and new teachers; and (e) external evaluation by local university for modification and improvement. (pp. 174-175)

Barrera et al. (2010) studied mentors' responses pertaining to how their school was supportive of their efforts. Mentors reported being given time to evaluate their mentees by spending time observing their teaching and giving feedback. Mentors' schedules were arranged to have the same planning time as their new teacher. Other forms of support came from having matching teaching assignments between mentor and mentee, and time to visit with their new

teacher. Suggestions for strengthening the program included giving mentors clear guidelines, training, and expectations for the program. Mentors felt that administrators should meet regularly with mentors and mentees to discuss concerns and check for progress.

Mentors participating in the Mentoring in Education program (Beutel & Spooner-Lane, 2010) perceived the most valuable aspect of the program to be reflection on relationships with their mentees, as well as with other colleagues. These participants, through critical reflection, determined they would make a greater effort to build stronger relationship with colleagues. In the next section, more detailed information on the preparation of mentors will be presented.

Teacher Mentor Preparation

The need for teacher mentoring is not a novel concept. In fact, an historical note that included the importance of teacher mentor support came in 1960 from educational psychologist Bruner:

> There are certain measures that must be taken to improve the quality of teachers, steps that have been proposed many times…Better recruitment and the possibility of better selection, better substantive education in teacher training institutions, *on-the-job training of younger teachers by more experienced ones* [emphasis added], in-service and summer institutes…improvement of teachers' salaries—all of these must obviously be pursued as objectives…[This] will depend upon the degree to which we in America are serious about educational reform and the degree to which efforts are made to improve not only the facilities and salaries available to teachers but the support they can count on. (p. 89)

We must continue to increase efforts of teacher quality, including teacher mentoring and, therefore, mentor development. Yet, it is crucial to remember that:

> While mentoring enhances the capacities of beginning teachers the presence of a mentor alone is not sufficient. The success of mentoring relationships lies in the skills and knowledge of mentors. While mentors must have an intimate knowledge and understanding of teaching and teaching practices, mentoring is different to classroom teaching and requires a new set of skills. (Beutel & Spooner-Lane, 2009, p. 351-352)

Mentors need preparation for their roles and responsibilities. Without preparation and training, mentors could easily fall into a comfortable relationship with their mentee; more of a friend than one who helps the teacher to grow professionally (Holloway, 2003). Furthermore, it is more likely that mentors will be effective in their roles when they have undertaken a mentoring preparation programme [sic] appropriate to their workplace context (Hobson et al., 2009).

Carver and Katz (2004) insist that particular aspects should be a part of mentor development including: a repertoire of clear and usable mentoring strategies; training to assess teacher performance, then design and implement appropriate intervention with honest and direct feedback; and training of how to meet these expectations while maintaining a trusting relationship with the mentee (p. 460). Similarly, Wang, Odell, and Schwille (2008) explain mentors are not likely to have experience in sharing their thinking with colleagues and will need to learn approaches to facilitating communication. Yet, few teachers receive formalized training that prepares them for the role of new teacher mentor. The remainder of this section reports what the literature says should be present in mentor preparation and aspects of preparation for consideration.

Reflection and educative mentoring

Mentors require time to process content, reflect, and internalize new learning from role-play, problem-solving, and case study. Fabian and Simpson (2010) confirm that "the more reflective and self-aware the mentors [are] about teaching and learning, the more effective they [are] at supporting their mentees" (p. 120). Couse and Russo (2006) also advocate for reflection in the development of mentors. Learning is "grounded in reflection" and, therefore, "through reflection we become better teachers" (p. 45). Mentors must encourage novice teachers to practice reflective thinking as well (Jones & Straker, 2006).

Accompanying reflection, Bradbury (2010) explored thinking with others through educative mentoring in the context of promoting reform-based science teaching through mentoring relationships. Bradbury concluded that "mentors often have little practice in sharing their thinking with others…and will need to learn approaches to facilitate communication" (p. 1061). Mentors need models such as video clips to practice analytic conversations with teachers. Professional development for mentors should incorporate articulation of their roles, identification of belief systems in teaching, and studies of how adults learn.

Feiman-Nemser (1996) contends that most mentoring programs provide common topics such as "clinical supervision, research on effective teaching, beginning teacher concerns, and theories of adult learning. Less common but no less important are opportunities for mentors to analyze their own beliefs about learning to teach and to articulate their practical knowledge of teaching" (p. 4). With educative mentoring, mentors help novices learn to teach and develop the skills and dispositions to continue learning in and from their practice (Feiman-Nemser, 1998, p. 66). Exercises in which the mentor thinks aloud for the mentee makes visible and explicit what

is normally invisible and implicit; so that knowledge is shared as well as ways of thinking and the process of inquiry (p. 69).

Adult learning

Much of the literature makes little of an important fact, that mentoring is a matter of adult learning and that helping adults learn complex tasks in often-times threatening conditions presents unique challenges, particularly of unlearning old habits and remaking established beliefs (Bullough, 2012, p. 70). New learning may take place for the adult learner through targeted activities.

Activities

According to Stanulis and Ames (2009), when mentors are actively engaged in activities for professional growth, they incorporate ideas from their readings and research into practice. They also are more apt to reflect upon their experiences. Athanases et al. (2008) also advocate for activities in mentor development. Examples of activities could be lectures from experts; practice exercises in class observations, collaborative lesson planning, analysis of student work. Role-playing conversations between mentor and mentee could be another example in preparing mentors.

Connecticut's Beginning Educator Support and Training (BEST) program includes mentor development activities such as "exploring new teacher case studies with documents such as lesson plans and student work; enhancing skills to coach novices in reflecting on evidence of student learning and needed instructional modifications; and engaging in collegial conversations and problem-solving with other mentors" (Athanases et al., 2008, p. 747).

Other examples include The Mentoring in Education program (Beutel & Spooner-Lane, 2009) that incorporates learning activities such as case studies, role play, examinations of

teaching videos, and collaborative group discussions. The activities are designed to encourage reflection and interpretation of research in mentors' professional context. Bradbury (2010) calls for "reading and writing cases with subsequent discussion" to be incorporated in mentor training to allow for "shared discourse of the practice of mentoring" (p. 1063). Gordon and Brobeck (2010) suggest the activity of recording conferences between mentors and mentees to be reviewed afterward with a mentor coach to identify and resolve discrepancies between mentor beliefs (their platform) and behaviors.

Domains of mentor knowledge

Jones and Straker(2006) found that Shulman's (1987) framework of teacher knowledge applied to their research of mentor development. Shulman's four domains of teacher knowledge include content knowledge, pedagogical knowledge, pedagogical content knowledge, and context knowledge. An adaptation to this model was created with the incorporation of a holistic approach in considering the social, cultural, and political contexts in which education is embedded (p. 180). Figure 2.6 displays a recreation of the domains of mentor knowledge from Jones and Straker (2006). The mentor knowledge framework serves as the foundation to guide the design of training to develop mentors' knowledge and critical understanding of theoretical constructs of mentoring in addition to the general principle of effective practice.

MODEL OF MENTOR KNOWLEDGE

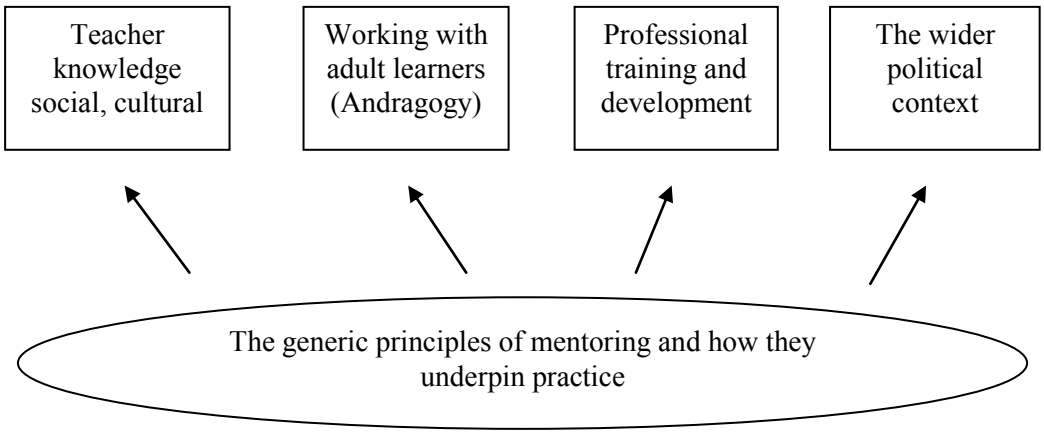

Figure 2.6 The five domains of mentor knowledge. (Jones & Straker, 2006, p. 180)

Ganser (1996) presented a different knowledge base that mentors should have in order to be effective. Mentors should:

> (1) be familiar with stages of teacher development and the predictable concerns of new teachers; (2) understand the basic characteristics of teaching as a complicated job conducted in a complex setting; (3) understand the various stages in teaching careers to move teachers beyond "surviving" to "thriving"; (4) understand the principles and practices of adult development and adult learning; (5) have familiarity with teacher preparation to have insight into why beginning teachers think and act the way they do; and (6) mentors should be familiar with and open to innovative approaches to curriculum design and teaching which beginning teachers are eager to implement in their work. (p. 9)

Related to mentor knowledge base, Achinstein and Athanases (2005) are concerned that programs that recruit expert teachers but do not support their mentor development in the area of pedagogical learner knowledge for students and adults, will leave mentors ill-equipped to focus novices on diverse learners' needs. They propose a bi-level knowledge base for mentor

development that assumes a "bifocal perspective" on teachers and students (p. 856). In this framework, mentors target teachers and students in their strategies of support in four knowledge domains: pedagogy, contexts, learners, and self. This structure, along with support from the school and district can foster new teachers' focus on equity in the classroom.

Subject-specific teacher mentor development

Recent works have emphasized the importance of discipline specific mentoring to the ultimate success of the novice teacher (Koballa, Bradbury, & Dias, 2010). Research findings highlight, for example, the unique needs of science teachers to include planning and facilitation of laboratories and inquiry-based learning experiences for students. Mentors need to be "hands-on with science lessons and units that are exemplars of reform-based science teaching" (Bradbury, 2010, p. 1063).

Collaboration

Ulvik and Sunde (2013) found that mentors value collaboration and being part of a mentoring community (p. 764). Mentors given the opportunity to collaborate with other mentors are provided with a community of practice with which to co-create new knowledge, reflect upon their practice, share ideas and experiences in order to deepen understandings, and grow professionally. Collaboration is also an important aspect of working with a novice teacher.

Granott (1993) draws on theories of Vygotsky and Piaget to categorize diverse patterns of interactions in the co-construction of knowledge by the degree of collaboration and relative expertise. Nine levels of interaction are set on a continuum that ranges from low to high collaboration; and from symmetric to asymmetric expertise between mentor and mentee: *mutual collaboration*—highly collaborative interaction between peers of equal expertise; *symmetric counterpoint*—peers of equal expertise interact while alternating dominance on an activity;

parallel activity—peers of symmetric expertise engage in an activity that is mostly independent with some degree of exchange that nourishes and stimulates one another's activity; *asymmetric collaboration*—collaborative interaction between peers of some asymmetric expertise where the degree to which participants take part in an activity is consistently unbalanced; *asymmetric counterpoint*—moderate collaborative interaction among peers of some asymmetric expertise where partners share feedback within a common situation but construct their understanding independently; *swift imitation*—interaction among peers of moderate asymmetric expertise, engaged in an activity that is mostly independent (noncollaborative) interspersed with short periods of imitation of a more capable peer with or without verbal exchange; *scaffolding*—a guiding collaborative interaction between partners with asymmetric knowledge and expertise; *guidance or apprenticeship*—interactions among participants with asymmetric expertise, characterized by periods of guidance interspersed throughout an activity or discussion; and *imitation*—interaction among partners of asymmetric expertise that is mainly noncollaborative with limited interaction and the less experienced partner imitates the more experienced (pp. 188-194).

The level at which a mentor collaborates with their novice teacher would be affected by several factors. Having awareness, however, of the levels of interaction and collaboration, and the flexibility to shift from one level to another would assist the mentor in meeting their mentee's needs. Acknowledging the traditional and more transformative levels of collaboration would also empower mentors to advance their practice, and that of their mentee's, in concert with desired reform goals.

The following excerpt serves as a suitable conclusion for this section on mentor development:

> Mentoring professional development must be a priority for education departments. Investing in teachers' professional development to become well-informed mentors can build system capacity on two fronts, namely: mentors can more effectively educate their mentees, and mentors can build their pedagogical knowledge by engaging with their mentees…mentors who do not have knowledge about current mentoring practices may be limiting their mentees' opportunities to succeed in the classroom. (Hudson, 2013, p. 781)

Texas Master Teacher Academies

The Texas Higher Education Coordinating Board (THECB) established fourteen Mathematics, Science and Technology Teacher Preparation (MSTTP) academies across the state of Texas to increase mathematics and science teacher quality. The purpose of these academies was to prepare more highly qualified mathematics and science teachers, as well as to improve the quality of certified teachers. Additionally, the program was created to increase the percentage of students who are college-ready in mathematics and science in the long term (Brown et al., 2012, p. 656). The various MSTTP academies focused on initial certification, Master Teacher certification, master's degree program, early childhood, or a combination of these. Subject foci of the academies included Mathematics and Science, Mathematics and Science with Integration of Technology, or Mathematics (p. 662).

Academy participants were either currently teaching in math or science classrooms for a high-need school district with at least two years of experience, or were enrolled in a teacher preparation program with an emphasis in STEM-related fields (Brown et al., 2012, p. 661). Participation in this program came with an agreement to teach in a Texas high-need public school district for at least two years upon completion of the program. Financial incentives were available to participants for tuition, textbooks, and in some cases, stipend pay.

Ratings were given to each academy in regard to the overall THECB goal implementation. Five academies received a high rating (including Academy K—more on this later), three were rated moderate, and six were rated as low. Evaluation in relation to effective professional development concluded that only one Academy (Academy K) demonstrated collective participation and coherence (Brown et al., 2012). Specifically, Academy K:

> Chose to establish a strong partnership with a local independent school district to promote collective participation. The local independent school district has a large cohort (n=33) of inservice teachers enrolled in the academy and provided funding for 20 of the participants. As a result of this partnership, the academy worked with the school district to ensure the curriculum met the needs of the school district and was aligned with its goals. The teachers from this district were able to work together with the knowledge that the school district fully supported their efforts. (p. 673)

This university-school district relationship instilled a sense of value to the teacher participants. Furthermore, Academy K was found to have greater motivation for participants through the integration of technology. Academy K is the academy of focus for the current study.

Conclusion

A review of the literature defends the value in effective mentoring programs. Not only can mentoring address areas such as teacher retention and student achievement by fostering professional growth of the novices in the teaching force, but can also provide a constructivist framework in which educators interact and collaborate to construct knowledge and understanding through social negotiation and evaluation of the viability of individual understandings (Savery & Duffy, 1996). Yet, not all mentoring programs are created equal, and it is important to consider findings from research in order to guide the design and

implementation of mentoring programs. Evaluation instruments and various studies (quantitative, qualitative, and mixed-methodologies) provide deep connections to best practices and theoretical frameworks that can facilitate successful mentor program plans. Criticisms that should be reflected upon in future mentor efforts were stated. Finally, the relationship between mentoring and self-efficacy were annunciated, as well as discourse in the literature in regard to mentor preparation.

What is still under-researched, however, are the specific components that make up a quality mentor preparation program; and more specifically a program designed for STEM teachers, from the perception of the mentors. What are the self-efficacy elements of such a program? What is the impact on the self-efficacy of novice teachers? What are the forms and elements of interactions between these mentors and their novices? Furthermore, what are the findings of such research in the context of underrepresented minority teachers in the context of a Southwest bordertown school district with more than 93% Hispanic students? The following research attempts to contribute these perceptions and voices to the current literature.

Chapter 3: Methodology

Purpose and Introduction

The purpose of this qualitative study was to explore and understand the perceptions of STEM (science, technology, engineering, and mathematics) Master Teachers' mentoring professional development in the context of the Master Teacher Academies program situated at a large Southwestern university located on the Texas-Mexico border. Additionally, I examined the reported mentoring and teaching self-efficacy of STEM Master Teachers (mentors), as well as teaching self-efficacy of the novice teachers (mentees) they have mentored. Another purpose of the study was to investigate the forms and elements of interactions between the STEM Master Teacher mentors and their mentees. Specifically, this study sought to answer three guiding research questions:

1. What are the teaching and mentoring self-efficacy elements of Texas certified Master Teacher mentors created under an approved Texas program?

2. What are the impacts on teaching self-efficacy of novice teachers mentored by Texas certified Master Teacher mentors created under an approved Texas program?

3. What are the forms and elements of interactions between Texas certified Master Teacher mentors created under an approved Texas program and their novice teacher mentees?

The preceding review of literature supports mentoring as an invaluable resource in the development of novice teachers which ultimately enhances student learning and achievement. Previous studies conducted to better understand the professional growth of teachers who mentor

novices have neglected to focus on STEM areas in particular. Additionally, prior studies have not concentrated in bordertown contexts, such as the Texas-Mexico border. This study incorporated both aforementioned contexts and will add to the current literature by representing the perceptions and voices of this population.

In this chapter, I identify the research design utilized in the study, sampling procedures and data sources, and data analysis strategies. Included as well, are my ethical protocol, my perspectives and positionality as researcher in this study, and identification of limitations.

Research Design

In conducting this study, I sought to gain insights and understanding of the personal experiences and perceptions of the sample, STEM Master Teacher mentors and their mentees; in regard to teacher mentor development, teaching self-efficacy, and interactions within the mentoring phenomenon. It was most appropriate, therefore, to conduct a qualitative study utilizing a grounded theory design. Qualitative research involves the study of people in their "natural settings, attempting to make sense of, or interpret, phenomena in terms of the meaning people bring to them" (Denzin and Lincoln, 1994, pg. 2). Grounded theory is an iterative process in which theory is developed from data "grounded" in narrative data, which has been systematically gathered and inductively analyzed to develop increasingly richer concepts and models of how the phenomenon being studied works (Teddlie and Tashakkori, 2009; Hammersley and Atkinson, 2007; Ryan and Bernard, 2000). The data obtained in this qualitative study consisted primarily of in-depth interviews and document review including STEBI and MTEBI surveys, records from the Master Teacher Academies, academic transcripts, and various pertinent resources from the Texas Education Agency.

Sampling Procedures and Data Sources

The sample for this study was purposively selected to reflect the make-up of the mentors who serve in the city's local school districts. Purposive sampling "means that units …are selected because of their characteristics relative to the phenomenon under study, rather than being selected randomly" (Wiersma, 1995, p. 214). In this way, as Teddlie and Tashakkori (2009) suggest, the study solicits rich detail from deeply studied cases of participants that are information rich. Longitudinal data collected by Desert State University (pseudonym) since the initial 2004 cohort of the Master Teacher Academies (MTA) program was examined in order to apply purposive sampling. At the time of this study, there were forty-two completers of the MTA program at Desert State University; who each teach in one of several localized public school districts. From all districts represented, MTA participants who teach for Borderland Independent School District (pseudonym) were purposively chosen. The majority of the all participants of the Master Teacher Academies program (completed, in progress, or enrolled but dropped) at Desert State University were employed by Borderland ISD (sixty percent at the time of the study). Borderland ISD has historically worked very collaboratively with Desert State University. The school district encourages their teachers to seek professional development in programs such as the MTA program, and even offers financial support and incentives to their teacher participants. Consequently, the purposive research sample of teachers from Borderland ISD was derived from the majority population of MTA participants, and had a strong dimension of professional support from their employing district. With the growing movement across the nation to explore the roles of mentors and Master Teachers—particularly STEM Master Teachers, I chose to take advantage the mature and well established program at Borderland ISD, a highly minority populated district. This provides an opportunity for other researchers to extend

my findings into other regions and situations where Master Teachers may be expected to play a role.

Of all forty-two completers of the Master Teacher Academies program at Desert State University, twelve met the criteria of: (1) having successfully passed the Texas Master Teacher Exam (TExMaT) for their particular subject and grade span (Mathematics or Science; either 4- 8, or 8-12), and (2) teaching for Borderland ISD. Of these twelve Texas certified STEM Master Teachers, five participated in the study (42%). Of those not participating, one stated she might participate but did not correspond after that; one stated she was not interested; four never responded to any contacts made via email, mailings, or phone calls; and one has a disconnected phone number and did not respond to emails or mailings.

To obtain a sample of novice teachers (mentees) for interviews, each STEM Master Teacher mentor was asked during their interviews to share the name(s) and campus of any mentee they have mentored after receiving certification as a Master Teacher. This process, referred to as snowball sampling (Berg, 2009), involves the use of informants or participants (in this case, mentors) to identify additional cases who may be included in the study (in this case, mentees) (Patton, 2002). There were four mentors who, at the time of the study, had a mentee they were working with. Three of the identified mentees participated in the study, while one never responded to emails or mailings. Two of the participating mentees teach math and one teaches science. All participants in this study but one are Hispanic, a demographic that closely mirrors that of the school district in which they all teach. According to the district website, Borderland ISD's teaching force is made up of 80.7% Hispanic; 16.3% White; and 1.7% African American professionals.

Two types of data were collected in this study: in-depth interviews and documents. Documents analyzed included STEBI and MTEBI surveys, records from the Master Teacher Academies, academic transcripts, and various pertinent resources from the Texas Education Agency.

Interviews

In conducting interviews, I wanted to investigate and gain an understanding of the STEM Master Teacher mentors' perceptions of their professional development from the Master Teacher Academies program at Desert State University. I found the interview questions used by Gilles and Wilson (2007) in their study at the University of Missouri to be particularly useful in targeting the themes of interest. Although my study differed in scope, (i.e. regional setting, participant demographics, characteristics of the mentor development program, and incorporation of the mentee perspective) I modified their questions and incorporated them into my interviews.

Novice teachers (mentees) were asked a series of questions that mirrored those of the mentors', but were changed slightly to match their role. The mentee perspective served to further understand mentor and mentee roles and to triangulate the data obtained from mentor interviews. Triangulation can be defined as "the checking of inferences drawn from one set of data sources by collecting data from others" (Hammersley and Atkinson, 2007, p. 183). Involving the use of different sources of information (mentors *and* mentees) increases the validity of a study (Patton, 2002).

Table 3.1 lists the initial guiding interview questions each participant was asked. Although qualitative researchers may not usually "decide beforehand the exact questions they want to ask", I found these guiding interview questions served as a list of issues to be covered (Hammersley & Atkinson, 2007, p. 117). Additional follow-up questions were interjected to

probe more deeply and elicit further explanation from participants, such as "Can you tell me a little bit more about…?"; "Can you give some examples of how those two experiences were different?" and "Can you think of a specific example of how you grew professionally?" These questions were beneficial in revealing perceptions of teachers' mentor/mentee experiences and their perceived self-efficacy, as well as the interactions between those in the role of mentor and in the role of mentee. Since "there is a sense in which all interviews, like any other kind of social interaction, are structured by both researcher and informant" (p. 117); probing questions differed by interview.

Table 3.1 Guiding interview questions asked of STEM Master Teacher mentors and their mentees.

Master Teacher Mentor Interview Questions	Mentee Interview Questions
How would you describe your mentoring preparation experience?	How would you describe your mentoring experience?
What, if any, professional development has been afforded to you through the Master Teacher Academies?	What, if any, professional development has been afforded to you through your mentoring program?
What, if any, personal development has been afforded to you in the Master Teacher Academies?	What, if any, personal development has been afforded to you in your mentoring program?
What are the barriers to your development?	What are the barriers to your development?
What do you expect will be your next professional position?	What do you expect will be your next professional position?
Prior to this interview, you completed a survey about your teaching efficacy beliefs. What comments or ideas would you like to share in relation to those survey items?	Prior to this interview, you completed a survey about your teaching efficacy beliefs. What comments or ideas would you like to share in relation to those survey items?

I interviewed each mentor and mentee one-on-one. I attempted to make the interviews informal in a conversational format by slowly introducing new elements to assist informants to respond as informants (Spradley, 1979). Serving as moderator, I strove to ensure a safe environment, invited conversation, and moved participants from general to specific with comments and questions (Berg, 1989). Mentors and mentees were free to discuss the questions, extend them, and share (Bogdan & Biklen, 1998). Each interview session was digitally recorded and interview transcription began immediately following each interview.

Interviews were held at a time that was most convenient to the participants and their schedule. Likewise, interviews were held in a location of each participants' choosing to help ensure the participant felt comfortable in sharing, and that the setting offered an appropriate level of privacy. Four interviewees chose to meet with me in their classrooms during their designated conference period. These arrangements required no travel on the part of the teachers, but I feared there may be a level of distraction or hesitancy to share openly due to the environment. I was pleased that only one minor interruption occurred and that participants spoke openly with me. I met two participants in a meeting room of a public library—a quiet locale, conducive to the interviews other than one brief interruption by an employee. For one participant, this location was scheduled with the intent of the interview being a focus-group (described later in this chapter). She was very interested in participating in my study and excitedly shared her experiences with me. The other interviewee chose to meet at the library after not being able to attend the same scheduled focus group. This participant was a bit reserved in dialogue to start, but opened up with time. Another interview was conducted by phone due to a scheduled business trip. I found the serenity of my SUV, parked in a McDonald's parking lot to be quite adequate. Although I was not able to meet this participant in person, the participant's

conversation was energetic and full of emotion. A lively Starbucks served as the venue for another interview. I was concerned this site would be too distracting and the audio-recording would not pick up the participant's voice clearly. Surprisingly, this session was the longest and the participant had no problem staying focused on the interview and sharing experiences in great depth and detail.

Documents Reviewed

Hammersley and Atkinson (2007) support the incorporation of document review in qualitative research, "Documents can provide information about the settings being studied, or about their wider contexts, and particularly about key figures or organizations. Sometimes this information will be of a kind that is not available from other sources" (p. 122). To collect data for participants' perceived teaching efficacy, for example, each mentor and mentee participant completed a teaching self-efficacy survey. There were two versions of the survey, the Science Teaching Efficacy Belief Instrument (STEBI) (Riggs and Enochs, 1990) for the participants who teach science; and the Mathematics Teaching Efficacy Belief Instrument (MTEBI) (Enochs, Smith, & Huinker, 2000) for those who teach math. Refer to Appendix B and Appendix C for the STEBI and MTEBI surveys.

STEBI and MTEBI Likert-scale surveys ask participants to respond to items addressing specific components of teaching efficacy (e.g. effective instruction, content knowledge, pedagogical knowledge) and outcome expectancy (e.g. exerting extra effort, teacher responsibility, overcoming students' adverse influences). In this study, I chose to use the STEBI and MTEBI instruments items as prompts for discussion and not in the more typical use as a quantitative instrument used to measure in a "pre- and post-" manner. Although the responses were scored utilizing the guidelines by Enochs, Smith, and Huinker (2000) and Riggs and

Enochs (1989); I did not use the scores except to establish a relative level of teaching self-efficacy beliefs in the components of teaching self-efficacy. This is an unusual use of the STEBI and MTEBI, but the various components of teaching efficacy addressed in the surveys have been well established in the literature (see Riggs and Enochs, 1990; Enochs, Smith, & Huinker, 2000; Bleicher, 2004; El-Deghaidy, 2006). Based upon personal correspondence with the MTA program director (January 10, 2014), participants of the MTA were administered the STEBI instrument anonymously at a point in their MTA participation. The intention was to have MTA cohorts take the survey in a pre- and post-manner, but administrative issues prevented this from happening. The previous exposure to the STEBI could have skewed data if it were used quantitatively, but in this case was used qualitatively.

Additional documents reviewed and analyzed included those related to the Master Teacher Academies, Master Teacher certification in Texas, and participant background. I gained access to a longitudinal database of the Master Teacher Academies at Desert State University. There were several fields of descriptive data available for each of the Master Teacher mentor participants. Database information included the titles of MTA workshops attended by each participant. Also included was record of the Texas Master Teacher (TExMaT) certification exam each mentor teacher took and accompanying performance scores. Mentor teacher academic transcripts from Desert State University were also reviewed. Mentee information was not available because the mentees were not participants of the MTA. Finally, pertinent district demographic data was retrieved from the Texas Education Agency website records. These data served as descriptive documents to further understand the holistic background, experiences, and perceptions of the STEM Master Teacher mentors.

Data Analysis

A qualitative researcher can be described as one who "builds a complex, holistic picture, analyzes words, reports detailed views of informants, and conducts the study in a natural setting" (Creswell, 1998, p. 15). Due to the complex nature of teacher mentoring in a natural school setting, it was appropriate and necessary to approach this study by collecting multiple forms of data. Collecting a range of data sources (interviews and documents) allowed for a thick description of participant perceptions, practices, and experiences. Thick description "involves making detailed descriptions of the context and other aspects of the research setting so that other researchers can make comparisons with other contexts in which they are working" (Teddlie and Tashakkori, 2009, p. 296). Denzin (1989) explains another importance of thick description in writing qualitative research. The narrative "presents detail, context, emotion, and the webs of social relationships…[and] evokes emotionality and self-feelings….The voices, feelings, actions, and meanings of interacting individuals are heard" (p. 83). Furthermore, the collection and analysis of multiple data sources allowed for triangulation and validation of evidence (for triangulation in qualitative research see Wiersma, 1995; Patton, 2002; Gall, Gall, and Borg, 2007; Hammersley and Atkinson, 2007; Teddlie and Tashakkori, 2009).

I applied the constant comparative method of qualitative analysis to analyze interview data. Hammersley and Atkinson explain that in the constant comparative method:

> The analyst examines each item of data coded in terms of a particular category, and notes its similarities with and differences from other data that have been categorized in the same way. This may lead to vaguely understood categories being differentiated into several more clearly defined ones, as well as to the specification of subcategories. In this

way, new categories or subcategories emerge and there may be a considerable amount of reassignment of data among the categories. (2007, p. 165)

The constant comparative technique allows the analyst "to compare different pieces of data, refine or tighten up categories, and move on to higher conceptual levels" (Teddlie and Tashakkori, 2009, p. 254). Each interview transcript was analyzed individually in search of patterns of thinking, phrases, or events that "appear with regularity or for some reason appear noteworthy" (Wiersma, 1995, p. 217). These patterns were organized, grouped, and coded.

Coding is a "process of organizing data and obtaining data reduction. In essence, it is the process by which qualitative researchers 'see what they have in the data'" (Wiersma, 1995, p. 217). Each new interview transcript was similarly reviewed and data was coded based on previously determined codes, or new codes were added. With the addition of each new code, the previous transcripts were reviewed to determine if any data should be reorganized under a new code. Data was constantly compared within and across categories and recoded as necessary. With this constant process, each category was clarified with sharp distinctions between the categories, and decisions could be made as to which categories were most important to the study (Gall, Gall, and Borg, 2007, p. 469). Codes were organized and grouped to arrive at five grand themes from interview transcript data.

Teaching efficacy surveys (STEBI and MTEBI) were completed by each participant and scored according to the scoring instructions by Riggs and Enochs (1989) and Enochs, Smith, and Huinker (2000), respectively. But, as stated earlier, I did not use these surveys in a quantitative, pre- and post- manner; as I was more interested in establishing relative levels of teaching efficacy beliefs in mentor and mentee pairs and in understanding the general perspectives of participants' self-efficacy in science and mathematics. Each of these surveys report two aspects:

the teaching efficacy of the responder in that subject area (science or math), and the outcome expectancy. Perceived self-efficacy is "a judgment of one's ability to organize and execute given types of performances, whereas an outcome expectation is a judgment of the likely consequence such performances will produce" (Bandura, 1997, p.21). The teaching efficacy and outcome expectancy scores were documented and examined for each participant in this study. Although these surveys are quantitative in form, they were utilized in this study as descriptive documents to deepen the understanding of the participants' perceptions of their teaching self-efficacy.

Another descriptive document integrated in this research was the longitudinal database of Master Teacher Academies participants. I incorporated these data to better understand the mentors' experiences in the program and to compare the varying levels of participation in professional development opportunities while enrolled in the Master Teacher Academies. University academic transcripts allowed me to review the cumulative hours taken by each mentor teacher participant in their particular subject area. Undergraduate and graduate coursework was available for all but one mentor teacher. The latter did not attend Desert State University for undergraduate work, but was enrolled in a doctoral program at Desert State University at the time of the study, so that transcript was included.

Interviews and document reviews served as the data in which to answer the guiding questions of this research study.

Ethical Protocol

In accordance with the University Handbook, I adhered to all ethical considerations in conducting this research. All proper guidelines set by the University of Texas at El Paso Institutional Review Board (IRB) have been followed, and approval was granted October 18,

2013 under IRB number 518640-1. Informed consent was distributed to all participants and has been collected and stored securely. IRB approval was obtained from Borderland Independent School District (pseudonym), the participants' employing school district, on October 17, 2013; prior to initial contact with participants via email (see Appendix A). Each participant responder was mailed a copy of the IRB consent form, an approval letter from Borderland ISD, and a teaching self-efficacy survey (Appendices B and C). Also included in the mailing was a self-addressed stamped envelope so that participants could easily return the consent form and survey to the researcher.

Signed consent forms and completed surveys were collected prior to interviewing participants. The identities of participants have and will remain confidential. Additionally, the time involved for participants was considered and respected. The location and times for interviews were chosen by the participant to ensure convenience, privacy, and comfort.

Researcher Perspective and Context of the Study

As the researcher of this study, I come with a rich background of educational experiences that has ignited a passion for STEM teacher mentoring as a crucial component to ensuring a quality education for all students. I participated as a student under a Teacher Quality grant program (which preceded the Master Teacher Academies program) for a graduate Instructional Specialist-Science Masters degree. This afforded me first-hand knowledge and experience of this predecessor program from the student perspective. In addition, I have fifteen years of professional educator experience in public education. As a novice teacher, I started my profession as a mentee; and later went on to serve as a mentor to novice teachers. I have also served as a campus administrator, giving eye-witness to the need for enhanced teacher mentoring. At the time of this study, I was serving in a position helping my school district

oversee the mentoring and professional development of teachers and administrators. This background has stimulated a high interest in the perspectives of mentor/mentee teachers and a strong desire to better understand mentoring in order to influence positive change.

My professional career has been situated in two diverse regions of the U.S. I have worked in both a Southwestern Texas-Mexico border city and a large city in the Midwest, providing experiences with dissimilar cultures and contexts in which to work. The former location is especially unique in student population and teacher demographic from most other regions in Texas and the United States. This can be seen in the Texas Academic Performance Reports from the Texas Education Agency. Borderland ISD has a student ethnic distribution of 93.02% Hispanic with 80.48% of the total student population economically disadvantaged (District website). This is compared to a student ethnic distribution of 51.3% Hispanic state-wide, with 60.4% economically disadvantaged across Texas (Texas Education Agency, 2013). Borderland ISD is similarly diverse from other regions in its teaching force. While Texas' Hispanic teaching force ethnicity is at 24.9%; that of Borderland ISD's is 80.7% (Texas Education Agency, 2013). This study, therefore, provided an opportunity for me to study and report the findings and perceptions of an underrepresented population from a diverse context.

In this research, my primary goal was the production of knowledge—knowledge of the perspectives of the mentors and mentees in which I studied. I recognize the fact that I am a part of the social world in which I conduct research, and minimized any distortion of my findings to maintain reflexivity which is neither objective or subjective (Hammersley & Atkinson, 2007). My research was conducted within my own society, and therefore, I attempted to guard against assuming my particular perspective was shared by my informants. My attempt was to make the

"broader context visible by a process of defamiliarization" (Davies, 1999, p. 108). In other words, to suspend any preconceptions from my everyday knowledge, I "fought the familiarity" of what I may have typically found to be obvious and focused on understanding the world in a new way (Hammersley and Atkinson, 2007). I situated myself as an observer, constructing knowledge alongside my participants. Data collection and analysis, therefore, describe the perspectives of the mentors and mentees involved, shaped by the contexts in which their interactions occur, as well as my own context as researcher.

Limitations

This study focused on the STEM areas of education, however, only math and science teachers were represented, as Desert State University's Master Teacher Academies program does not offer an engineering route. Similarly, the state of Texas does not offer Master Teacher certification in the area of engineering. A technology Texas Master Teacher certification does exist; however, none of the participants that matched the criteria of the study (completers of the Desert State University's MTA program and teaching for Borderland ISD) had pursued the technology route. This may be due to Borderland ISD's focused support and incentives for mathematics and science Texas Master Teacher certifications. A pursuant limitation of this study is that the data collected were from math and science teachers only. Additionally, the sample was not equally representative of math and science. Four of the five mentor teacher participants teach science and one teaches math. From the novice teacher (mentee) sample, two teach math and one teaches science.

The sampling criteria for this study presented another limitation. Participants were required to be completers of the Master Teacher Academies program, and have obtained Texas Master Teacher certification from the State Board for Educator Certification (SBEC). See

Sampling Procedures in this chapter for further explanation. Teachers who did not complete the MTA program (or were in progress) were excluded. Teachers who completed the MTA program but had not obtained Master Teacher certification were not invited to participate.

The participating school district for this study is unique in its systemic induction and mentoring program, in place for several years now. This collaborative relationship between the university and school district is not commonly found in other districts. Although they cannot be generalized, perceptions and findings from this study may prove informative and applicable to other districts in the area of teacher mentoring.

A potential limitation with the STEBI and MTEBI surveys was expressed by Dr. Ron Wagler, Assistant Professor of Science Education for the Department of Teacher Education at the University of Texas at El Paso. Dr. Wagler has conducted extensive research involving the use of the STEBI to measure self-efficacy of preservice teachers (see Wagler, 2007; Wagler, A. & Wagler, R., 2013; Wagler, R. & Wagler, A., 2011). In personal communication with Dr. Wagler (September 8, 2013), he explained some of his research findings:

> The problem is the STEBI-B (based on a self-collected very large data set) "falls apart" when given to our …preservice elementary teachers (i.e., Hispanic women). I am not sure about the MTEBI but I would assume the same would occur since the MTEBI is based on the STEBI. I expect that if the majority of your population is similar to mine (minus the preservice and possibly gender part) your STEBI data would also do the same. I have an article coming out discussing some of these issues. The instrument seems to behave differently with my population which means that the current STEBI appears to not be able to measure teacher efficacy the way the original authors suggested when administered to Hispanic women that average 28 years of age. (September, 2013)

Although the demographics were similar (Hispanic women) in my study, my population included secondary teachers, rather than elementary teachers; and all were inservice compared to the preservice teachers from Wagler's studies. I opted to keep the survey as part of my study, but utilize the scores as a descriptive document and to use survey items as discussion prompts, allowing participants the opportunity to comment and elaborate on components of teaching self-efficacy during interview sessions.

Focus groups were originally planned to be an additional layer of data collection for this study, but did not occur due to difficulty in substantiating a common time available for all participants. Participant consent forms had asked for permission to conduct individual follow-up interviews, so I proceeded with individual interviews for data collection.

Conclusion

In this qualitative study, I use a series of case studies to answer three guiding research questions:

1. What are the teaching and mentoring self-efficacy elements of Texas certified Master Teacher mentors created under an approved Texas program?

2. What are the impacts on teaching self-efficacy of novice teachers mentored by Texas certified Master Teacher mentors created under an approved Texas program?

3. What are the forms and elements of interactions between Texas certified Master Teacher mentors created under an approved Texas program and their novice teacher mentees?

I examined data obtained from participant interviews and the review of descriptive documents. My sample included five certified Math and Science Master Teachers and three mentees currently working with the mentors. In a constructivist framework, I applied constant comparative analysis methodology and grounded theory to systematically derive my findings. Ethical protocol was adhered to as outlined by the University of Texas at El Paso, as well as borderland ISD. I addressed my perspectives as the researcher, and included limitations to the study. In the next chapter, I delineate the research findings of this qualitative study in response to these research questions.

Chapter 4: Research Findings

Introduction

Recall the novice teacher introduced at the beginning of this manuscript. We see that she was off to a rough start in her first year as an educator. Her story is a remarkable one in that she was able to overcome a demoralizing situation, seek out her own mentor for support, and remains in teaching five years later. She would tell you (as you will see below) that it was her positive experiences with good mentors (including one who participated in this study) that kept her in the teaching profession.

I devote this chapter to the findings in my study in which I sought to explore and understand the perceptions of STEM Master Teachers' mentoring professional development and self-efficacy, and to examine mentor/ mentee interactions and participant teaching self-efficacy in STEM content areas. The questions that guided my study are as follows:

1. What are the teaching and mentoring self-efficacy elements of Texas certified Master Teacher mentors created under an approved Texas program?
2. What are the impacts on teaching self-efficacy of novice teachers mentored by Texas certified Master Teacher mentors created under an approved Texas program?
3. What are the forms and elements of interactions between Texas certified Master Teacher mentors created under an approved Texas program and their novice teacher mentees?

To address these guiding questions, participants (mentor and mentee STEM teachers) were asked to complete a teaching efficacy survey, and respond to a series of questions during interview sessions. Additionally, I reviewed various related documents throughout the study. The multiple data types from different sources allowed for data-source triangulation through "the

comparison of data relating to the same phenomenon but deriving from different phases of the fieldwork, different points in the temporal cycles occurring in the setting, or the accounts of different participants…differently located in the setting" (Hammersley and Atkinson, 2007, p. 183). This study involved *different phases of the fieldwork* with the incorporation of mentor teachers from different cohorts and modalities of the Master Teacher Academies (MTA) program. For example, one mentor participant was involved in an accelerated cohort, while the others were not. Different points in the *temporal cycles occurring in the setting* were represented in the various amounts of teaching experience of the participants (mentors and mentees); as well as differing amounts of time since the completion of the MTA program for the mentors. This study also featured *participants located differently in the setting* by including the perceptions of the novice teachers (mentees) in addition to the mentor teacher participants.

Participants

The two groups who took part in this study were Texas certified STEM Master Teacher mentors and their novice teachers (mentees). The mentor group was comprised of completers of the Master Teacher Academies program at Desert State University (pseudonym) that met the following criteria: 1) successfully passed the Texas Master Teacher certification exam (TExMaT) for their respective subject area (math or science) and grade span (either 4-8 or 8-12); and (2) teach for Borderland Independent School District (pseudonym). See Chapter 3 for discussion of this criteria. Borderland ISD was chosen among all school districts represented in the Master Teacher Academies for two critical reasons: (1) the majority of all participants since the inception of the Master Teacher Academies program at Desert State University have been teachers employed by Borderland ISD (sixty percent at the time of the study); and (2) Borderland

ISD has historically worked collaboratively with Desert State University by encouraging their teachers to seek professional development in the Master Teacher Academies program with financial support. Additionally, Borderland ISD has an existing systemic mentoring program for all teachers new to the district (elaborated upon in Chapter 5).

Novice teachers from Borderland ISD who were under the mentorship of the mentor teacher participants of this study were also invited to participate. The mentee informants were referred to the researcher by their mentors (termed snowball sampling, see Chapter 3). This enabled the researcher to add the perceptions of the mentee informant group to triangulate the data from the mentor group; therefore deepening the holistic investigation and improving understanding to answer the guiding research questions.

Data was collected from eight individuals throughout the course of this study, which began in October of 2013 and concluded January of 2014. Five participants were Texas certified STEM Master Teacher mentors. Four of these mentors teach science and one teaches math. There were two males and three females, and all mentors teach at the secondary level- two at middle schools and three at high schools. The years of teaching experience for the mentors ranged from seven to fourteen. Three novice (mentee) teachers participated in the study. Two were males and one was female. Two mentees teach at the high school level and one at middle school; and two teach math while one teaches science. The mentee group's teaching experience ranged from less than one year to five years. Although five years of experience would not necessarily be defined as "novice" by some, this participant was new to teaching chemistry and saw mentorship as a necessary support. Table 4.1 presents a demographic summary of the participants.

All participants in this study but one are Hispanic. This demographic is representative of Borderland ISD, with a professional teaching force comprised of 80.7% Hispanic; 16.3% White; and 1.7% African American. The student population is 93.02% Hispanic; 6.98% White; 2.93% African American; and Economically disadvantaged is at 80.48%. Borderland ISD has a population unlike most others in the U.S., allowing for this study to investigate the perceptions and voices of those underrepresented in the literature.

There was not a one-to-one match of mentor and mentee participants. One mentor was not currently mentoring any teachers, and none of her previous mentees had remained in the district. One mentee was referred by a participating mentor, but failed to respond to any emails or mailers inviting her to join the study.

Table 4.1 Participants

Participants	Gender	Subject Taught	Level Taught	Years Experience	Mentor/ Novice
Participant 1	Female	Science	High School	7	Mentor
Participant 2	Male	Mathematics	Middle School	11	Mentor
Participant 3	Female	Science	High School	11	Mentor
Participant 4	Male	Science	High School	9	Mentor
Participant 5	Female	Science	Middle School	14	Mentor
Participant 6	Male	Mathematics	High School	<1	Novice
Participant 7	Male	Mathematics	Middle School	1	Novice
Participant 8	Female	Science	High School	5	Novice

Interview Findings

Each STEM Master Teacher mentor and novice teacher mentee participated in a one-on-one interview with the researcher. Interviews were transcribed immediately following interview sessions. I utilized Microsoft Word and Excel software to organize all interview data. Interviews were transcribed in Word and the Comments feature was used to code sentences and phrases as each transcript was read and re-read. With each reading of transcripts, codes were

added or reclassified constantly, and indexed in an Excel spreadsheet. The code index was used to organize and categorize codes, as well define and reduce codes to distinct rules to define each category (Teddlie & Tashakkori, 2009, p. 255). Categorized codes were grouped to create grand themes.

I applied the constant comparative technique to analyze all transcript data. From this iterative process, five grand themes emerged from the data: (1) professional development from the Master Teacher Academies; (2) Master Teacher mentoring experience and self-efficacy; (3) mentee's experience with Master Teacher mentor; (4) teaching self-efficacy of mentors and mentees; and (5) forms and elements of interactions between mentors and mentees. Two of the grand themes: (1) professional development from the Master Teacher Academies; and (2) Master Teacher mentoring experience and self-efficacy, were distinctive to the mentor group, as the novice mentee teachers had not shared in the Master Teacher Academies program experience. Similarly, the third theme was unique to the mentee group and delineates their perceptions. Themes four and five were shared experiences of both mentors and mentees. See Figure 4.1.

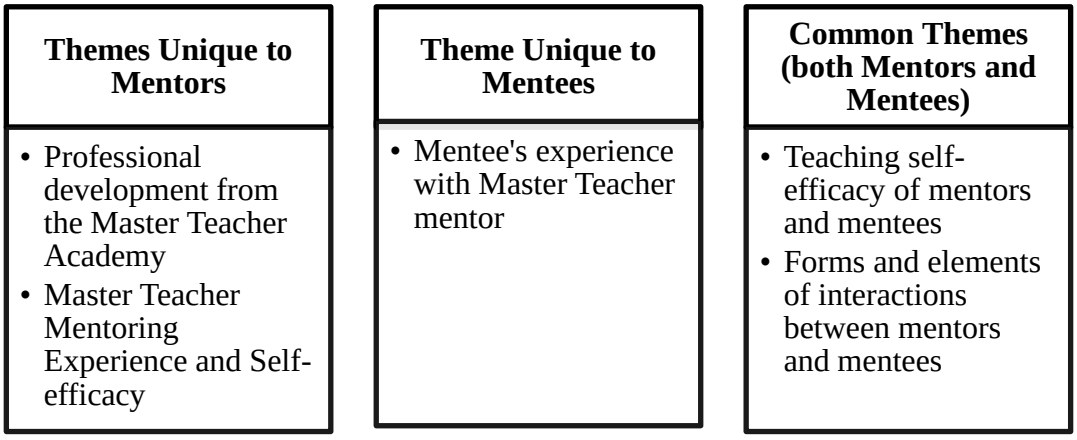

Figure 4.1 Thematic outline from interview data

Interview sessions were conducted in a location of the participant's choosing to allow for teacher privacy, comfort, and convenience. Sessions ranged from ten minutes to an hour and eight minutes. I left each participant my contact information in the event they wanted to ask questions or add comments after concluding the interview. Interview questions asked of mentors were: (1) How would you describe your mentoring preparation experience? (2) What, if any, professional development has been afforded to you through the Master Teacher Academies? (3) What, if any, personal development has been afforded to you in the Master Teacher Academies? (4) What are the barriers to your development? (5) What do you expect will be your next professional position? and (6) Prior to this interview, you completed a survey about your teaching efficacy beliefs. What comments or ideas would you like to share in relation to those survey items?

Mentee participants were asked to discuss their time in working with the mentor whom had referred him/her. Interview questions asked of mentees were similar, only modified slightly to implore the mentee perception. (1) How would you describe your mentoring experience? (2) What, if any, professional development has been afforded to you through your mentoring program? (3) What, if any, personal development has been afforded to you in your mentoring program? (4) What are the barriers to your development? (5) What do you expect will be your next professional position? (6) Prior to this interview, you completed a survey about your teaching efficacy beliefs. What comments or ideas would you like to share in relation to those survey items? (See Table 3.1 for a side-by-side comparison)

Drawing from interview transcript data, each grand theme had multiple subcategories that detailed participants' experiences, beliefs, and perceptions within the grand theme. Originally, the transcript data of mentors was coded separately from the mentees for the common themes

(four and five). Table 4.2 demonstrates the percentage of comments from the STEM Master Teacher mentors within the grand themes by subcategory. Table 4.3 does the same for novice mentee grand themes. What follows is a narrative of the findings grouped by grand theme. For mentor/mentee common themes (4) teaching self-efficacy of mentors and mentees, and (5) forms and elements of interactions between mentors and mentees, the mentor findings will be discussed first, followed by mentee findings.

Theme 1: Professional development from the Master Teacher Academies

Much of the mentors' discussion about professional development from the Master Teacher Academies revolved around the aspects they found value in. For some it was an opportunity to better themselves by applying some courses toward a Master degree program, or getting professional development hours that could be applied toward recertifying their Texas teaching license. All five saw value in learning new skills or content that could be applied in their classrooms with students, as illustrated by Participant 3, "I thought it was one of the best things they taught us. Like hands-on how to do it so we could go and do it with our own kids. That was very valuable" (January 11, 2014).

One mentor, who had an unsuccessful experience acting as a mentor prior to enrolling in the MTA, explained "I'd probably approach it [mentoring] differently now that I know… I learned through the courses at the Master Teacher Academies program for what a mentor's supposed to be" (November 19, 2013). Participant 3, similar to the other mentors, expressed how she grew in many ways:

> So, I think it, for me it's been a great experience. The Master Teacher Academies totally- I grew in so many dimensions, I can't I can't even- I'm still feeling the growth. From

two years ago or whenever it was that I was part of the Academy. So it's amazing. (January 11, 2014)

One can deduce from these responses that the mentors in this study placed high value on learning experiences from the MTA. These experiences will now be expanded upon, beginning with content.

All five mentor participants expressed that the MTA weekend workshops, summer workshops, and/or semester courses were sources of learning new math or science content that could be applied in their classrooms. Some examples mentioned were: studying changes in polar ice caps with the use of technology to bring the issue of global warming into the classroom; studying circuits using fruit; studying physics concepts by watching videos of ballet dancers; a unit on a local smokestack; and algebra and geometry activities. Each of these activities had a "hands-on" approach and some were in a "problem-based learning" format. One mentor, who had been in an accelerated cohort, stated that although her workshops were focused more on preparation for the Texas Master Teacher exam than on the math or science content; she did have some exposure to units for the classroom. Some mentors shared their learning with colleagues at the campuses where they teach, which brings us to collaboration experiences throughout the Master Teacher Academies program.

Table 4.2 Percentage of STEM Master Teacher mentors' comments in regard to each grand theme by subcategory.

Themes	% of Mentors' Comments
Professional Development from the Master Teacher Academies	
Texas Master Teacher Exam	44
MTA preparation for exam	57
Difficulty of Master Teacher exam	25
Experience taking Master Teacher exam	14
Master Teacher exam related to real-world	2
Value of Master Teacher certification	2
Professional development in preparation for mentor role	14
Value of MTA	14
Learning content	10
Example of how MTA prepared me for the mentor role	8
Collaboration	7
Mentor support during MTA	6
Other related experiences	5
Electronic/technology support	4
Sacrifices/commitments made for MTA	4
MTA relationship with the mentor's district	4
Mentor preparation from MTA vs. district/campus	3
STEM Master Teacher Mentoring Experience and Self-efficacy	
Aspects of formal mentoring	25
Beliefs about mentoring	19
Lessons learned from the field	17
Informal mentoring	14
Barriers to mentoring	10
Mentor's reflection of their own experience as a mentee	10
Mentoring needs specific to STEM	4
Motivation of mentee	1
Forms and Elements of Interactions between Mentor and Mentee	
Interactions between mentor and mentee	66
Mentor/mentee relationship	15
Prerequisites for mentoring	7
Barriers to development	9
Value of mentorship	3
Teaching Self-efficacy of Mentor	
Teacher responsibility	34
Professional aspirations	20
Content knowledge	17
Student motivation	9
Teacher exerts extra effort	8
Teachers are important	7
Parents' responsibilities	6

Table 4.3 Percentage of mentees' comments in regard to each grand theme by subcategory.

Themes	**% of Mentees' Comments**
Experience as a Mentee	
District/campus provided experiences	28
Pedagogy	25
Collaboration	19
Motivation	18
Content	6
Beliefs about mentoring	4
Forms and Elements of Interactions between Mentor and Mentee	
Mentor/mentee relationship	45
Barriers to development	20
Value of mentorship	18
Interactions between mentor and mentee	12
Prerequisites for mentoring	5
Teaching Self-efficacy of Mentee	
Student motivation	29
Teacher responsibility	24
Professional aspirations	24
Teacher exerts extra effort	9
Teachers are important	9
Content knowledge	5

Collaborative practices among peers during the Master Teacher Academies program was described as "very positive", "very amazing"," invaluable"," really good", and "a big plus for me". Comments about collaboration represented two dimensions. One was collaboration around content and subject matter taught to students; the other was in relation to serving in the mentor role. These dimensions can be seen in the reflections of Participant 4:

> Interacting with other teachers that have different levels of experience and have different ideas um, I think is invaluable as well because you were able to talk to each other about certain units, ideas, topics, whatever. And if you have, you you have an idea, I think this might work, let me run it by the other teachers, maybe they've done it before and they can tell me what to look for as far as pitfalls. Or what's successful, what works, what doesn't work. I think the program was really good as far as that. And, and the groups of

> teachers that went in as cohorts um, I think they still, most of them still have at least some type of working relationship and are able to call each other or email each other and talk about things. Or, or bounce ideas off each other. (November 22, 2013)

Furthermore, he recalled, "a lot of it was discussion where we would talk about…when you mentor, when you're mentoring people what are you looking for." (November 22, 2013)

This collaborative structure created a constructivist approach in which the students of the Master Teacher Academies could learn from one another. Refer to pages 28-29 for further discussion of constructivist learning applicable here. Additional sources of support were discussed. There was a Desert State University professor, who also served as the MTA Program Director, named by all mentor participants as being very active in the program and serving as a mentor to many MTA students:

> I'm very thankful cuz [sic] I had a really good working relationship with [Program Director]. And he um, he's he's always he's been my mentor, you know? Like I I feel like I've been his mentee to some extent. And uh I love the fact that he's still at [Desert State University], you know, in the college of Ed, but he still thinks about, "Okay what do we need to do to help science teachers at the high school?" (Participant 3, January 11, 2014)

Participants spoke of graduate students who worked closely with the program as well. They, along with retired teachers, were brought in to conduct weekend and summer workshops. One of the MTA participants of this study was even brought in to conduct sessions after she successfully completed the Texas Master Teacher certification exam. Participant 1 listed the type of support received from these mentoring constituents:

> We could check out books from them. They would help us in the workshops. They would send us case studies. Um, if we had any questions in regard to the test or things like that we were constantly- we had constant feedback. (November 19, 2013)

The relationship between Borderland ISD and Desert State University provided even more support for the teachers in the Master Teacher Academies.

> I think the support that kinda [sic] helped us too was the fact that um, I think they[Desert State University] had it with the district. They had a very good relationship with the district that I work with. And I think that was important. Um, because it was to the point where we didn't have to worry about really our registration. We didn't really have to worry about our courses or tuition because it was taken care of. You know? And there was constant communication so we kinda always knew what to do and what to expect coming up. And, which is something I love. I love to make sure that the communication's open there. So, that's one thing that I really liked about the program. (Participant 1, November 19, 2013)

Further demonstration of the collaboration between Desert State University and Borderland ISD came in the fact that some participants only became aware of the MTA when their campus administrators recommended they enroll. This was the case for Participant 2 who stated, "It was the summer and our principal called me over and said, 'You know what, you're a good candidate for the Master Teacher program that they're offering'" (November 25, 2013). Furthermore, Participant 1 doubted that she would have completed the MTA without the support of her campus principal:

> One other thing that I think I was able to accomplish this with, and the principal that I had um, really helped with this is that I only had one prep. So, speaking professionally as

a teacher who's going to school to try to accomplish this, there's no way I would have done it if I had three preps. There's no way. It would be too much. I would have [been] overwhelmed, because you know, the more preps you have, the more time you need to spend at home preparing. And that home time, you know when my kids went to bed, was the time that I needed to work on my papers and my assignments, studying to pass the exam. You know, and I- in looking back now, I think I was able to accomplish it because I only had one prep. And, you know, two or three preps are pretty common now in regards to high school. Um, which are extremely time consuming at three preps, which I've had before and…I.. I don't think I would have accomplished it if I would have been in that situation… My principal knew that I was trying to do this and…my home time was my home time to actually study. (November 19, 2013)

Support for those enrolled in the Master Teacher Academies also came in the form of electronics and technology support. Devices such as Samsung tablets and Sony Blog digital cameras; and various free open source software resources that are effective options for schools in low-socioeconomic regions (see Giza, 2012) were given to MTA students. Technical support accompanied these technologies. Some of the outcomes captured from interviews are highlighted by Participants 5 and 3:

My technology skills have improved quite a bit. It had been eleven years since I had been in college when I went back to [Desert State University] for the Master Teacher program. So that in itself um, I use technology just about every day in my classroom. And I think a lot of that um I think it's a lot about projects that we had to turn in were either a Power Point or um again we had to do project-based learning projects. Um, so it just brought up my skills. (December 14, 2013)

> And we used computer graphics. And I tell the kids, you know, this is where you can integrate math. And this is where you can integrate science and it's it it has technology. You measure with the cursor and it was really cool, um, I I thought it was one of the one of the best things they taught us. (January 11, 2014)

The various means of support received by the STEM Master Teacher mentors undoubtedly helped them to successfully complete the program and move on to achieve certification with the state. After all, the completion of the MTA was not an easy feat, and mentors did converse about the sacrifices and commitments made.

Coursework, Saturday workshops, summer workshops, and a culminating state certification exam were components of the MTA that demanded a commitment of time and energy. Participant 2 found the decision to join the MTA a hard one:

> I knew it would take a few years. It took me a couple- two or three years of just taking classes after school. Um, it was a hard decision because I coach. You know I'm I'm involved in school and I stay after school. And on top of that I'd have to, you know, go back to school. Which was uh, well..so I kind of didn't want to. But finally, you know, I said well, okay this is a good chance. So I did go through with it. (November 25, 2013)

Another participant echoed the sacrifices made for the MTA:

> And they were all-day long workshops. So all day Saturday or in the summer. I mean, you know, we would be there for at least six hours of the day. And it was a commitment that we had to make. We were in the Academy and we had to show up. Arrange your summer vacations around that because it's important. (Participant 3, January 11, 2014)

Professional sacrifices were made as well, such as Participant 5 who reluctantly declined serving as a mentor because "I was too busy with school. With [Desert State University], going through the program. So I was like, oh! I don't know if this is a good time" (December 14, 2013).

With all the time committed and effort expended, one payoff was preparation to serve as a mentor to novice teachers in the field. In studying how to best serve as an effective mentor, participants shared varied assignments and learning activities that stood out as beneficial to their development. Case studies gave a real-world application in which MTA students would discuss what to expect and how to handle situations:

> Being able to converse and have a conversation, and helping someone without impeding on their own professionalism. Um, so you kinda have conversations there about, um what should you say to someone without offending them? Wh..how can you give a suggestion? Which is very important in regards to mentoring someone else. (Participant 1, November 19, 2013)

Participant 4 remembered "a lot of the assignments…were writing projects" (November 22, 2013). In one such project, Participant 1 recalled, "one of the assignments they had given was reflecting upon our *own* experience as a mentee. Looking at what *our* mentors did for *us.* And then kind of evaluating, uh, maybe what *should* have happened" (November 19, 2013). There were also reading assignments that added to their knowledge of mentoring, and worksheets posing scenarios in which to respond about how they would react if that situation arose. Guest speakers, some retired teachers, provided information during Saturday and summer workshops to prepare for mentoring in schools.

Professional development for serving as a teacher mentor was a necessary component for two expected outcomes of students in the MTA program. One was preparation for the potential

of serving as a teacher mentor in their schools; and second was to successfully complete the mentoring component of the Master Teacher exam (TExMaT). The first of these purposes was articulated during interviews. Participant 1 talked about what the MTA program did for her, "My training I think, uh in regards to mentorship really did happen at the graduate level. In the Academy… they train us to be mentor teachers. Master teachers are really there to mentor others" (November 19, 2013). Participant 4 gave similar testimony:

> I think it was more of the classes that I took and the [MTA] program itself. Uh, I think that's what helped to I guess uh, provide me with the information on how how to be a mentor and what is what is required of you. And um, I guess what your role is in in mentoring. (November 22, 2013).

Participant 4 explained how the MTA experience was in contrast with mentor professional development he received from the school district:

> [In] the district…SMART mentoring program, we spoke about, we spoke a little bit about it there. But I think it was more of the classes that I took and the [MTA] program itself. Uh, I think that's what helped to I guess uh provide me with the information on how to be a mentor and what is what is required of you. (November 22, 2013)

Although the mentors spoke about the overall beneficial relationship between the MTA program and Borderland ISD, Participant 1 had dissimilar sentiments in comparing mentor preparation in the district versus in the MTA program:

> When I learned and experienced what it *should* be ah, ah, at the graduate level, it was very different. So I saw a difference there in regards to what it should have been [in the district]. So it was very enlightening to see that aspect. But my training I think, uh in regards to mentorship really did happen at the graduate level. (November 19, 2013)

To return to the second expected outcome of mentor preparation for students in the MTA program, data indicated that perhaps the most challenging component of the entire Master Teacher Academies experience was the Texas Master Teacher exam (TExMaT). The importance placed on this exam can be seen in that the majority of mentor comments in this grand theme were related to preparation for, and experience taking the TExMaT exam. To begin, the TExMaT was described by participants as having a high failure rate- especially the case study component that assessed aspects of mentoring a teacher with a scenario-based written response. "People would pass the content. People wouldn't pass the case study" (Participant 1, November 19, 2013). It was a timed test with a "very extreme rubric". The exam seemed "just so random" explained Participant 5. She elaborated that:

> The questions, the actual test part was very much like the STAAR [State of Texas Assessments of Academic Readiness] test to me. Or the TAKS [Texas Assessment of Knowledge and Skills] test. It was just questions, you know, how much do you know about each area? Which- that's important too. Um, it just- there was so much on there that you have to know. So I think probably the more experience you have teaching multiple grade levels, the better you're going to do on that test. (December 14, 2013)

Participant 3 described her experience in taking the TExMaT:

> You know the content. You know the pedagogy. And this one puts it together {interlocks fingers in front of her face}. And you need to be able to know your content well enough to to figure out the scenarios that they give you: A, B, C, or D? Which one's the best one to teach that specific concept? (January 11, 2014)

Essay questions were a part of the TExMaT exam as well:

> Those essays are asking…where does this teacher- where is this teacher missing- the content? And how would you, um help redirect that? Or um it could also be how- where could the teacher have addressed the students' misconceptions? And where they failed to do that?...How can you help the teacher to be more effective? (Participant 5, December 14, 2013)

In response to the difficulty of the TExMaT exam, the Master Teacher Academies provided a multitude of preparatory opportunities. Specifically, the workshops held on Saturdays and during the summer were a venue for this preparation. One of the participants of this study was the first to successfully pass the TExMaT in the region. She was happy to conduct some of these workshops to prepare others, and served as a mentor to guide and coach them through the completion of the program.

The collaborative nature of the MTA program was mentioned again as a strategy to prepare for the TExMaT. Students would discuss the feedback from practice exams and create sample case studies for each other to respond to and evaluate. There was mention of a useful outline format to use in responding to essay questions; and practice tests with accompanying feedback for improvement. One participant found it helpful to apply a test analysis strategy, similar to what she had applied to the state STAAR test:

> In regards to study time…uh, I found myself…preparing for the Master Science Teacher exam, actually breaking down the entire thing. Kinda like what we do in the classroom for the kids; for myself. Pulling out the verbs. Pulling out the concepts. At what level should I be learning this at? And it actually helped to manage me to kinda study for the test. (Participant 1, November 19, 2013)

All but one of the mentors passed the TExMaT on their first try, and they felt that was quite an accomplishment.

Results within this theme demonstrate that the Master Teacher Academies was a challenging, yet meaningful undertaking. The mentor valued the learning gained from the MTA and gained tools, life-long skills, and relationships that will continue to benefit their professional practice. The mentorship and supports along the way paved the road to success in passing the TExMaT and equipping participants to serve as mentors for novice teachers in their district. Mentors contribute their success in serving the role of mentor to their preparation from the MTA.

Theme 2: Master teacher mentoring experience and self-efficacy

In this theme, data illustrated the mentoring experiences of the Texas STEM Master Teacher participants. What came to light also in these conversations, were aspects of mentoring self-efficacy. Perceived self-efficacy refers to "beliefs in one's capabilities to organize and execute the courses of action required to produce given attainments" (Bandura, 1997, p. 3). Comments from participants that allude to their level of mentoring efficacy will be included below.

From Theme 1, we saw that the MTA program required mentors to reflect upon their own experiences as a mentee and evaluate those undertakings. I will begin Theme 2 with some of these reflections. For Participant 1, her time as a mentee started off poorly. She expressed concerns with the inexperience of the second-year teacher that had been appointed as her mentor:

> And, although she was very helpful in regards to kinda giving me, uh, this is so-and-so here who works here, this is how our gradebook works, very basic level. I don't think I was given the initial foundation to really help kind of develop a beginning teacher… And, um, you know in a sense my initial experience was kind of, you know, okay I guess

> it's what's supposed to be because I didn't know any better. Um, my degree was not in education. So I didn't have any of that prior knowledge in regards to terms…like uhh...what does SAC mean? Or what does, uh, an IEP? Um, things like that. So I had to learn along the way things that my initial mentor didn't even know herself. (November 19, 2013)

Participant 3 felt she really had mentored herself as a new teacher since she did not have a mentor; although she did report collaborating with other teachers. The other three mentor participants did not share negative experiences as mentees.

Three of the mentor participants seemed to see a concrete difference between working formally and informally with novice teacher mentees. This may be a consequence of Borderland ISD's systemic teacher mentoring program for new teacher hires. Teachers new to the district, even those who come with experience, are assigned a mentor from their campus. Mentor/mentee assignments are kept on record at Central Office in order to document that new teachers are receiving services and training that are a part of the new teacher program. Mentors attend meetings with mentees as a part of the district program, and even receive small stipends for submitting Mentor Logs that document interactions between the mentor and their mentee. It is understandable that mentors from this district would refer to those assigned mentees as their "formal" mentees, and any other teachers that they may be mentoring as "informal" mentees. Participant 3 reflected:

> I haven't mentored in about three years. But there is one teacher that has consistently come to my room for help. And she's she's a general chemistry teacher…she comes to me for, you know, what do you think about this?... And so the support is there even

though the umbrella is not like designated, I'm not a designated mentor. (January 11, 2014)

Participant 5 shared a similar experience with a teacher she says is an informal mentee:

> I haven't been assigned a role as a mentor [but]… we do, um collaborate with each other quite a bit. Um, I think just being open and having the open door, um to where she knows she can come over at any time, and um ask, you know, what are you doing? How, how's this lesson going for you? Um, what changes do you make to the lesson? (December 14, 2013)

Participant 1 seemed to have a broader definition of mentoring and understood that mentoring could take place, even if you are not the assigned mentor:

> Being assigned a men- a mentee, you know a mentor and mentee? Is, is, you have a lot of interactions but there's a lot of I think mentorship that happens with people who aren't necessarily brand new teachers. So I think mentorship happens at different levels. I have a lot of interactions with other teachers that have told me, "Oh I learned a lot from you". You know, or, "Thank you so much, I really appreciate it" or, "Could you help me with this?" And I think that's mentorship too. There's a relationship there. So I've had a lot of positive relationships with other people who aren't necessarily assigned as a mentee. And I think that's important. You know. Um, that if you are willing to help…that in a sense- if you really think about it, you are mentoring someone else. You're helping someone else. You're guiding them. (November 19, 2013)

There were other comments about the experience in serving as a mentor teacher and generally, the data showed positive experiences. Reports included such actions as "sitting down with [the mentee] and actually knowing that you're there to kinda guide them…[and doing]

walk-throughs to kind of evaluate how their overall, ah, classroom is, uh in regards to management, in regards to teaching strategies" (Participant 1, November 19, 2013). Another mentor spoke about planning with his mentee on a daily basis. He felt his mentee is strong in his content, but lacks experience; and so he is there to guide him. One mentor spoke about offering advice from experience and asking the mentee to reflect upon decisions made or ideas in order to grow professionally.

Participant 1 did have an unfortunate experience one year as a mentor. She began the year on a high note, actually mentoring two novice teachers. What she found, however, was a challenging situation that she wasn't prepared to deal with. One mentee was very open to the advice and assistance she offered:

> And, on the other hand, I had another mentee who initially was a good experience. And, kinda started saying mmm, no, I don't need any help. And I kinda didn't know how to approach that. I didn't know what- this is kinda right before I had started the Academy, actually. And I said, well I'm doing the same thing I'm doing with this other one. Why is this one different? And, she really didn't want any help at all. She really didn't want to have a mentor...[What I later learned was] the first one that was accepting all of the information was certified as a teacher through an alternative certification program and her major was not education. The other person… majored in education. So a lot of the stuff that I was probably telling her, she had already received that background. She already had done her internships at campuses and had probably seen, you know, strategies for time management, or things like that. So she already had an internship. She had a background in education, where the other person didn't…Neither of them are at the campus anymore, unfortunately. (November 19, 2013)

This mentor found herself asking "What am I doing. Did I come on too strong?" She felt defeated and blamed herself for not being "able to overcome it." Although most experiences for the mentors were positive, these narratives illustrate that barriers to mentoring can pose challenges to mentors and their mentees.

I move now to other perceived barriers to mentoring that were reported during interviews. Beginning with the obvious; one participant stated she had not been given the opportunity *to* mentor, or at least, not "formally" mentor. To her, the absence of opportunity was a definitive barrier. The attitude of the mentee was another barrier; negativity creating difficulty in the working relationship. Accountability pressures were added as a barrier to mentoring. "We're right now so much under the gun with testing. That you know, we don't enjoy teaching anymore." (Participant 3, January 11, 2014) Furthermore, the matching of the mentor and mentee could create obstacles. Participant 3 felt passionately that mentoring should *not* be:

> District personnel going in to them [mentees] and telling them what to do. I think it needs to be somebody that knows the culture of the school. That knows the students. That, you know, knows exactly which base we're on. Preferably a teacher that's teaching the same discipline. (January 11, 2014)

Participant 1 also saw a mismatch with a mentee outside of her content area. "She could get that information from somebody else. Or any help that she needed from somebody else who was doing, uh, the same content area." (November 19, 2013) The barrier that was discussed most frequently, however, was time. Participant 2 explained:

> We just don't have time to to take on other things. In the, being in the classroom…I would like to mentor more teachers…But it's just, it's it's very hard. Unless you're given the opportunity to, you know, teach half of the day and the other [half] day do

> something else. But, if you're teaching full time; staying after school; doing tutoring. I coach. It's just very hard to find the time. (November 25, 2013)

Additional commentary about time as a barrier to mentoring was heard from Participant 3:

> Meetings every day! And I don't mean meetings like PLC meetings. Those are good meetings. Where you discuss, hey did you teach that? Periodic trends- did your kids get atomic radius? Cuz my kids didn't get it. That's the kind of meetings I want to have. Yeah I did it, but you know what? I did this with them too. Those are the kind of collaboration meetings that I want. I don't want to have meetings about…I don't want to have meetings about how bad we screwed up. (January 11, 2014)

There was an expression of overall desire to participate more in the mentor capacity from the participants. But time, matching, attitudes, etc. could infringe upon maximizing mentorship.

"Lessons learned from the field" is what I call this section of Theme 2. Each mentor verbalized important things they have taken away from working with mentees. Some they have observed or learned from being in the situation themselves; some are things they would change if they could repeat the situation; and some are things that can be applied in one setting but not in others.

Lessons learned from Participant 1: Stay positive and give help where help is needed.

> If [mentees] see you as a teacher with a positive attitude in teaching science, knowing that there's room for improvement, knowing that things are gonna [sic] change…you've gotta be flexible, and you have to be open minded, and that the kids deserve an opportunity, you know to teach at a level that will motivate them. Then, they'll [mentees] pick up on it. (November 19, 2013)

She also will be more cognizant of mentees' backgrounds:

> Next time I have… a mentee…I have [to have] a little bit more open perspective… Not just see someone who auto automatically needs help just because they're brand new. Um I think you definitely have to take into consideration the person's background. Where they came from. If, uh, what level of help they would like. And, and most definitely um, knowing how to communicate with them, and building that initial relationship. (November 19, 2013)

Lessons learned from Participant 2: It takes time.

> This mentor was convinced that with experience comes knowledge:
>
> Schooling gives you the degree. But I think being a teacher really comes in the classroom with experience…It takes a while to be able to teach effectively…Some of these teachers; they do. They leave the field and uh, I think they leave leaving like, you know, "I wasn't good enough." And it's not that. I think everybody can be good enough. But they need to understand that it takes time. (November 25, 2014)

Lessons learned from Participant 3: Treat mentees as equals and cheer them on.

> I see these [novice] teachers. They're equally as brilliant, they're equally as effective, they're equally as awesome teachers. I feel like I'm sharing with them something that was good for me, that worked for me. And and they can take that or they cannot take that. However they wanna [sic], you know, do it…some teachers have their own way of learning. They don't like somebody else to teach them. They learn on their own. So, um, I've always felt like working with uhh the diverse set of teachers that I've worked with in the past has been such a strength for me because I draw from them more than they are drawing from me. I sometimes feel like they're the ones mentoring me. And I think it's a learning process for me. You know, you learn from each other…[But] a lot of the

teachers that I have mentored…they kind of doubt their teaching a lot… Mentees come with a sense of fear… don't give up on yourself. And I tell them, if you can survive- you know take it one day at a time. And the year will finish and then you'll feel more confident coming in the second year…I think we're in danger, of losing teachers the first three, four years of school. Because they don't- they feel overwhelmed. (January 11, 2014)

Lessons learned from Participant 4: Lead by example and pool your resources.

That's how a mentor best works…through example… I think teachers that have experience teaching, I think it's better to go to them first and if if they if their idea doesn't work then you can start looking elsewhere. But, at least if you go to them there's that wealth of knowledge that can help you. Because in this school we have teachers that have been teaching science, long periods of time. We have one that's a scientist, we have a few that went to medical school, and we have a lot of a wealth of knowledge at this school. So, if one of us doesn't know something in an area or not an expert, if we don't know the best way to do something, there's always somebody else to go to. So, having that- having that, that pool of ideas and being able to share them with the mentee, I think is a good idea. (November 22, 2013)

Lessons learned from Participant 5: Things will get better.

A lot of times she needs a lot of encouragement and [I] always tell her you know what, it kind of comes in waves. It'll get better um, even after Christmas. That can make a big difference in their [students'] maturity and it's um, you know, being there to lift her up. (December 14, 2013)

This assembly of reflections is a testament to the importance these mentors place on serving in the mentor role. They share a common dedication to the development and success of novice teachers they work with.

With diverse experiences and lessons learned along the way, these mentors have formed personal beliefs about mentoring. Some of these beliefs were expressed during the interviews. Personal beliefs will shape the self-efficacy and, ultimately, the expected outcomes of the mentor. Personal beliefs are crucial to the culture of mentorship because beliefs are related to action:

> People's beliefs in their efficacy have diverse effects. Such beliefs influence the courses of action people choose to pursue, how much effort they put forth in given endeavors, how long they will persevere in the face of obstacles and failures, their resilience to adversity, whether their thought patterns are self-hindering or self-aiding, how much stress and depression they experience in coping with taxing environmental demands, and the level of accomplishments they realize. (Bandura, 1997, p. 3)

A mentor's self-efficacy, then, would likely have an effect on their actions serving as a mentor and their interactions with their mentees. In Chapter Five I analyze self-efficacy related to this study more deeply. Here I denote mentors' beliefs about mentoring derived from interviews.

One reoccurring belief about mentoring involves communication between the mentor and mentee. You must be able to have a conversation with the mentee "without impeding on their own professionalism" (Participant 1, November 19, 2013) and keep in mind the different perspectives and background of the mentee. The mentor should consider their demeanor in giving advice or suggestions and "always look at the positive" (Participant 2, November 25, 2013). One goal of communication should be "trying to get them [mentees] to reflect…rather

than just try to throw advice at people. Kind of talk and say what do think about that? This happened, is that- do you think that's the best way to handle it?" (Participant 4, November 22, 2013). The mentor's passion for teaching should be apparent and they must demonstrate openness for improvement and being open to suggestions. Finally, mentees should be included in professional collaboration and treated as equals to more veteran teachers. "When I think of the word mentor, I think of like somebody that knows more than somebody else and you're trying to teach them the ropes [but] I always s[ee] them as my equals." (Participant 3, January 11, 2014)

Another important belief that surfaced is the mentor must have experience and know their content. As a mentor, you must "know what you're talking about…because if you don't then you become an ineffective mentor" (Participant 2, November 25, 2013). Mentors must couple content knowledge with "what they've learned about mentoring. If that's not there, then you can't really expect them to be a good mentor." (Participant 4, November 22, 2013) In other words, mentorship must go beyond "this is how our gradebook works, [or the] very *basic* level" in order to "develop a beginning teacher" (Participant 1, November 19, 2013).

An additional belief is there should be structure and organization to the mentoring process. Care should be taken in matching mentors with mentees, and in most cases it is best if they are teaching the same content. Regular meetings are important as well as conducting observations to check for progress. Mentees should receive feedback from mentors, and compliments when doing well.

The experiences and beliefs of STEM Master Teacher mentors provide many aspects for consideration in the realm of teacher mentoring. Some alluded to their own experiences as mentees (the good and the bad) and how this reflexivity has shaped their own mentoring practice.

Drawing on experiences with formal and informal mentees, mentors identified obstacles that can hinder mentoring effectively; namely time, matching of mentor and mentee, and attitudes. Lessons learned from diverse experiences also resulted in the formation of certain beliefs about mentoring and its many aspects. For example, mentors must know their content, have a passion for their profession, and understand the intricacies of being a mentor.

Theme 3: Mentee's experience with Master Teacher mentor

Mentees shared exciting and, in one case, troubling times in regard to their experiences being mentored thus far in their careers. The recollections relate to mentoring in pedagogy and curriculum content; and to motivation and collaboration connected to their mentorship. Much like the comments within the *mentors'* grand theme of experiences, the mentees' experiences shaped some fundamental beliefs about mentoring.

Two of the mentees (Participant 6 and Participant 7) were active in Borderland ISD's mentoring program at the time of interviews. They explained that new teachers are assigned a mentor for their first three years with the district. Both had mentors that were on their campus, and both had mentors in the same subject area. One of these mentees, however, had been matched with a science mentor from this study as a preservice teacher the previous year. At the time of the study, he was matched up with a different mentor due to his assignment to teach math as an inservice teacher (he is dual certified in math and science). This mentee's reflections and responses to questions were based on his interactions with his mentor from this study. Participant 7 had been assigned to his mentor (included in this study) for two years now. Both of these mentees reported having positive experiences with seasoned teachers of nine and eleven years of experience.

Participant 7 and Participant 8 were able to attend regular district meetings where:

> They tailored the training to what we as a whole group kind of wanted. So that helped out a lot too. So it looks like [Borderland ISD] has been doing this for a while and it's working out. At least in my eyes it's working out. Instead of just have at it! And see what happens kind of thing. (Participant 7, January 17, 2014)

To their understanding, the intent of Borderland ISD's mentor program was to lower the turnover rate of novice teachers. The only negative aspects reported by Participants 7 and 8 were that there was not enough training on administrative tasks (documentation, paperwork, etc.), and there were so many strategies introduced in their district trainings that they became overwhelmed wanting to use them all. "[I am trying] to figure out that right combination of…a strategy and the activity together. Uh, hopefully it will come with more experience and I'll be able to mesh them together" (Participant 7, January 17, 2014).

The third mentee has not been a part of Borderland ISD's mentoring program. She described her experience as an alternatively certified teacher who entered the profession from a different path. She did have a mentor from her campus assigned to her, but this mentee's program was managed by the regional service center instead of the district. As a requirement for the teacher alternative certification program, mentors had to observe their mentees in the classroom and report back to the service center. Participant 8's assigned mentor had only one year of experience and ranked her mentee very poorly. Calibration with a region service center rater revealed Participant 8 was progressing well, despite the low marks from her mentor:

> It even got to the point where I called [the region service center] and I said, "Look, my mentor's going to evaluate me today. Can you come also? And evaluate me?" So my mentor and the mentor- or the [Region] coordinator came. They both evaluated me. Two

> totally different scores… [My] quote unquote mentor was knocking me off on all kinds of stuff and the [Region coordinator] was saying I was doing a great job. So it was very- a lot of personal bias. I I don't- I didn't understand why that was happening. (January 27, 2014)

At that point, the region service center-assigned mentor was released from her mentor duties. Participant 8 later sought out a mentor of her own; that mentor turned out to be one of the STEM Master Teachers from this study. The responses to Participant 8's mentoring experiences focused mostly on the positive experience with her self-selected mentor. It is important, however, to understand the history of this particular relationship, as it differs from the experience of the other two mentees. It could also account for why Participant 8, after five years of teaching experience, continues to regularly seek the support of her mentor.

The three mentees in this study verbalized a great amount of growth and support in their experiences working with their STEM Master Teacher mentors. One example was becoming more comfortable with the content to be taught. Participant 7 admitted, "The first year yes, I was lost" (January 17, 2014). Participant 8 claimed to "feel more comfortable in chemistry now because of her…I have a good mentor…she's very knowledgeable in not only uh in the subject but also in the pedagogy of teaching" (January 27, 2014).

Mentors also supported mentees in their gradual progress toward developing pedagogical practices in the classroom. Participant 6 felt he wasn't prepared in his university classes and wasn't "really sure if [teaching] was what I wanted to do". It was not "until I got into that mentorship. And then you know, saw things kind of click a little bit. Saw how it runs" (January 15, 2014). Participant 7 also shared uncertainty in the beginning with functioning in the classroom:

> This year [I see] this is where I wanna [sic] go with that lesson and we get to see the picture. It flows a little bit better for me. And I'm starting to see, oh yeah we gotta get to that door, but to get to that door we gotta go in this direction. And last year…there was no door. It was just uh follow the line and see where it leads you. (Participant 7, January 17, 2014)

Learning to see that big picture and to know the end goal of classroom instruction is paramount, especially when considering that every year changes:

> When we were in school we kept on hearing, "First year's the hardest. Because after that, you're gonna [sic] have everything you did last year. And you're just gonna [sic] reuse it." That's not true. We're constantly changing our our lessons. We're adjusting it. (Participant 7, January 17, 2014)

Participant 8 shared similar thoughts, "It's always different every year. We don't teach the same thing every year. Like we'll teach the same topic, but I do different stuff" (January 27, 2014). With constant adjustments, therefore, it is vital that novice teachers have the support system of a mentor.

The format of mentor support typically came as collaboration between the mentor and mentee as seen in the comments here. Participant 6 states, "having that everyday…one-on-one conversation…We had a really really good working relationship" (January 15, 2014). Participant 7 recognizes collaboration as a key to success:

> We actually collaborate and he values my opinions as much as I value his input into things. So, I thought it was gonna [sic] be more like okay he's gonna [sic] show me the ropes. This is the way we teach here and no ifs or buts about it. But no, it's been like a team, group effort kind of thing. Which is really good. I like it. I think it's helping me

as a teacher and not being forced into someone else's mentality of teaching. (January 17, 2014)

Participant 8 felt strongly that "Collaboration is very important in teaching, and you can't be proprietary at all in teaching…for the success of the school, students, the team, you really can't be that way" (January 27, 2014).

This strong collaboration between the mentees and their mentors is one factor that kept the mentees motivated. Having "a strong teacher on my side" (January 15, 2014) kept Participant 6 charged; and he also spoke about intrinsic motivation. He considers himself a proactive self-starter. His mentor knew to "let me go at my own pace and pick things up quickly. Slow it back if I needed to and he would just be there and gauge me and guide me, and and help out." Participant 7 added how his students encouraged him:

> You do hear every now and then a kid say, "Really. It's that easy?"…And that's what um...helps. Like they help me grow inside every now and then hearing someone pleased with what we showed them…some do actually appreciate and they say thank you every day when they leave uh the classroom. So I think that helps you grow personally and um makes you wanna [sic] come back. (January 17, 2014)

I conclude with culminating beliefs about mentors and mentoring from Participant 8, based upon her experiences (the good and the bad) as a mentee:

> Number one, experience. [The mentor] should have experience in that subject. Um, and also just teaching. Um, good classroom management would be number two. And then three, just openness to helping another person out…you can't be a passive mentor. You know, you have to really get in there. Even if you don't like the person, you really do

have to help [your mentee]. If you want them to stick around, you have to help them. (January 27, 2014)

Mentees expressed the extreme value they place on their collaboration and relationships with their mentors. Growth and development in pedagogical and content knowledge was influenced by the support from mentors. Mentees appreciated the support in classroom management strategies and advice. Collaboration with mentors as a means of shared learning was of definitive value to all mentees. Mentees also voiced expectations and parameters they felt important in a mentor, such as having a solid knowledge base in their content, a willingness to allow the mentee to experiment and coach them if efforts fail, and respecting them as equals.

The two remaining grand themes are common to both mentors and mentees. For each theme, mentors' responses will be discussed first, followed by those of the mentees. Chapter Five will interweave mentor and mentee responses from these themes.

Theme 4: Teaching self-efficacy of mentors and mentees

For this study, each participant was asked to complete a teaching efficacy survey in the subject area he/she teaches: the STEBI (Science Teaching Efficacy Belief Instrument) or the MTEBI (Mathematics Teaching Efficacy Belief Instrument). Responses to these surveys are included in the section *Surveys* below. The theme reported here features elements of teaching self-efficacy from participant interviews. The final guiding question of each interview was, "Prior to this interview, you completed a survey about your teaching efficacy beliefs. What comments or ideas would you like to share in relation to those survey items?" This question triggered discussion around elements of teaching self-efficacy and gave the participants the

opportunity to expand their thoughts and perceptions beyond the limitations of a Likert scale survey. Participants' statements are captured here.

The mentor group spoke primarily about the responsibility of the teacher. Responsibilities to students included finding ways to engage all students, building relationships with students, being prepared, and knowing your content well enough to truly know if your students understand the concepts. Participant 2 captures some of these points:

> If you don't...engage the children; if you don't reach out to them. First of all they won't respond- and I think that's with any subject. So your first great challenge is getting that rapport with the kids, with the students. Um, once you have that, you know, they need to trust that you know your subject. Cuz they'll read right through you. (November 25, 2013)

There was expression of responsibly meeting the diverse needs of students with varied academic preparedness and levels, such as Participant 3's comment,

> It's like you gotta clone yourself to be ten different teachers in one classroom because you got ten different SPED kids that have different needs…So it's it's a a challenge. It's holding us accountable. If we're teaching, we're teaching true to what we're supposed to be doing, every kid should have some knowledge base that they can say we learned this. (January 11, 2014)

Also mentioned was a responsibility to get parents involved in student learning by providing opportunities for them to become more active participants. Finally, there is a responsibility to continue professional growth to benefit instruction and student learning:

> My perception on science is the fact that there's always room for improvement. There's always stuff to learn… it's an important job and it doesn't matter the level of the kids,

you gotta try and get them to to at least like it, you know. Something about it. (Participant 1, November 19, 2013).

STEBI and MTEBI surveys include self-efficacy questions related to teachers' levels of content knowledge. In this study, the mentors considered themselves to be comfortable with their content. "I consider myself a very good math teacher. I consider myself effective in the classroom, because I know the material" (Participant 2, November 25, 2013). "I can talk math and I can talk science. I feel comfortable with it" (Participant 3, January 11, 2014).

Each of the mentors felt that teachers are important to student success. "As far as learning something like biology, I think the teacher is the most important part of it" (Participant 4, November 22, 2013). It also makes a difference of "who the teacher is and what their approach is" (Participant 5, December 14, 2013). There should be a love for working with students and motivation for helping students succeed. This is crucial because, as the mentors explained, it is not always easy to keep students motivated.

"They're just not driven" explained Participant 3 of some students. "I could try to bring these kids in after school. Which, if they're motivated, they'll show up. But if they are not motivated, then I can't teach them" (Participant 3). Statements like these hint at the level of self-efficacy in teaching; which will be elaborated upon in Chapter 5. Participant 4 felt that "whenever you get the parents involved….that's a good idea" for raising student motivation. Ultimately, low motivation is present in classrooms and could require teachers to exert extra effort.

Extra effort was discussed in different contexts. Some mentors told of ways in which they reached out to parents to gain increased support. Others discussed using their lunch or

conference periods to tutor a low-performing student. Participant 3 told of a camp she held for her students on the Friday and Saturday prior to everyone returning from the winter break.

A final discussion point within this theme is professional aspirations of the mentor group. When asked about expectations for their next professional position, the mentors had the following to say, "I'll probably be in the classroom for a while and if anything with that, um, possibly instructional specialist in the future. If not, maybe assistant principal…and possibly going for the Ph.D." (Participant 1, November 19, 2013). Participant 2 planned to complete his Masters degree and possibly become an instructional specialist. Participant 5 also showed interest in working as an instructional specialist, possibly for an elementary campus. Participant 3 could see herself in the classroom at least another two to four years because she loves what she does. "If a dual credit chemistry program opens up at [my school], uh I would love to be a part of that" (Participant 3, January 11, 2014). Participant 4, who was working on his doctoral degree at the time of this study, wasn't sure what would happen afterward but did state, "I like teaching. I'm fine here where I am...So, as far as like um, being a principal? Or an assistant principal? I don't see that in the plans. Um, maybe some working at central office somehow" (November 22, 2013). All mentors shared intentions of remaining in education in the future.

Mentees also reacted to the survey questions in regard to teaching self-efficacy. Beginning with teacher responsibility, mentees felt that it was up to them to motivate students:

> I do feel that it is the teacher's responsibility for the most part to find a way to motivate the kids. That's just how the generation is now I think. I mean they're not gonna [sic] wanna [sic] do it unless you get it in to them that it's interesting, or there's a reason they're gonna [sic] have to do it. (Participant 6, January 15, 2014).

Participant 8 added, "It's hard to teach. You can easily lose the kids. So, um planning is really important" (January 27, 2014). This relates to remarks regarding the importance of the teacher. "I think if the kids are succeeding, it's a big part. You know, of the teacher, of the teacher's classroom" (Participant 6, January 15, 2014). Participant 7 also explained the importance of continuously looking for "more effective teaching approaches" (January 17, 2014). There was minimal dialogue about content knowledge from the mentee group. One comment was in regard to watering down the content learned in college so that high school students could understand the concepts.

The issue of student motivation comprised more of the conversation from mentees. "It's hard sometimes to get some kids to see- they just don't like math. And for that, they don't like science, and like the subjects they don't like, they're not gonna [sic] like them. No matter how hard you try" (Participant 7, January 17, 2014). Participant 8 was frustrated that, "There are just some kids you can't get through to...no matter how much, how motivating you are, or anything. They've lost so much knowledge that it's really hard to get them to even have any sort of interest in science" (January 27, 2014). Parents also came into the picture when discussing student motivation. Participant 8 shared a story of trying to overcome a situation of low student motivation that stemmed from home:

> I noticed one of the students I had…was very unmotivated in science because her parents were telling her she didn't need it…and her mother told me at a parent conference that she's never gonna [sic] use chemistry. So why should she- why should her daughter even bother? You know, so it's like, no matter what I did, I couldn't convince her. You know, so I tried convincing the mom like, "Well, do you dye your hair?" And she said, "Yeah". That's chemistry. You know, "Do you cook?" "Yes". That's chemistry. So you do use

> [it] every day. You know? Maybe not electron configuration, but, it's you know? Some kind of chemistry. You use it every day. (January 27, 2014)

In situations of low student motivation, students who are struggling, etc., mentees felt it necessary for the teacher to exert extra effort. They talked about not giving up and trying even harder. They discussed continuously working to find what will work and putting in extra time.

Expectations of future professional positions were shared by the mentees. The least experienced, Participant 6, holds a double certification in math and science. He was teaching math at the time of this study, but was working with his principal to create a position to "do half Algebra I with freshman and half biology. Split math and science" (January 15, 2014). He expressed staying in teaching; "for now". Participant 7 saw himself spending the majority of his career in the classroom as a math teacher. Participant 8, the most experienced mentee, declared:

> I love teaching and I wanna [sic] stay in the classroom. So I'd like to pursue a Master's in chemistry and teach dual credit one day. Or- and if that doesn't work out, then go into administration. But, I'd like to stay in the classroom…I'm used to always moving up, and it's hard for me to stay in one position. And I I think, I'm hoping that..dual credit is the wave of the future. You know, the way they're restructuring the curriculum. You know, with endorsements and all that stuff? So, I don't I'm- I don't know. I really..it's one of those two. (January 27, 2014)

Much like the mentor group, the mentees shared an interest in continued careers in the field of education.

Using the STEBI and MTEBI survey items as possible discussion prompts, mentors and mentees elaborated on their teaching efficacy beliefs. One efficacy component discussed deeply was the complex responsibilities of the teacher. Among these, building relationships with

students, finding ways to engage all learners and increasing parental involvement were points of challenge for mentors and mentees. Also discussed were examples of teachers exerting extra effort in order to help their students succeed. Each participant wishes to remain in education, indicating a positive belief in the teaching self-efficacy of the two groups.

Theme 5: Forms and elements of interactions between mentors and mentees

This theme is a collective account of the comments from both mentors and mentees about their relationships and interactions throughout the mentorship phenomenon. Also included are discussions about the overall value of teacher mentoring and barriers to mentorship that were discussed during interviews.

Mentors reported the importance of building a relationship with their mentee over time. "After a while they [mentees] just feel comfortable" (Participant 2, November 25, 2013). The relationship can be easier to establish, and more advantageous if the mentor and mentee are from the same teaching discipline. A mentor must consider their approach with their mentee. Participant 1 explained, "I think as a mentor you don't wanna [sic] impo- you don't wanna [sic] feel like you're imposing or getting other people upset. Or feel like you're coming on too strong. And everybody's different, so it's kinda hard to gauge someone" (November 19, 2014). Participant 4 looked at the mentor/mentee relationship in terms of:

> Guiding them…So that they- I guess have the tools to get to where they need to go, but they find it on their own. So you don't really want to push somebody in a direction they don't want to go because then that, they have nothing invested in it. So as long as they are moving toward- in the right direction, you keep helping them out. But if they get off track, kind of help them get back on track. (November 22, 2013)

Creating a strong mentor/mentee relationship and maintaining that relationship is crucial. In fact Participant 1 explained, "when there's something that happens with the relationship between the mentor and the mentee it's very hard to mend it. I think there's an uncomfortable tension there and that tension is, is very hard to overcome" (November 19, 2014). The relationship is built upon interactions between the mentor and mentee. The frequency of interactions among mentors and mentees was of significance to the mentors. "You should have uh continuous meetings, observations, continuous talks with [mentees]" (Participant 1, November 19, 2013). The other mentors also described collaborating with mentees at least weekly; or in the case of Participant 2, on a daily basis.

Collaboration topics between mentors and their mentees were varied by subject and purpose. For example, Participant 5 illustrated how her mentee needed the most help in content and simply surviving through the end of the year:

> She needs a lot of encouragement and I'm always telling her you know that it kind of comes in waves. It'll get better um, even after Christmas. That can make a big difference in their [students'] maturity. And it's um, you know, being there to lift her up and sharing uh ideas when we're doing our common planning together. Uh, just you know being open to her ideas and encouraging her ideas. And then letting her know, well this works for me. Um try this. Have you tried to show more visuals? Or, you know, just giving her ideas to help her out. (December 14, 2013)

Participant 3 interacted with her mentees for needs that were quite different:

> I noticed that a lot of the stuff that [mentees] have trouble with was not even content stuff. It was more classroom management, and routines, and setting up. Like my kids always have a mini quiz, a five minute mini quiz at the beginning- and that allows me to

take attendance, you know. If I tore down a lab because I had an AP class and then I have a general chemistry class which means I'm switching gears; that gives me enough time to secure chemicals or whatever…And so I told her that's very very beneficial… the kids know that you- they're walking into a quiz…And so it keeps the tardies down. It gives you some time to take attendance. And these are little things that I shared with my mentees. (January 11, 2014)

Participant 2 has interacted with mentees in combination of content *and* classroom management:

We do curriculum and…we go through a lesson cycle where I tell him, you know, we should do this so we can engage the students. After that, you know, uh help them here and help them there. And I can tell him, you're gonna [sic] have problems with this or the kids will have problem here. So you need to, you know, look out for that…We talk a lot about room arrangements cuz I keep moving my room around…students that act up or do this, you want put them here, you wanna [sic] place them there in front of the room...and he tells me, you know, he looks at me first and then he'll try it. "Yeah it worked." (November 25, 2013)

Participant 1 remembered difficult interactions with a mentor/mentee relationship that had failed:

It was at the point where, you know, where we'd we'd have to set up an appointment for observation meetings. I would send out an email and I would have to copy them to the person in charge of it to let them know that I'm still trying to make those interactions with her. But, I was getting nothing back. Or you'd go to her classroom and she wasn't there. So she was kinda MIA for a while. Unfortunately. It was very awkward. (November 19, 2013)

To some degree, interactions between the mentor and mentee will depend on the needs of the mentee, as Participant 4 described:

> As far as working with [mentees], um, if I need to be that kind of like, coach type person for a for a teacher, I'll help with. If that's what they need or that's what they ask for. But most of the time, it's more of a collaborative relationship, and I just bring in my experience and what I know. They'll bring in their experience and we'll just try to come up with the best plan possible. (November 22, 2013)

The interactions between mentors and mentees, as described by the mentor group are dependent upon the needs of the mentee, should be regular and ongoing, and are vital to the overall working relationship.

According to the mentor group, in order to effectively serve in a mentor role, several aspects should be prerequisite. First, the mentor must have experience teaching in the field. Mentoring should take place between a mentor and mentee matched at the same campus. Participant 3 advocated for campus-based mentors:

> I don't know if I believe in mentoring when it's like a district personnel going in to them and telling them [mentees] what to do. I think it needs to be somebody that knows the culture of the school. That knows the students. That, you know, knows exactly which base we're on. (January 11, 2014)

Additionally, the mentor should have training and knowledge about mentoring in order to be a good mentor.

Of course mentoring is not an easy role to play. The mentor group identified several barriers to their ability to effectively work with their mentees. Mismatches between mentor and

mentee (different content areas taught, for example) could pose an obstacle to effective mentorship. The responsibilities and work load of teaching one's own class can interfere as well:

> I would like to mentor more teachers…But it's just, it's it's very hard. Unless you're given the opportunity to, you know, teach half of the day and the other day [mentor]…But, if you're teaching full time, staying after school doing tutoring. I coach. It's just very hard to find the time. (Participant 2, November 25, 2013)

Personal responsibilities, such as family obligations or attending university classes can be a barrier that impedes on time for mentoring as well. The attitude of the mentee and their willingness to accept mentoring pose a potential barrier. Moreover, the lack of opportunity to serve as a mentor at all is an obvious barrier.

In the end, the mentor group recognized the value of mentorship, understood its benefits, and would like to see teacher mentoring continue. Some mentors voiced the personal benefits of serving as a mentor. "I draw from them more that they are drawing from me", said Participant 3 (January 11, 2014). And Participant 2 claimed to always have "good experiences with mentoring other beginning teachers". He added, "I hope I can continue doing that. Cuz I I like to do that. Um, I feel that um I've helped. I've helped some people. And that just makes me feel um satisfied or, you know, accomplished" (November 25, 2013).

Next, I will present findings from the mentees' interviews in relation to Theme 5: Forms and elements of interactions between mentors and mentees. I will begin with the relationship of the mentor and mentee. Each mentee told of a strong relationship with their STEM Master teacher mentor. "I have a good mentor. Uh, she's very knowledgeable in not only uh in the subject but also in the pedagogy of teaching" explained Participant 8 (January 27, 2014). The mentees described the openness of their mentors and felt that they could go to them for help with

anything, and as often as necessary. These are collaborative relationships in which each member is respected as a professional:

> He values my opinions as much as I value his input into things… So, I thought it was gonna [sic] be more like okay he's gonna [sic] show me the ropes. This is the way we teach here and no ifs or buts about it. But no, it's been like a team, group effort kind of thing. Which is really good. I like it. (Participant 7, January 17, 2014)

Participant 6 felt that the relationship with his mentor has been very successful. He stated that, in order for a mentor/mentee relationship to work, "it has to be two people that can work together like that. You know willing to talk back and forth and take advice and all that" (January 15, 2014). Participant 8 has had two extremes in relationships with mentors:

> When I first started I had uh a bad mentor. She had only been teaching for two years, and it was my first year. And uh, it was hard-like she would walk into my classroom and tell me everything that I was doing wrong. Which, you know, you're supposed to I suppose. But then, uh, since it was part of the [Regional Service Center] program, I had to go and see her teach too. And her classroom wasn't any better than mine. So I- it was really hard for me to take what she was saying seriously, or take it to heart because she wasn't implementing what she was critiquing me on. (January 27, 2014)

Luckily, her STEM Master Teacher mentor is much more effective. "She's a great mentor. I really- she'll take you…under her wing I should say. And teach you how to fly. You know? That's- so I'm grateful for her" (January 27, 2014).

Of course much of the strength of the mentor/mentee relationship depends on the interactions between the two parties. The mentees spoke about the collaboration they enjoy with their mentors. They welcome feedback from observations mentors make of them. They

appreciate their mentors' encouragement to reflect on how a lesson went and their follow-through with discussion and/or suggestions for improvement:

> [My mentor] doesn't uh butt in in the sense and say, "Alright, do this strategy with this because this is the way it should work". Uh, he lets me explore that on my own and find out oh it didn't work out. It didn't pan out the way I thought it was going to pan out in my head. So, I think I learned more that way than him just spoon feeding me the stuff… I think it's helping me as a teacher and not being forced into someone else's mentality of teaching. (Participant 7, January 17, 2014)

The mentees felt their STEM Master Teacher mentors were qualified and highly effective in assisting their growth as professionals. Mentor characteristics that seemed to be most valued by mentees were listed by Participant 8, as, "Number one, experience. [Mentors] should have experience in that subject. Um, and also just teaching. Um, good classroom management would be number two. And then three, just openness to helping another person out" (January 27, 2014).

The mentee group did share concerns over barriers that impede on their development as teachers, as well as being able to fully reap the benefits of working with a mentor. Much like the comments from the mentor group, mentees too felt time constraints were a major hurdle. They complained of the amount of unnecessary meetings at their campuses that take away from what could be planning time. These novice teachers also felt overwhelmed by trying to fit in all the strategies and tools they learn about from district professional development:

> We get all this cool training on different teaching techniques and different strategies um, but at least I found myself um, at this point kind of like overwhelmed. Having so many strategies that I wanna [sic] try that seem so promising. I I can't because I don't have uh, the time to do it. (Participant 7, January 17, 2014)

An additional barrier was not yet having a handle on classroom management and some of the administrative duties required of a teacher. Mentees felt supported by their mentors in trying to overcome barriers, and expressed the value of mentorship.

Simply put, "That was what kept me here wanting to be a teacher. That mentorship program" (Participant 6, January 15, 2014). Furthermore, Participant 6 declared, "I definitively think a mentor program, you know for new teachers, is something that needs to stay." He was not alone. Participant 8 admitted, "I would have probably quit too if she- if I didn't have that [mentor] support" (January 27, 2014). Participant 7 understood that the district goal was "retaining teachers. So they started this [mentoring] program. I like it. Quite a lot" (January 17, 2014). The value of mentorship was mutually felt by all mentees of this study.

Although experienced from different roles, both mentors and mentees reported positive interactions in their current mentoring situation. Mentors stated building relationships with mentees was an important starting point. Regular, ongoing collaboration was important to both groups. Mentors understand that they must adjust their level and type of support depending on the needs of their mentee. Mentees described being treated as equals by their mentors and respect their knowledge and expertise. Barriers to mentoring interactions were named by both groups, especially time, but overall every participant felt the mentoring program is beneficial and should continue.

The preceding grand themes, (1) professional development from the Master Teacher Academies; (2) Master Teacher mentoring experience and self-efficacy; (3) mentee's experience with Master Teacher mentor; (4) teaching self-efficacy of mentors and mentees; and (5) forms and elements of interactions between mentors and mentees, capture teacher mentoring experiences and practices of the mentor and mentee sample from Borderland ISD. Gathering

data on the perceptions of both mentors and mentees afforded a more holistic approach and triangulation in the examination and understanding of the teacher mentoring phenomenon. Additional data collected for this study, in the form of survey responses and the review of documents, are presented below.

Document Review

In order to more fully understand the perceptions of the participating mentors of this study, it was enlightening to review multiple documents that relate to their background experiences. I administered two versions of a self-efficacy survey that match the teaching assignment of the participants, the Science Teaching Efficacy Belief Instrument (STEBI) (Riggs and Enochs, 1990) and the Mathematics Teaching Efficacy Belief Instrument (MTEBI) (Enochs, Smith, & Huinker, 2000). These surveys may be found in the Appendices B and C. Surveys used for data collection reported two aspects: perceived teaching efficacy of the responder in their subject area, and their perceived outcome expectancy. Perceived self-efficacy is "a judgment of one's ability to organize and execute given types of performances, whereas an outcome expectation is a judgment of the likely consequence such performances will produce" (Bandura, 1997, p.21). Survey items include several aspects related to teaching self-efficacy since:

> Teachers' perceived efficacy rests on much more than the ability to transmit subject matter. Their effectiveness is also partly determined by their efficacy in maintaining an orderly classroom conducive to learning, enlisting resources and parental involvement in children's academic activities, and counteracting social influences that subvert students' commitments to academic pursuits. Multifaceted teacher efficacy scales (Bandura,

1990b) enable researchers to select those that are most germane to the domain of functioning the research is designed to elucidate (Bandura, 1997, p. 243).

STEBI and MTEBI self-efficacy scores range from 13 (indicating the lowest level of perceived self-efficacy) to the highest level at 65. Outcome expectancy scores range from the lowest level of 12 to the highest, 60. Mentor scores for self-efficacy ranged from 57 to 63, while mentee results ranged from 51 to 61. Outcome expectancy scores ranged for the mentor group from 37 to 52; and for the mentee group from 31 to 40. Results are presented in Table 4.4.

Table 4.4 Self-efficacy and Outcome Expectancy Scores from STEBI/MTEBI Surveys

Participant	**Mentor/ Novice**	**Years Experience**	**Survey Taken**	**Self-efficacy Score (13-65)**	**Outcome Expectancy Score (12-60)**
Participant 1	Mentor	7	STEBI	61	52
Participant 2	Mentor	11	MTEBI	57	37
Participant 3	Mentor	11	STEBI	63	45
Participant 4	Mentor	9	STEBI	63	42
Participant 5	Mentor	14	STEBI	60	49
Participant 6	Novice	<1	MTEBI	58	40
Participant 7	Novice	1	MTEBI	51	31
Participant 8	Novice	5	STEBI	61	37

Although results were tabulated according to the scoring guidelines for each survey, the items were used qualitatively to gain an additional layer of descriptive data. The items were used as a discussion prompts during interviews to allow participants to discuss and describe their perceptions related to components of teaching self-efficacy and expected outcomes in mathematics and science (which was detailed in the interview section of this chapter).

Several documents regarding the Master Teacher Academies at Desert State University were inspected and will be summarized here. The MTA Program Director's Year-End Report (2012) details program history, goals, and progress up to that point.

> [Desert State University's] Department of Teacher Education applied to become an approved Master Teacher Program provider in 2003-2004, and by 2004 it was the first organization to offer courses for MT [Master Teacher] certification in all four MT areas (MTT [Master Technology Teacher], MMT [Master Mathematics Teacher], MST [Master Science Teacher], and MRT [Master Reading Teacher]) (Giza, Hampton, & Robertson, 2006). Even though the courses for the MT certification were subsumed within the course sequences for the Teacher Education Masters of Education, Instructional Specialist Degrees few teachers would go on to take the exams after completing their Masters degrees - most were focused on the personal success of achieving Masters Degrees and were not cognizant of the additional role that MT certification provided to them. Even though some local districts provided stipends to Master Teachers, and despite the fact that the districts recognized their worth, very few were available. By 2009 there were almost no MMTs [Master Math Teachers] or MSTs [Master Science Teachers] and only a couple of MTTs [Master Technology Teachers] in the region.
>
> The [Desert State University] Master Teacher Academies program was initiated in the late summer of 2009 with funding from the Texas Higher Education Coordinating Board MSTTPA program (cycle 3). The [Desert State University] Master Teacher Academies concentrates on two…areas: Master Teacher Certification and…Masters of Education Programs…The [Desert State University] Master Teacher Academies (MTA)

> began recruiting teachers in the second half of 2009 and stared [*sic*] providing support for MT-related graduate courses in the fall 2009 semester. The MTA also began to vigorously develop robust partnerships with school districts, the [local] Community College (to coordinate with HS/College dual-credit teaching programs), and with Colleges across the [Desert State University] campus. It has built partnerships and leveraged resources across the colleges of Education, Science, and Engineering at [Desert State University], and has generated partnerships with three local school districts, resulting in over two dozen teachers receiving Masters Degrees to date through the program, and another two dozen completing the coursework for Master Teacher Certification. As of September 2012 many members of the first cohort have either taken the May 2012 TEXMaT Exams for Texas Master Teacher Certification in mathematics, science, or technology or the Fall 2012 certification exams. Several successful TEXMaT certifications have been already achieved by several early completers who took certification exams in 2011, and some of the May 2012 test-takers have received their results and have conveyed those results to us. (Report to Texas Higher Education Coordinating Board, 2012)

This report sheds light on the purpose and goals of the MTA program that mentor participants were a part of. The MTA program has archived information regarding student participants since its initiation, some of which is shared below.

The Master Teacher Academies program at Desert State University records longitudinal data of all participants, their demographics, and activity while involved in the program. This includes a history of the MTA-offered workshops attended by each participant. Mentor

participants in this study attended several of the MTA workshops, although some capitalized more on opportunities than others. This can be seen in Table 4.5.

The MTA program has also recorded performance scores on the TExMaT exam. Each domain on the TExMaT is assessed in multiple choice format. A case study written response is the second component of each TExMaT exam, and is scored utilizing a rubric with a score range of one to four. (See Appendices D-F for rubrics). The multiple choice score and written response score are combined for a total test scaled score (ETS Preparation Manual, 2014).

TExMaT exam results are reported out by domain, one of which addresses the mentoring component of Master Teacher certification in Texas. For the Masters Mathematics Teacher 4-8 exam, this is Domain 5- Mathematical Processes, Perspectives, Mentoring, and Leadership. Domain 5 makes up approximately fifteen percent of the multiple choice section of the exam, and is also addressed in the case study written response (Texas Education Agency, 2012). For the Master Science Teacher 4-8 and Master Science Teacher 8-12 exams, the mentoring element is Domain 6- The Learning and Teaching Environment, Mentoring and Shared Leadership. Domain 6 comprises approximately fourteen percent of multiple choice items of each exam, with the Domain 6 also addressed in the case study written response. Passing scores for the mentors in this study can be seen in Table 4.5

To gain insight into the preparation of the STEM Master Teachers of this study, I examined the Desert State University academic transcripts of each mentor participant. Specifically, I scrutinized transcripts for the content courses of each mentor—math courses for those who teach math, and science courses for those who teach science. I also noted any math/science education or pedagogy classes taken. I accessed undergraduate and graduate

transcripts for all but one participant (Participant 4). Only doctoral level transcripts were available at Desert State University for this mentor. Table 4.5 has a tabulation of math/science and math/science education or pedagogy total credit hours for each mentor participant, along with notation of any withdrawals or failed courses in these focus areas.

Documents from the Texas Education Agency (TEA) were reviewed during the course of this study. Texas Academic Performance Reports (TAPR), formally Academic Excellence Indicator System (AEIS) reports, are published annually and include the number of beginning teachers and turnover rates for the state of Texas and all school districts. Table 4.6 compares this data for Texas with Borderland ISD, as well as two neighboring districts with similar demographics.

To further compare the status of new teachers and attrition for Borderland ISD compared to the neighboring districts and the state, I reviewed the history of teacher turnover rates for the last fifteen school years. Although Texas Education Agency AEIS and TAPR reports do not disaggregate teacher turnover rates by the years of experience for those leaving the profession, it is pertinent information to the purpose and goals of teacher mentoring. Table 4.7 presents the findings of the rates of Borderland ISD, its neighboring districts, and the state of Texas for school years 1998-1999 through 2012-2013. Note that Borderland ISD has the lowest teacher turnover rate (noted in red) of the three districts for nine of the fifteen years, and has consistently been below the state teacher turnover rate.

Table 4.5 Summary of STEM Master Teacher Mentor Document Review from Various Sources

Participant/ Area Taught	MTA Workshops Attended	TExMaT Exam Results		Transcript Review: Total Credit Hours
		Mentoring Domain Score (Multiple Choice)	Holistic Score from Case Study (Range 1-4)	
Mentor 1 HS Science	Science Workshop; MTA Workshop; Workshop; MTA Workshop; TExMaT Qualifying Exam Session	TExMaT: 8-12 Science		Science: 84 (1 withdrawal)
		9/11 questions 82% correct	3	Science education/ pedagogy: 21
				Undergraduate & Masters
Mentor 2 MS Math	Free and Portable Technology in the Classroom; Static Electricity and Electric Circuits; Rockets; Clickers; Chemistry; Physics; Technology; Mathematics; Mathematics	TExMaT: 4-8 Math		Math: 21 (2 withdrawals, one F)
		13/14 questions 92% correct	Not available at the time of study	Math education/ pedagogy: 21
				Undergraduate & Masters
Mentor 3 HS Science	Mentoring Strategies; Mentoring Strategies; Physics; Chemistry; Technology; Math Content	TExMaT: 8-12 Science		Science: 70
		8/11 questions 73% correct	3	Science education/ pedagogy: 18
				Undergraduate & Masters
Mentor 4 HS Science	Science Workshop; Workshop; MTA Workshop; MTA Workshop; MTA Workshop; TExMaT practice (follow up); MTA Workshop; TExMaT Qualifying Exam Session	TExMaT: 8-12 Science		Science: n/a
		11/11 questions 100% correct	3	Science education/ pedagogy: 12
				*Doctoral level only
Mentor 5 MS Science	Free and Portable Technology in the Classroom; Static Electricity and Electric Circuits; Rockets; Action Science; Technology; Informal Meeting; Mentoring; Chemistry; Testing/Reception; TExMaT practice session; TExMaT Qualifying Exam Session	TExMaT: 4-8 Science		Science: 54 (1 withdrawal and three Fs)
		8/11 questions 73% correct	3	Science education/ pedagogy: 24
				Undergraduate & Masters

Table 4.6 School Year 2012-2013 demographics and teacher turnover rates for Texas, Borderland ISD (pseudonym), and two neighboring districts. Source: Texas Education Agency, 2013

	Texas	**Borderland ISD**	**Neighbor District A**	**Neighbor District B**
Total Students	5,058,939	43,512	44,054	62,884
Student Ethnic Distribution (%)	African American 12.7 Hispanic 51.3 White 30.0 American Indian 0.4 Asian 3.6 Pacific Islander 0.1 Two or more races 1.8	African American 1.0 Hispanic 95.7 White 2.7 American Indian 0.1 Asian 0.2 Pacific Islander 0.1 Two or more races 0.3	African American 2.3 Hispanic 91.0 White 5.3 American Indian 0.3 Asian 0.6 Pacific Islander 0.1 Two or more races 0.4	African American 4.1 Hispanic 82.6 White 10.6 American Indian 0.2 Asian 1.1 Pacific Islander 0.3 Two or more races 1.2
Economically Disadvantaged (%)	60.4	81.1	72.1	69.7
Total Number of Teachers	327,419.5	3,053.7	2,295.9	4,145.4
Teachers by Ethnicity & Sex (%)	African American 9.4 Hispanic 24.9 White 62.8 American Indian 0.4 Asian 1.4 Pacific Islander 0.1 Two or more races 1.1 Males 23.2 Females 76.8	African American 1.8 Hispanic 81.0 White 15.8 American Indian 0.2 Asian 0.7 Pacific Islander 0.0 Two or more races 0.5 Males 27.3 Females 72.7	African American 1.9 Hispanic 81.2 White 15.5 American Indian 0.2 Asian 0.6 Pacific Islander 0.0 Two or more races 0.5 Males 29.0 Females 71.0	African American 2.4 Hispanic 66.0 White 28.8 American Indian 0.3 Asian 1.1 Pacific Islander 0.0 Two or more races 1.4 Males 31.3 Females 68.7
Teachers by Years of Experience (%)	Beginning 7.0 1-5 Years 26.1 6-10 Years 22.7 11-20 Years 26.9 Over 20 Years 17.3	Beginning 5.5 1-5 Years 23.9 6-10 Years 25.6 11-20 Years 28.7 Over 20 Years 16.3	Beginning 2.9 1-5 Years 21.3 6-10 Years 33.8 11-20 Years 27.8 Over 20 Years 14.1	Beginning 3.1 1-5 Years 22.0 6-10 Years 27.1 11-20 Years 27.0 Over 20 Years 20.9
Turnover Rate for Teachers (%)	15.3	8.4	10.2	9.2

Table 4.7 Fifteen year account of teacher turnover rate percentages for Texas, Borderland ISD, and two neighboring districts. Source: Texas Education Agency, 2013

	Texas	Borderland ISD	Neighbor District A	Neighbor District B
2012-2013	15.3	**8.4**	10.2	9.2
2011-2012	12.6	6.1	**5.8**	9.1
2010-2011	11.9	7.3	**6.6**	7.7
2009-2010	11.8	**6.5**	7.3	8.6
2008-2009	14.7	**7.4**	9.6	8.6
2007-2008	15.2	**9.4**	9.5	14.7
2006-2007	15.6	**10.5**	11.3	11.3
2005-2006	14.6	**9.1**	9.4	10.6
2004-2005	16.1	**9.9**	10.2	14.1
2003-2004	14.3	**10**	10.3	10.7
2002-2003	15.6	14.2	11	**10.6**
2001-2002	15.7	12	**10.4**	11
2000-2001	16	12.5	11.3	**10.2**
1999-2000	15	**11.5**	13.1	16.5
1998-1999	15.5	13.6	11.7	**11.3**

The various documents reviewed while conducting this study gave a richer, more robust portrayal of the participants and the contexts in which they were prepared as mentors and where they teach and mentor.

Conclusion

The purpose of this qualitative study was to explore and understand the perceptions of STEM Master Teachers' mentoring professional development and self-efficacy, and to examine mentor/ mentee interactions and the teaching self-efficacy in STEM content areas. A multitude of data sources were consulted while conducting the study. Interviews detailed first-hand accounts of the perceptions, experiences, and beliefs of STEM Master Teacher mentors, as well as the mentees that work with them. From these interviews, five grand themes emerged: (1) professional development from the Master Teacher Academies; (2) Master Teacher mentoring

experience and self-efficacy; (3) mentee's experience with Master Teacher mentor; (4) teaching self-efficacy of mentors and mentees; and (5) forms and elements of interactions between mentors and mentees. STEBI and MTEBI surveys depicted the levels of self-efficacy and outcome expectancy in teaching math or science of the mentor and mentee participants. With the review of other various documents, a more robust background was uncovered and descriptive data was gathered that, otherwise, would not have been available. The diverse data sources contributed to the thick description (see page 66) of the participants and their perceptions, the Master Teacher Academies, and the district in which this study is situated. This triangulation of data sources was vital for a thorough examination and understanding of the mentoring phenomenon, and to paint a more complete picture of the experiences that contribute to each participant's perceptions.

In Chapter 5, I further analyze the preceding findings in the context of the guiding research questions; tie my findings to what can be found in the literature; discuss the implications of my findings; and offer recommendations for educators, mentorship programs in universities and school districts, and for further research.

Chapter 5: Summary of Findings and Recommendations

Introduction

We saw in Chapter 4 that the novice teacher with the bad mentor experience was able to overcome the experience and now feels supported and encouraged by her STEM Master Teacher mentor. This mentor/mentee pair report a high level of collaboration and construction of knowledge together. Their interactions are supportive and valued by both. Even though Participant 8 is in her fifth year of teaching, she has a new assignment in teaching chemistry. She has chosen to continue her mentor/mentee relationship and credits her mentor as the reason why she has not quit teaching. For this novice teacher, mentoring was found to be a positive factor in influencing her retention in the profession. Mentoring also enabled her to become a more effective teacher. She continues to participate regularly in a constructivist learning environment in which she and her mentor collaborate and solve issues of puzzlement (Savery & Duffy, 1996), which stimulates new learning. I found similar outcomes for the other mentors and mentees in this study and elaborate on them here.

In this qualitative study I set out to explore and understand the perceptions of STEM Master Teachers' mentoring professional development in the context of the Master Teacher Academies; examine the teaching self-efficacy of STEM Master Teacher mentors and their mentees; and to investigate the forms and elements of interactions between the STEM Master Teacher mentors and their mentees. The significance of this research is linked to the critical need for Americans to possess science, technology, and mathematics skills in order to benefit from or contribute to our knowledge-based society (National Research Council, 2007).

Improving teacher quality, as this is firmly linked to student achievement, is key to enhancing K-12 STEM education and ensuring that students receive a twenty-first-century

education. One difficulty, however, lies in the early-exit of teachers from the profession—with one-third to about one-half of new teachers leaving within five years (Darling-Hammond, 2003; Smith & Ingersoll, 2004). The American Association of State Colleges and Universities (2006) argue it could take years for novice teachers to develop necessary skills to be most effective in the classroom. This has a "negative impact on student learning, particularly in poor and low-performing schools where new teachers are often assigned" (p. 1). In response, states are increasingly mandating mentoring and induction programs for new teachers because they realize the "investment in the learning of all youth requires investment in mentoring new teachers" (Athanases et al., 2008, p. 767).

I conducted this study, therefore, to examine "the thinking of teachers engaged in mentor preparation [which] is important because of the strong relationship between teacher thinking and practice" (Koballa et al., 2010, p. 1073). My findings may be used by various stakeholders to inform their efforts in establishing, improving, and maintaining teacher mentor preparation programs.

Summary of Findings

Participant interviews resulted in five grand themes: (1) professional development from the Master Teacher Academies; (2) Master Teacher mentoring experience and self-efficacy; (3) mentee's experience with Master Teacher mentor; (4) teaching self-efficacy of mentors and mentees; and (5) forms and elements of interactions between mentors and mentees. These findings are interwoven with data from the review of documents to address the three guiding research questions.

Research Question 1

What are the teaching and mentoring self-efficacy elements of Texas certified Master Teacher mentors created under an approved Texas program?

STEM Master Teacher mentors responded to interview questions in the context of their professional development experiences as students in the Desert State University (pseudonym) Master Teacher Academies, and experiences working as teacher mentors and classroom teachers for the Borderland Independent School District (pseudonym). In discussing professional development from the Master Teacher Academies (MTA), all mentors placed value on the skills and content they learned. They valued gaining new knowledge of what a mentor is "supposed to be" and the roles they play for novice teachers; collaborating with fellow mentor preparation students to socially construct new knowledge for mentoring; reflecting upon their mentoring practice in order to make improvements in assisting the mentee; what to look for in helping a novice to develop and ways of communicating and giving feedback; and how to best approach mentoring and ways to adapt their approaches to meet their mentees' needs. This element of effective mentoring can be called "reading the mentee"—differentiating interpersonal approaches (nondirective, collaborative, or directive) depending on the mentees learning style, developmental level, changing needs, and the particular situation (Gordon & Brobeck, 2010, p. 429). This proved to be an important aspect of mentoring success and led to stronger interactions and relationships.

In preparing for the Texas Examinations for Master Teachers (TExMaT), the mentor participants discussed the valuable workshops and activities that helped to prepare them for the demanding exam. The most challenging component, according to participants, of the exam is an open-ended, scenario-based prompt. In order to practice for this section, participants would

respond to case studies, as well as write their own to exchange with others. They would then get feedback from retired teachers or graduate students working with the MTA program, and from fellow classmates. These became the topic of many discussions and participants would sometimes collaborate to analyze these prompts. This helped prepare them for the exam, but also gave them authentic learning activities in which to build their mentoring knowledge base around. This aligns with Arnold's (2006) conclusions that mentor training requires coaching, practice, and feedback for mentors.

In training to become teacher mentors, the participants demonstrated their willingness to face obstacles and pursue their goals in their successful completion of the Master Teacher Academies and subsequent attainment of Texas certification as a Master Teacher. Although a survey for this was not used in this study, elements of *mentoring* self-efficacy were discussed when mentors spoke of working closely with novice teachers to guide and assist their development in collaborative ways, with expectations of successful outcomes.

A practicum component of the MTA program required participants to mentor a teacher as part of the mentoring course. The mentors, while in the MTA program, would collaborate with peers about ways of handling situations that arose with mentees. Feiman-Nemser (1996) regards this as an effective element of mentor development. "While training usually occurs before mentors take up their new responsibilities, mentors are more likely to develop their practice as mentors if they also have opportunities to discuss questions and problems that arise in the course of their work with novices" (p. 4). The MTA provided a learning context in which participants began mentoring while still enrolled in MTA courses, offering a supportive community of practice with similar levels of experience in which to collaborate with and learn from.

Mentors were willing to exert extra effort and seek out ways to assist their mentee (both during the practicum and afterward). They expressed positive feelings toward mentoring experiences in Borderland ISD, felt that they were making a positive impact, and wish to continue working with mentees. Those not mentoring during the time of this study were eager to work with a new teacher. These discussions demonstrate a high level of mentoring self-efficacy among the participants.

For content learning, all mentors valued the hands-on, interactive activities embedded throughout the MTA program that integrated technology in meaningful ways. Not only was the content knowledge of participants enhanced, but their technological knowledge was as well. They were given an abundance of high-quality lessons, techniques, and technology tools they could integrate with their curriculum in the classroom. Problem-based learning was discussed by the mentors as a meaningful approach that functioned well in the classroom. A teacher who incorporates "problem-based learning provides opportunities for students to experience a curriculum based on real-world problems and increases students' problem-solving and critical-thinking skills" (Brown et al, 2012, p. 659). By incorporating elements such as technology and problem-based learning, the MTA program, provided the mentor group with alternatives to using text-based instruction that is highly motivational to students, and taps into their prior knowledge to build upon. Dewey (2001/1902) endorses this type of learning to motivate students:

> If the subject-matter of the lessons be such as to have an appropriate place within the expanding consciousness of the child, if it grows out of his own past doings, thinkings, and sufferings, and grows into application in further achievements and receptivities, then no device or trick of method has to be resorted to in order to enlist "interest". (p. 120)

The knowledge mentors gained from the MTA program are good examples of elements that contribute to higher levels of self-efficacy—in this case, participants' efficacy of teaching in their content area, as well as to serving as an effective teacher mentor. Self-efficacy refers to "beliefs in one's capabilities to organize and execute the courses of action required to produce given attainments" (Bandura, 1997, p. 3). Efficacy beliefs are important because they:

> Influence the courses of action people choose to pursue, how much effort they put forth in given endeavors, how long they will persevere in the face of obstacles and failures, their resilience to adversity, whether their thought patterns are self-hindering or self-aiding, how much stress and depression they experience in coping with taxing environmental demands, and the level of accomplishments they realize" (Bandura, 1997, p. 3).

Mentor participants discussed teaching self-efficacy beliefs related to classroom teaching and indicated these beliefs on the STEBI and MTEBI surveys, as well. Survey results reflected a holistically high level of teaching self-efficacy and outcome expectancy among the mentor group (see Table 4.4). The mentor group felt that teachers hold a great deal of responsibility. Educators are held to demanding levels of accountability, and it is up to the teacher to ensure that students succeed, even when they are functioning below grade level. Other responsibility beliefs were that there should be constant learning and seeking out of best strategies and tools to use in the classroom. There was also a strong belief that the teacher must be highly knowledgeable in their content.

There were many stories of exerting extra effort and giving up personal time in order to help students succeed. This is related to the expected outcome of the mentor teacher. Mentors discussed working with students' parents to enhance the students' academic performance, and

consistently seeking out new strategies and tools to instruct their students (such as those from the MTA). Mentors expressed beliefs that every student can learn, but made comments that were efficaciously low in regard to student motivation.

An efficaciously low teacher holds beliefs that "there is little they can do if students are unmotivated and that the influence teachers can exert on students' intellectual development is severely limited by unsupportive or oppositional influence from the home and neighborhood environment" (Bandura, 1997, p. 240). Interestingly, three of the four science mentors responded at a low level of self-efficacy in regard to STEBI survey item #7: If students are underachieving in science, it is most likely due to ineffective science teaching. This response would indicate that the teacher is not able to overcome the oppositional influences on students' motivation.

This was a topic of discussion during interviews. One mentor commented that she could make a difference if the student actually showed up to class, but if he/she is not motivated, she can't teach him/her. Another mentor stated that some students are just not motivated, no matter how hard you try. Bandura (1997) explained that "efficacy beliefs are easily negated by disconfirming experiences" (p. 43). It is likely, therefore, that these mentors have had a history of working (possibly unsuccessfully) with unmotivated students, and this has influenced their efficacy and expected outcome beliefs. Although the mentors feel comfortable with their content and their instructional abilities and scored high in these items, the one element that scored lower was that of student motivation and overcoming outside factors that deter student motivation.

A background element that potentially contributes to the mentors' teaching self-efficacy could be the academic preparation in the participant's content area. Descriptive document data from transcript reviews (see Table 4.5) show that the two mentors with the lowest teaching self-

efficacy (Table 4.4) had each failed a course in their taught content areas. These mentors had also withdrawn from a content-related university course at one point. This might suggest that there had been some struggle with the content at an earlier point in these mentors' knowledge building experiences. Interviews and surveys revealed, however, that the mentor participants of this study held overall high instructional efficacy beliefs and their commitment to remain in education substantiates Coladarci's findings. "Coladarci (1992) found that teachers' sense of instructional efficacy was the best predictor of commitment to the teaching profession" (Bandura, 1997, p. 242-243).

In conclusion, findings would indicate that the collective experiences and elements offered by the Master Teacher Academies, in its collaborative, constructivist approach positively contributed to the mentoring and teaching self-efficacy of the mentor participant group. The mentor group's experiences mentoring teachers in Borderland ISD also allude to high efficacy in mentoring. Teaching self-efficacy was at a high level for the mentor group, with one outlying item that speaks to student motivation. Ultimately, all mentors desire to stay in the field of education, which would suggest high levels of teaching self-efficacy. Mentors also expressed their satisfaction with and wish to continue mentoring, suggesting high levels of mentoring self-efficacy.

Research Question 2

What are the impacts on teaching self-efficacy of novice teachers mentored by Texas certified Master Teacher mentors created under an approved Texas program?

The mentee group reported positive experiences with the mentoring they have received from their STEM Master Teacher mentor. There was an additional layer of support for two of the mentees from the district mentoring program, which includes meetings and trainings

specifically for mentees. The third mentee was not a part of this when she began teaching for the district, as she began the profession on an alternative certification route and had mentoring provided by the regional service center instead. This, unfortunately, was a bad experience for her, but she is now mentored by a STEM Master Teacher mentor from this study.

The mentees felt they have grown professionally as a result of working with their mentors. They all highly value the collaboration they have with their mentors and found it as a venue to discuss content, pedagogy, classroom management, etc. Their comments in regard to self-efficacy reflect upon their work with their mentor. They expressed feeling more comfortable with the curriculum now and being able to see the "big picture". Mentees felt encouraged to try new strategies and techniques in the classroom. They collectively expressed a gradual movement toward complete confidence in their instruction with students.

Mentees, like the mentor group, also spoke about the immense responsibility of a teacher. They discussed the responsibility of motivating students in ways that appeal to them and in ways that meet their academic needs. Mentees expressed disappointment in working with poorly motivated students. There were comments about kids simply not liking some subjects, and some kids that you just can't get through to no matter how motivating the teacher is. There was also the story of the mentee who had an oppositional situation where the parent did not see a need for her daughter to know chemistry, requiring the mentee teacher to work especially hard to motivate the daughter. These adverse experiences can affect an educator's teaching self-efficacy.

STEBI and MTEBI survey scores resulted in slightly lower self-efficacy levels for the mentees than the mentor group (see Table 4.4). Mentees' responses were fairly consistent with no outlying items like the mentor group. It is interesting to note that Participant 6, the mentee

with the least amount of experience (less than one year) had the highest outcome expectancy of all mentees. Another noteworthy occurrence is that the mentee with the lowest self-efficacy and outcome expectancy levels on the survey is mentored by the mentor with the lowest self-efficacy and outcome expectancy levels. These would be interesting phenomenon to research further.

Research Question 3

What are the forms and elements of interactions between Texas certified Master Teacher mentors created under an approved Texas program and their novice teacher mentees?

Both mentors and mentees appreciated their mentoring relationships. Mentors spoke of the importance of building relationships with mentees over time and the importance of guiding mentees without "telling them what to do". Mentors felt it important for mentees to explore and discover on their own, but then to support their mentees with discussions and encourage reflection after things don't go as planned.

Some key elements contribute to the strength of relationships between mentors and mentees. Mentors were cognizant, as a result of their development in the MTA, of gauging their mentee so that the mentor doesn't impose or "come on too strong". Ganser (1995) also found that mentors voice discomfort in drawing the line between "being helpful and being overbearing" (p. 85) in giving advice to novice teachers.

Regular meetings are crucial. One mentor/mentee pair meets daily; while the other two pairs reported meeting at least once every week. The latter pairs would meet more frequently if time allowed for it. Unfortunately, however, mentors and mentees experience "the accountability context [of education which] reduces opportunities for teacher growth and meaningful learning" (Mullen, 2011, p. 65). Mentees look forward to meeting with their mentors to access their expertise in helping them plan; while mentees also contribute their own ideas.

Both mentors and mentees described their relationships as respectful of the talents, knowledge, and ideas of both parties. The two must be able to work together.

Another key element is the diversity and flexibility of the mentor. Mentees expect and appreciated being able to consult their mentor on issues with content and pedagogy; as well as with classroom management and administrative tasks. Mentees also depend upon their mentors for moral support and encouragement.

In order to forge a strong relationship, mentors must come with some specific prerequisites. Mentors should have experience teaching, and have training and knowledge about mentoring. Mentors should also be willing to learn from their mentee as much as the mentee is learning from them. Mentoring works best when the mentor and mentee teach the same subject/grade, and are at the same campus so they know the culture of the school and the students. Questions of mentor/mentee fit are perplexing and when problems arise, beginning teachers generally seek help elsewhere by looking for an informal mentor rather than request a change in assignment (Worthy, 2005).

Forms of mentoring are best in a collaborative setting. Ingersoll and Strong (2011) agree that "teacher collaboration [is one of] the most influential factors for novices" (p. 212). Mentees spoke about the comfort they feel in knowing that they have a strong teacher "on my side". Mentees see the collaboration they have with mentors as the vehicle that helps "make everything click" and all three mentees attributed the fact that they are still teaching to their relationship with their Master Teacher mentor. Mentees appreciate being seen as equals and are less afraid to fail with the support of a mentor. Collaboration encourages strong relationships because everyone contributes, and there is a common goal. Furthermore, collaboration has a particularly large effect on new teacher turnover, decreasing new teachers' risk of leaving by 43 percent

(Johnson, Berg, and Donaldson, 2005, p. 89). Participant 8 echoes that strong mentor/mentee relationships are vital, "I would have probably quit too if she—if I didn't have that [mentor] support" (January 27, 2014).

Borderland ISD Context

"Mentoring programs visibly demonstrate a school district's commitment to beginning teachers" (Ganser, 1996, p. 8); and Borderland ISD certainly demonstrates this commitment. Borderland ISD has a long-standing, systemic teacher mentor program in which each new teacher begins with a week-long New Teacher Induction series, as well as the assignment of a mentor for at least the first three years of teaching. There are regular meetings for the mentor/mentee pairs and there is a system of support that is consistent across the district. Mentors are compensated for submitting mentor logs monthly that detail their professional interactions with mentees. There is a minimal amount of mentees that are exited from the New Teacher Induction program prior to three years based on principal recommendation. The majority of these cases are teachers who were new to the district, but had previously taught elsewhere.

It is important to note that this is not the norm for district mentor programs in the region (or likely in the nation). Conducting my study in this context allowed for data collection that would not likely be obtainable elsewhere. Additionally, "examples of ways in which university-based induction leaders and district mentors work together to develop a conceptualization of mentorship while engaged in the practice of mentoring are rare" (Stanulis & Ames, 2009, p. 28). The context of this study is one of those rare instances.

Borderland ISD mentoring practices, and the collaboration between Desert State University and Borderland ISD have positive impacts on beginning teachers and their mentors.

Borderland ISD has lower teacher turnover rates than districts in the same region and in the state of Texas (See Tables 4.6 and 4.7). Desert State University provides mentor preparation, as well as content and pedagogical development, that meet the needs of Borderland ISD. Master Teacher Academies mentors and their mentees have high self-efficacy beliefs and intend to stay in the teaching profession. These positive results make Borderland ISD and Desert State University a successful partnership and districts or universities interested in designing or improving teacher mentor preparation programs would benefit from the current study findings and conclusions.

Recommendations

The following recommendations have been derived from participant data and research conducted throughout this study.

For Educators

Recognize that novice teachers come with knowledge and expertise of their own and encourage them to participate in collaborative planning and discussions. Encourage new teachers to be reflective practitioners and model how to do so by asking reflective questions instead of telling them how to resolve an issue. Actively listen to mentee's concerns, and build them up when they become frustrated or feel defeated. Praise the good work that mentees do. Give honest, constructive feedback, with prioritization of things that are manageable given the novice's level of understanding and experience. Remember that a novice's mentor is one of the determining factors for whether or not the teacher will stay in the profession.

For Universities

Partnering with local school districts to assist efforts in mentor development will pave the way for mutual benefits between the university and the district. Universities should work closely

with districts to understand their needs and work collaboratively to create programs designed to help districts meet their goals. Universities could offer services such as program evaluation in order to measure for impact and outcomes. In turn, districts would be motivated to encourage their teachers to enroll in the university mentor development program. The district partnership could serve as the study site for authentic learning components of university courses (e.g. mentoring practicum), or as a research site for related studies.

For School Districts

Mentoring should be a part of every new teacher's induction for at least the first three years. Mentoring should come from a teacher who has been highly trained to provide support in curriculum, pedagogy, and classroom management. The mentor must be an experienced teaching, who is willing to take on the added responsibility of helping a novice develop their profession. Mentors should be given regular opportunities to meet and collaborate with other mentors in order to co-construct knowledge and to have a community of support. Mentors should be compensated for their time, either monetarily or with a lightened course load. Principals must arrange novice teachers' schedules so they may meet regularly with their mentor; at least weekly.

For Future Research

The current study could be extended to examine different aspects such as a **c**omparison between the levels of teaching self-efficacy of novice teachers mentored by Master Teachers with those mentored by teachers without such certification in their subject area. Another extension could be to empirically study the impact of the Master Teacher program on student achievement. Also researchers could examine whether or not teachers implement what was

learned during the Master Teacher Academies in classroom instruction, and in working as mentors with mentee teachers.

More globally, several researchers have recommended research for the area of teacher mentor preparation. Some of these are summarized here. Athanases, Abrams, Jack, Johnson, Kwock, McCurdy, Riley, & Totaro (2008) point out "there is little research in the US on mentor development to inform practice. Many programmes [sic] have yet to articulate a deliberate, conscious, proactive approach to developing mentors. Often the available literature has been dominated by technical manuals and guidelines that lack a coherent theoretical or research base (p. 746). Bullough (2012) states that there is surprisingly little research on how mentoring effects mentors, and on challenges that mentors face when mentoring. Feiman-Nemser (1998) adds, "We need to know how thoughtful mentors actually work with novices, how they develop their mentoring practice, and what conditions support and sustain this kind of work" (p. 70). The current study purports to shed some light on this much needed area of study, yet there is much more work to be done.

Conclusions

Through conducting this research, drawing on personal experiences, and careful examination of the data and reflective responses of STEM Master Teacher mentors and their mentees who participated in this study, I was able to draw specific conclusions. It is imperative for the future of our students and the nation that states design, implement, fund, and sustain effective teacher mentoring programs (such as Desert State University's Master Teacher Academies) especially for the hard-to-staff fields such as mathematics and science. These programs must include mentor preparation that equips mentor teachers with the tools, skills, and

knowledge to assist new teachers in developing into highly-qualified educators as quickly as possible. As the informants of this study expressed, participants of mentor preparation would greatly benefit from a constructivist framework in which understanding comes from interactions with others to solve problems and knowledge evolves through social negotiations (Savery & Duffy, 1996). The data collected and analyzed in this study support the following conclusions for mentor preparation.

First, mentor preparation programs are most effective when participants are given opportunities to learn through a constructivist, authentic approach that includes content development simultaneous with mentoring content. This approach supports the development of teaching and mentoring beliefs and can increase levels of self-efficacy. A mentor's level of teaching self-efficacy and mentoring efficacy will affect their behaviors in working with novices. For this reason, mentors-in-training should become aware of their efficacy beliefs (perhaps by completing a survey instrument) so that they may conscientiously account for any efficaciously low areas. This would prevent them from possibly casting those beliefs onto their mentee.

Second, collaboration is a vital part of building the knowledge base for mentors. Targeted activities and practices such as creating and responding to case studies, then discussing them in collaborative groups provides a cognitively high-level learning experience. These should be considered in forming lesson agendas. Collaborative content experiences should be incorporated as well, such as problem-based learning or technology embedded group projects. This models pedagogical strategies, while also maintaining a constructivist framework in forming opportunities for learning.

Thirdly, mentor preparation is ideal when an institute of higher education partners with a school district. The university provides courses in content, as well as mentoring that could

possibly count toward a graduate degree. The district in turn, promotes the university mentor program and supports cohorts of teachers with Title IIA or other funds. The return for the district would be qualified mentors to support new teaching staff. If the partnership works collaboratively, the university could focus courses on the areas of highest need for the district. District teachers who complete the program could then provide support workshops at the university for subsequent mentoring students in the areas of content or mentorship.

These three pillars of mentor preparation were interlocked for the mentor and mentee participants of this study (See Figure 5.1). The data show Desert State University's Master Teacher Academies, partnered with Borderland ISD to be a comprehensive and high impact collaboration with positive results that would be of interest to other mentor preparation programs.

Ultimately, simply appointing a mentor with no direction or training to a new teacher will not result in improving new teachers' practice in a shortened amount of time so that all students are receiving instruction from a highly-qualified and effective teacher. Nor will it increase teacher retention. Mentors must undergo training that readies them for their role.

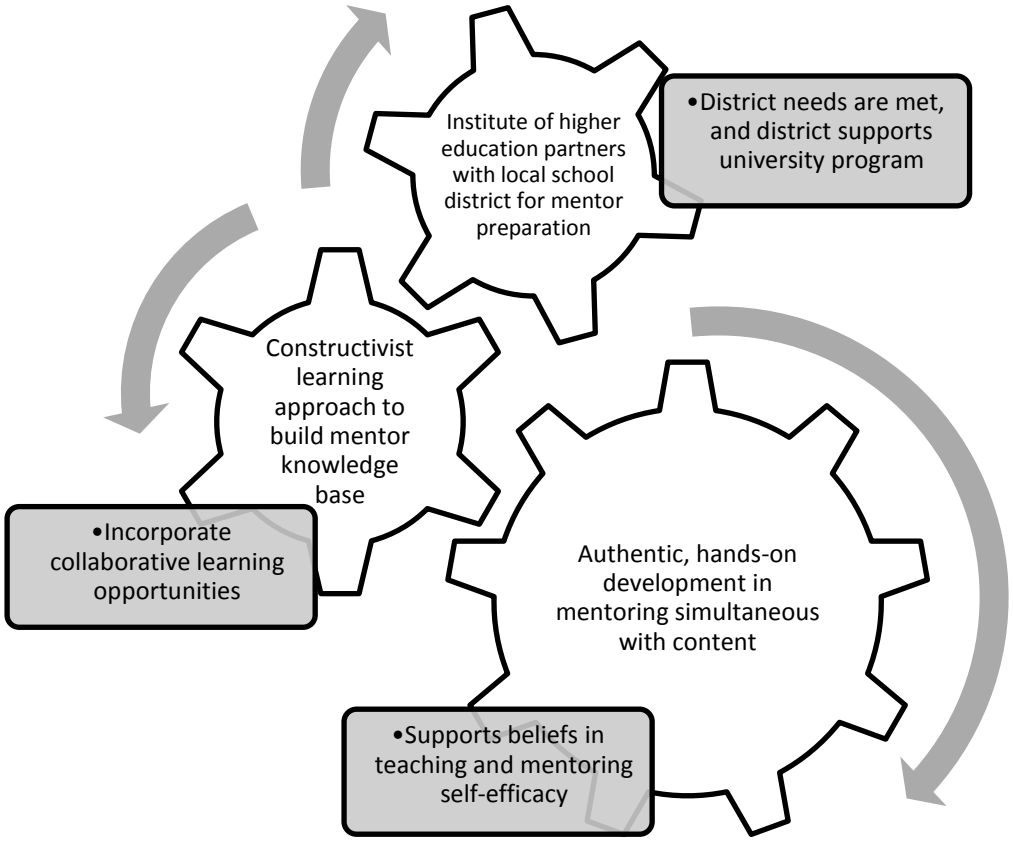

Figure 5.1 Components of the collaboration between Desert State University and Borderland ISD for teacher mentor preparation

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Appendix A: Initial Email to Potential Participants

Dear Educator,

My name is Heather Click-Cuellar and I am a doctoral candidate in the Teaching, Learning, and Culture Ph.D. program at UTEP. I am conducting research on mentor STEM teacher preparation. This email is to invite you to participate in this research study.

The purpose of this study is to investigate Master teacher perceptions of their mentor preparation in the Master Teacher Academies; and to examine mentor/mentee interactions and self-efficacy in their specific content areas. Although there are no direct benefits in this study, results could be helpful in guiding the design of mentor professional development in the future.

If you agree to participate in this study, you will complete a brief survey and participate in a focus-group interview. The surveys which consist of 23-25 questions, ask for responses in regard to teaching math or science (depending on which area you teach). This survey will only take about 15 minutes to complete. You will also be asked to take part in a group interview. You will be asked for your perspective on mentoring/being mentored in math or science and self-efficacy of teaching. This group interview will take approximately one hour. You may be asked for a follow-up interview. This would be one-on-one, and would only take about 30 minutes. In order to capture what you say correctly, the interviews will be audio recorded. Your identity will be kept confidential--your name and school name will not be used in this study. There are no known risks associated with your participation.

Participation in this study is strictly voluntary and you may choose not to participate or stop your participation at any time. There are no consequences for non-participation or for terminating your participation. This project has been approved by the Institutional Review Boards at UTEP and [Borderland Independent School District]. If you have any questions or concerns regarding this study, you may contact the researcher using the contact information below or her faculty sponsor, Dr. Brian Giza, at 915-747-6655. Questions about your rights as a research participant may be directed to the UTEP Office of Research and Sponsored Projects 915-747-5680.

Your perspective and insights would be greatly appreciated as a part of this study, and have the potential of benefitting the profession in the future. I do hope you will consider participating. If you are in agreement, please complete the attached consent form. Detailed information about the survey and interviews will be sent upon receipt of your completed consent form.

Appendix B: Science Teaching Efficacy Belief Instrument

Please indicate the degree to which you agree or disagree with each statement below by circling the appropriate letters to the right of each statement.

SA = Strongly Agree
A = Agree
UN = Uncertain
D = Disagree
SD = Strongly Disagree

1.	When a student does better than usual in science, it is often because the teacher exerted a little extra effort.	SA A UN D SD
2.	I am continually finding better ways to teach science.	SA A UN D SD
3.	Even when I try very hard, I don't teach science as well as I do most subjects.	SA A UN D SD
4.	When the science grades of students improve, it is most often due to their teacher having found a more effective teaching approach.	SA A UN D SD
5.	I know the steps necessary to teach science concepts effectively.	SA A UN D SD
6.	I am not very effective in monitoring science experiments.	SA A UN D SD
7.	If students are underachieving in science, it is most likely due to ineffective science teaching.	SA A UN D SD
8.	I generally teach science ineffectively.	SA A UN D SD
9.	The inadequacy of a student's science background can be overcome by good teaching.	SA A UN D SD
10.	The low science achievement of some students cannot generally be blamed on their teachers.	SA A UN D SD
11.	When a low achieving child progresses in science, it is usually due to extra attention given by the teacher.	SA A UN D SD
12.	I understand science concepts well enough to be effective in teaching elementary science.	SA A UN D SD
13.	Increased effort in science teaching produces little change in some students' science achievement.	SA A UN D SD
14.	The teacher is generally responsible for the achievement of students in science.	SA A UN D SD
15.	Students' achievement in science is directly related to their teacher's effectiveness in science teaching.	SA A UN D SD
16.	If parents comment that their child is showing more interest in science at school, it is probably due to the performance of the child's teacher.	SA A UN D SD
17.	I find it difficult to explain to students why science experiments work.	SA A UN D SD
18.	I am typically able to answer students' science questions.	SA A UN D SD
19.	I wonder if I have the necessary skills to teach science.	SA A UN D SD
20.	Effectiveness in science teaching has little influence on the achievement of students with low motivation.	SA A UN D SD
21.	Given a choice, I would not invite the principal to evaluate my science teaching.	SA A UN D SD
22.	When a student has difficulty understanding a science concept, I am usually at a loss as to how to help the student understand it better.	SA A UN D SD
23.	When teaching science, I usually welcome student questions.	SA A UN D SD
24.	I don't know what to do to turn students on to science.	SA A UN D SD
25.	Even teachers with good science teaching abilities cannot help some kids learn science.	SA A UN D SD

*In Riggs, I., & Knochs, L. (1990). Towards the development of an elementary teacher's science teaching efficacy belief instrument. *Science Education, 74*, 625-637.

Appendix C: Mathematics Teaching Efficacy Belief Instrument

Please indicate the degree to which you agree with each statement below by circling the appropriate letters to the right of each statement.

SA = Strongly Agree
A = Agree
UN = Uncertain
D = Disagree
SD = Strongly Disagree

1. When a student does better than usual in mathematics, it is often because the teacher exerted a little extra effort.	SA A UN D SD
2. I will continually find better ways to teach mathematics.	SA A UN D SD
3. Even if I try very hard, I do not teach mathematics as well as I do most subjects.	SA A UN D SD
4. When the mathematics grades of students improve, it is often due to their teacher having found a more effective teaching approach.	SA A UN D SD
5. I know the steps necessary to teach mathematics concepts effectively.	SA A UN D SD
6. I am not very effective in monitoring mathematics activities.	SA A UN D SD
7. If students are underachieving in mathematics, it is most likely due to ineffective mathematics teaching.	SA A UN D SD
8. I generally teach mathematics ineffectively.	SA A UN D SD
9. The inadequacy of a student's mathematics background can be overcome by good teaching.	SA A UN D SD
10. The low mathematics achievement of some students cannot be blamed on their teachers.	SA A UN D SD
11. When a low-achieving child progresses in mathematics, it is usually due to extra attention given by the teacher.	SA A UN D SD
12. I understand mathematics concepts well enough to be effective in teaching mathematics.	SA A UN D SD
13. Increased effort in mathematics teaching produces little change in some students' mathematics achievement.	SA A UN D SD
14. The teacher is generally responsible for the achievement of students in mathematics.	SA A UN D SD
15. Students' achievement in mathematics is directly related to their teacher's effectiveness in mathematics teaching.	SA A UN D SD
16. If parents comment that their child is showing more interest in mathematics at school, it is probably due to the performance of the child's teacher.	SA A UN D SD
17. I find it difficult to use manipulatives to explain to students why mathematics works.	SA A UN D SD
18. I am typically able to answer students' mathematics questions.	SA A UN D SD
19. I wonder if I have the necessary skills to teach mathematics.	SA A UN D SD
20. Given a choice, I would not invite the principal to evaluate my mathematics teaching.	SA A UN D SD
21. When a student has difficulty understanding a mathematics concept, I am usually at a loss as to how to help the student understand it better.	SA A UN D SD
22. When teaching mathematics, I usually welcome student questions.	SA A UN D SD
23. I do not know what to do to turn students on to mathematics.	SA A UN D SD

*Enochs, L. G., Smith, P. L., & Huinicker, D. (2000). Establishing factorial validity of the mathematics teaching efficacy beliefs instrument. *School Science and Mathematics*, 100(4), 194-202.

Appendix D: Scoring Rubric for Mathematics TExMaT Grades 4-8

SECTION V

CASE STUDY ASSIGNMENT

In addition to the multiple-choice section, the Master Mathematics Teacher (MMT) test will include one case study assignment that requires a written response. The written-response score will be combined with the multiple-choice score to produce a total test scaled score.

Included in this section is a description of the case study assignment, an explanation of the way case study assignment responses will be scored, and one sample case study assignment.

How Case Study Assignment Responses Are Scored

Responses will be scored on a four-point scale (see next page). Each point on the scale represents the degree to which the performance characteristics (see below) are demonstrated in the response.

The score point descriptions reflect typical responses at each score point. Although the score assigned corresponds to one of the score points, individual responses may include attributes of more than one score point.

PERFORMANCE CHARACTERISTICS

PURPOSE	The extent to which the candidate responds to the components of the assignment in relation to relevant competencies in the Master Mathematics Teacher 4–8 test framework.
APPLICATION OF KNOWLEDGE	Accuracy and effectiveness in the application of knowledge as described in relevant competencies in the Master Mathematics Teacher 4–8 test framework.
SUPPORT	Quality and relevance of supporting details in relation to relevant competencies in the Master Mathematics Teacher 4–8 test framework.
RATIONALE	Soundness of reasoning and depth of understanding of the assigned task in relation to relevant competencies in the Master Mathematics Teacher 4–8 test framework.
SYNTHESIS	The extent to which the candidate is able to synthesize the knowledge and skills required to perform the multifaceted role of the Master Mathematics Teacher 4–8 in an applied context.

Score Scale

Score	Score Point Description
4	**The "4" response reflects thorough knowledge and understanding of relevant competencies in the Master Mathematics Teacher 4–8 test framework.** • The response addresses all components of the assignment and fully completes the assigned task. • The response demonstrates an accurate and very effective application of relevant knowledge. • The response provides strong supporting evidence with specific and relevant examples. • The response demonstrates clear, logical reasoning and a comprehensive understanding of the assigned task. • The response demonstrates strong ability to synthesize the knowledge and skills required to perform the multifaceted role of the Master Mathematics Teacher 4–8.
3	**The "3" response reflects sufficient knowledge and understanding of relevant competencies in the Master Mathematics Teacher 4–8 test framework.** • The response addresses most or all components of the assignment and sufficiently completes the assigned task. • The response demonstrates a generally accurate and effective application of relevant knowledge; minor problems in accuracy or effectiveness may be evident. • The response provides sufficient supporting evidence with mostly specific and relevant examples. • The response demonstrates sufficient reasoning and an overall understanding of the assigned task. • The response demonstrates sufficient ability to synthesize the knowledge and skills required to perform the multifaceted role of the Master Mathematics Teacher 4–8.
2	**The "2" response reflects partial knowledge and understanding of relevant competencies in the Master Mathematics Teacher 4–8 test framework.** • The response addresses at least some components of the assignment and/or partially completes the assigned task. • The response demonstrates a partial and/or ineffective application of relevant knowledge; significant inaccuracies may be evident. • The response provides minimal supporting evidence with few relevant examples; some extraneous or unrelated information may be evident. • The response demonstrates limited reasoning and understanding of the assigned task. • The response demonstrates partial ability to synthesize the knowledge and skills required to perform the multifaceted role of the Master Mathematics Teacher 4–8.
1	**The "1" response reflects little or no knowledge or understanding of relevant competencies in the Master Mathematics Teacher 4–8 test framework.** • The response addresses few components of the assignment and/or fails to complete the assigned task. • The response demonstrates a largely inaccurate and/or ineffective application of relevant knowledge. • The response provides little or no supporting evidence, few or no relevant examples, or many examples of extraneous or unrelated information. • The response demonstrates little or no reasoning or understanding of the assigned task. • The response demonstrates little or no ability to synthesize the knowledge and skills required to perform the multifaceted role of the Master Mathematics Teacher 4–8.
U	The "U" (Unscorable) will be assigned to responses that are off topic/off task, illegible, primarily in a language other than English, or are too short or do not contain a sufficient amount of original work to score.
B	The "B" (Blank) will be assigned to written response booklets that are completely blank.

Note: Your written response should be your original work, written in your own words, and not copied or paraphrased from some other work.

Scoring Process

Case study assignment responses are scored on a scale of 1 to 4. Each response is evaluated by a minimum of two scorers with expertise in mathematics instruction. All scorers have successfully completed standardized orientation and are calibrated to the scoring criteria throughout the scoring session.

Analytic Notation

Examinees who do not pass the test and do not perform satisfactorily on the case study assignment will receive information concerning specific aspects of the written response that show a need for improvement. This information will be provided for examinees to use in preparing to retake the test.

If you do not pass the test or perform satisfactorily on the case study assignment, your score report will indicate one or more of the following areas for improvement in your written response. These areas are based on the performance characteristics in the score scale.

- Purpose
- Application of Knowledge
- Support
- Rationale
- Synthesis

Preparing for the Case Study Assignment

Following is one sample case study assignment that represents the type of question you will see on the MMT test.

In preparing for the case study assignment component of the test, you may wish to draft a response to the question by reading the case study and planning, writing, and revising your essay. You should plan to use about 90 minutes to respond to the sample case study assignment. Also, since no reference materials will be available during the test, it is recommended that you refrain from using a dictionary, a thesaurus, or textbooks while writing your practice response.

After you have written your practice response, review your response in light of the score point descriptions. You may also wish to review your response and the score scale with staff in your MMT preparation program.

Appendix E: Scoring Rubric for Science TExMaT Grades 4-8

SECTION IV

CASE STUDY ASSIGNMENT

In addition to the multiple-choice section, the Master Science Teacher (MST) test will include one case study assignment that requires a written response. The written-response score will be combined with the multiple-choice score to produce a total test scaled score.

Included in this section is a description of the case study assignment, an explanation of how case study assignment responses will be scored, one sample case study assignment, and examples of a strong and a weak response to the assignment.

On the actual test, candidates will be given a different case study assignment from the sample provided in this preparation manual.

How Case Study Assignment Responses Are Scored

Responses will be scored on a four-point scale (see next page). Each point on the scale represents the degree to which the performance characteristics (see below) are demonstrated in the response.

The score point descriptions reflect typical responses at each score point. Although the score assigned corresponds to one of the score points, individual responses may include attributes of more than one score point.

PERFORMANCE CHARACTERISTICS

PURPOSE	The extent to which the candidate responds to the components of the assignment in relation to relevant competencies in the Master Science Teacher 4–8 test framework.
APPLICATION OF KNOWLEDGE	Accuracy and effectiveness in the application of knowledge as described in relevant competencies in the Master Science Teacher 4–8 test framework.
SUPPORT	Quality and relevance of supporting details in relation to relevant competencies in the Master Science Teacher 4–8 test framework.
RATIONALE	Soundness of reasoning and depth of understanding of the assigned task in relation to relevant competencies in the Master Science Teacher 4–8 test framework.
SYNTHESIS	The extent to which the candidate is able to synthesize the knowledge and skills required to perform the multifaceted role of the Master Science Teacher 4–8 in an applied context.

Score Scale

Score	Score Point Description
4	**The "4" response reflects thorough knowledge and understanding of relevant competencies in the Master Science Teacher 4–8 test framework.** • The response addresses all components of the assignment and fully completes the assigned task. • The response demonstrates an accurate and very effective application of relevant knowledge. • The response provides strong supporting evidence with specific and relevant examples. • The response demonstrates clear, logical reasoning and a comprehensive understanding of the assigned task. • The response demonstrates strong ability to synthesize the knowledge and skills required to perform the multifaceted role of the Master Science Teacher 4–8.
3	**The "3" response reflects sufficient knowledge and understanding of relevant competencies in the Master Science Teacher 4–8 test framework.** • The response addresses most or all components of the assignment and sufficiently completes the assigned task. • The response demonstrates a generally accurate and effective application of relevant knowledge; minor problems in accuracy or effectiveness may be evident. • The response provides sufficient supporting evidence with mostly specific and relevant examples. • The response demonstrates sufficient reasoning and an overall understanding of the assigned task. • The response demonstrates sufficient ability to synthesize the knowledge and skills required to perform the multifaceted role of the Master Science Teacher 4–8.
2	**The "2" response reflects partial knowledge and understanding of relevant competencies in the Master Science Teacher 4–8 test framework.** • The response addresses at least some components of the assignment and/or partially completes the assigned task. • The response demonstrates a partial and/or ineffective application of relevant knowledge; significant inaccuracies may be evident. • The response provides minimal supporting evidence with few relevant examples; some extraneous or unrelated information may be evident. • The response demonstrates limited reasoning and understanding of the assigned task. • The response demonstrates partial ability to synthesize the knowledge and skills required to perform the multifaceted role of the Master Science Teacher 4–8.
1	**The "1" response reflects little or no knowledge or understanding of relevant competencies in the Master Science Teacher 4–8 test framework.** • The response addresses few components of the assignment and/or fails to complete the assigned task. • The response demonstrates a largely inaccurate and/or ineffective application of relevant knowledge. • The response provides little or no supporting evidence, few or no relevant examples, or many examples of extraneous or unrelated information. • The response demonstrates little or no reasoning or understanding of the assigned task. • The response demonstrates little or no ability to synthesize the knowledge and skills required to perform the multifaceted role of the Master Science Teacher 4–8.
U	The "U" (Unscorable) will be assigned to responses that are off topic/off task, illegible, primarily in a language other than English, or are too short or do not contain a sufficient amount of original work to score.
B	The "B" (Blank) will be assigned to written response booklets that are completely blank.

Scoring Process

Case study assignment responses are scored on a scale of 1 to 4. Typically, each response is scored by two or more qualified readers. All scorers have successfully completed standardized orientation and are calibrated to the scoring criteria throughout the scoring session. If two scores assigned are discrepant, additional scoring will determine the final score.

Analytic Notation

Examinees who do not pass the test and do not perform satisfactorily on the case study assignment will receive information concerning specific aspects of the written response that show a need for improvement. This information will be provided for examinees to use in preparing to retake the test.

If you do not pass the test or perform satisfactorily on the case study assignment, your score report will indicate one or more of the following areas for improvement in your written response. These areas are based on the performance characteristics in the score scale.

- Purpose
- Application of Knowledge
- Support
- Rationale
- Synthesis

Preparing for the Case Study Assignment

Following is one sample case study assignment that represents the type of question you will see on the MST test.

In preparing for the case study assignment component of the test, you may wish to draft a response to the question by reading the case study and planning, writing, and revising your essay. Although you can choose how much time to spend during the test session to respond to the case study assignment, the assignment has been created so that an acceptable response could be written within 90 minutes. Also, since no reference materials will be available during the test, it is recommended that you refrain from using a dictionary, a thesaurus, or textbooks while writing your practice response.

After you have written your practice response, review your response in light of the score point descriptions. You may also wish to review your response and the score scale with staff in your MST preparation program.

Appendix F: Scoring Rubric for Science TExMaT Grades 8-12

SECTION IV

CASE STUDY ASSIGNMENT

In addition to the multiple-choice section, the Master Science Teacher (MST) test will include one case study assignment that requires a written response. The written-response score will be combined with the multiple-choice score to produce a total test scaled score.

Included in this section is a description of the case study assignment, an explanation of how case study assignment responses will be scored, one sample case study assignment, and examples of a strong and a weak response to the assignment.

On the actual test, candidates will be given a different case study assignment from the sample provided in this preparation manual.

How Case Study Assignment Responses Are Scored

Responses will be scored on a four-point scale (see next page). Each point on the scale represents the degree to which the performance characteristics (see below) are demonstrated in the response.

The score point descriptions reflect typical responses at each score point. Although the score assigned corresponds to one of the score points, individual responses may include attributes of more than one score point.

PERFORMANCE CHARACTERISTICS

PURPOSE	The extent to which the candidate responds to the components of the assignment in relation to relevant competencies in the Master Science Teacher 8–12 test framework.
APPLICATION OF KNOWLEDGE	Accuracy and effectiveness in the application of knowledge as described in relevant competencies in the Master Science Teacher 8–12 test framework.
SUPPORT	Quality and relevance of supporting details in relation to relevant competencies in the Master Science Teacher 8–12 test framework.
RATIONALE	Soundness of reasoning and depth of understanding of the assigned task in relation to relevant competencies in the Master Science Teacher 8–12 test framework.
SYNTHESIS	The extent to which the candidate is able to synthesize the knowledge and skills required to perform the multifaceted role of the Master Science Teacher 8–12 in an applied context.

Score Scale

Score	Score Point Description
4	**The "4" response reflects thorough knowledge and understanding of relevant competencies in the Master Science Teacher 8–12 test framework.** • The response addresses all components of the assignment and fully completes the assigned task. • The response demonstrates an accurate and very effective application of relevant knowledge. • The response provides strong supporting evidence with specific and relevant examples. • The response demonstrates clear, logical reasoning and a comprehensive understanding of the assigned task. • The response demonstrates strong ability to synthesize the knowledge and skills required to perform the multifaceted role of the Master Science Teacher 8–12.
3	**The "3" response reflects sufficient knowledge and understanding of relevant competencies in the Master Science Teacher 8–12 test framework.** • The response addresses most or all components of the assignment and sufficiently completes the assigned task. • The response demonstrates a generally accurate and effective application of relevant knowledge; minor problems in accuracy or effectiveness may be evident. • The response provides sufficient supporting evidence with mostly specific and relevant examples. • The response demonstrates sufficient reasoning and an overall understanding of the assigned task. • The response demonstrates sufficient ability to synthesize the knowledge and skills required to perform the multifaceted role of the Master Science Teacher 8–12.
2	**The "2" response reflects partial knowledge and understanding of relevant competencies in the Master Science Teacher 8–12 test framework.** • The response addresses at least some components of the assignment and/or partially completes the assigned task. • The response demonstrates a partial and/or ineffective application of relevant knowledge; significant inaccuracies may be evident. • The response provides minimal supporting evidence with few relevant examples; some extraneous or unrelated information may be evident. • The response demonstrates limited reasoning and understanding of the assigned task. • The response demonstrates partial ability to synthesize the knowledge and skills required to perform the multifaceted role of the Master Science Teacher 8–12.
1	**The "1" response reflects little or no knowledge or understanding of relevant competencies in the Master Science Teacher 8–12 test framework.** • The response addresses few components of the assignment and/or fails to complete the assigned task. • The response demonstrates a largely inaccurate and/or ineffective application of relevant knowledge. • The response provides little or no supporting evidence, few or no relevant examples, or many examples of extraneous or unrelated information. • The response demonstrates little or no reasoning or understanding of the assigned task. • The response demonstrates little or no ability to synthesize the knowledge and skills required to perform the multifaceted role of the Master Science Teacher 8–12.
U	The "U" (Unscorable) will be assigned to responses that are off topic/off task, illegible, primarily in a language other than English, or are too short or do not contain a sufficient amount of original work to score.
B	The "B" (Blank) will be assigned to written response booklets that are completely blank.

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Case study assignment responses are scored on a scale of 1 to 4. Typically, each response is scored by two or more qualified readers. All scorers have successfully completed standardized orientation and are calibrated to the scoring criteria throughout the scoring session. If two scores assigned are discrepant, additional scoring will determine the final score.

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Preparing for the Case Study Assignment

Following is one sample case study assignment that represents the type of question you will see on the MST test.

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After you have written your practice response, review your response in light of the score point descriptions. You may also wish to review your response and the score scale with staff in your MST preparation program.

Curriculum Vita

Heather Lynn Click-Cuellar earned her Bachelor of Interdisciplinary Studies degree with a minor in Elementary Education concentrating in Life-Earth Science, Cum Laude-Honors from the University of Texas at El Paso in 1999. In 2006, she received her Master of Education Instructional Specialist degree from UTEP. She joined the Teaching, Learning, and Culture doctoral program in 2009.

Dr. Click-Cuellar has fifteen years of experience as a professional educator. She has taught multiple grades in Texas and Kansas, and worked as Science Consultant for the Standards and Assessments Division of the Kansas State Department of Education. During that time, she actively participated in revisions of the Kansas State Science Standards and Kansas State Science Assessments. She was involved in legislative sessions and various advisory councils, including NAEP (National Assessment of Educational Progress) review panels in Washington, D.C. While pursuing her doctoral degree, Heather held full-time administrative positions as Instructional Specialist, Assistant Principal, and Coordinator of Professional Learning Services for El Paso school districts.

Dr. Click-Cuellar has presented her research at local and international conferences including the 2012 Society for Information Technology and Teacher Education (SITE) Conference and UTEP's 2013 Graduate Research Expo. She has published research for the Society for Information Technology and Teacher Education (Vol. 2012, No.1).

Following graduation, Heather intends to maintain her commitment to students and teachers with service to public education. She will continue research in areas of teacher professional development and STEM education, to guide her efforts in improving teacher development and enhancing student achievement. Most importantly, Heather strives to be the best mother and role model possible to her beloved daughter; and loving supporter of her family.

Heather's dissertation, *Mentor Preparation: A Qualitative Study of STEM Master Teachers' Perceptions of their Professional Development*, was supervised by Dr. Brian Giza.

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