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Evolving Identity: A Case Study Of Mentor Science Teachers

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EVOLVING IDENTITY: A CASE STUDY OF MENTOR SCIENCE TEACHERS

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DEDICATION

This dissertation is dedicated to my daughters Gianna, Calista, and Azalea. You three are my whole world, my inspirations, and my greatest accomplishments.

EVOLVING IDENTITY: A CASE STUDY OF MENTOR SCIENCE TEACHERS

by

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ABSTRACT

This dissertation is a case study of how mentor science teachers understood and presented their experiences, challenges they faced, and learning of being and becoming a mentor teacher while they participated in a year-long district mentoring program. The purpose of this study is to examine what science teachers learn in their experiences as mentors and the role this learning played on their identities as professional educators. According to Bullough (1997), teacher identity is of vital concern to teacher education as it is the "basis of meaning making and decision making" (p. 21). Existing research on science teacher identity indicate that a strong sense of identity leads to resilience, satisfaction, and sustaining and developing (Henderson & Bradey, 2006; Proweller & Michener, 2004; Volkmann & Anderson, 1998). Described by Avraamidou (2014) examining identity is particularly important with the field of teacher education because "it offers a comprehensive construct in with to study teacher learning that goes beyond knowledge and skills" (p. 146). This study looked within and across cases of individual science mentor teachers and their experiences within the teacher community of practice and the roles that mentoring beginning teachers played in their own continued and evolving learning and identity. This study found that mentoring experiences are learned through various identity practices. This study also found that that the stability of their mentor identities was influenced by the support of the organization and community in which they belonged. Findings revealed that identity development and sustainability occurred through experiences of mentor re-learning pedagogy and curriculum, tensions they experienced involving the perceptions of leadership role and fabricating time as a mentor, caring through mentoring, and a legacy for science education through mentoring, as analyzed through Wenger's (1998) characteristics of identity: 1) identity as negotiated experience, 2) identity as community

membership, 3) identity through learning trajectory, 4) identity as nexus of multimembership, and 5) identity as a relation between the local and the global.

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CHAPTER 1

INTRODUCTION

Teacher quality in the United States has been identified as a significant factor linked to student performance. A teacher's impact on student achievement is arguably greater than other factors such as school organization, leadership, and financial condition (Kastberg et al., 2006). TIMSS surveys of science teachers show that a teacher's ability to deliver content, their instructional style, material, and activities chosen to deliver instruction are all linked to the quality of their teaching practices (Roth et al., 2006). Allen (2010) suggests that staffing schools with well-qualified teachers is especially critical in science because the highly technical subjects can only be taught by individuals with a sold grasp of the discipline, solid training in one science field does not necessarily qualify an individual to teach successfully in another science field, and a political commitment to increase science skills for our nation's students can only be met by recruiting, preparing, and hiring teachers with solid qualifications.

According to National Academies of Sciences, Engineering, and Medicine (2015), the Science Teaching Workforce at a Glance reveals that elementary teachers with a bachelor's degree in science, engineering, or science education make up 5%, middle school teachers make up 41%, and high school teachers make up 82%. The National Science Teachers Associate (NSTA) recommends that elementary teachers should be prepared to teach life, earth, and physical sciences. Banilower et al. (2013) found that only 36% of elementary teachers reported completing college preparation course in all three areas, 38% reported completed two of the three content areas, 20% completed one of the three content areas, and 6% reported not having taken any college courses in science. Although most elementary school teachers have completed at least one course in a science topic in their preparation of science teaching, they are

considerably less prepared to engage their students in scientific investigations. On the other end of the spectrum, high school science teachers who majored in science are also unlikely to have had the opportunity to engage in authentic scientific investigations which are closely integrated with the core science ideas and crosscutting concepts indicated by the Next Generation Science Standards [NGSS], (National Research Council, 2006, 2012).

Statement of the Problem

Our nation is in need of more highly qualified science teachers. The U.S., in comparison to other high-performing nations, has developed fewer and lower-stakes filters of science teacher recruitment and retention (Wang, Coleman, Coley, & Phelps, 2003). Another national survey (Birman et al., 2007) found that 65% of school district experienced difficulty attracting highly qualified teachers in science. As a result, attention needs to be placed on teacher quality and explore ways to promote it. National reports suggest that science teachers should demonstrate greater pedagogical proficiency in the classroom in order to improve national competitiveness in global economies (National Research Council [NRC], 2001; National Commission on Mathematics & Science Teaching, 2000; Committee on Science & Mathematics Teacher Preparation [CSMTP], 2010). Ingersoll et al., (2007) suggested that some factors that may hinder teacher quality and the success of science education programs may include teacher shortages, teacher preparation programs, professional development, social-cultural support, and educational policy.

According to The U.S. Department of Education Nationwide Listing from 1990-91 through 2017-18 Teacher Shortage Area (2017) report, our nation has suffered a shortage of qualified science teachers for over two decades. Since the No Child Left Behind Act of 2001, requirements of highly qualified teachers have been in place. As defined by the Code of Federal

Regulations, a highly certified teacher is defined as an individual who holds a bachelor's degree, full state certification or licensure, and demonstrates proficiency in the subject matter they teach (34 CFR 200.55). Science education has been a problematic discipline in the supply and demand of teachers that are highly qualified in this subject area. Teacher shortages result in education reform efforts that primarily focus on new and preservice teachers. As a result, these reform efforts often neglect their impact on preretirement teachers. Ingersoll's and Perda's (2009) study indicate that staffing problems are largely the result of preretirement turnover. The number of science teacher candidates was significantly lower than the number of teachers leaving the profession. Ingersoll and Perda's (2009) study found that only 46% of teacher candidates filled the vacancies of positions left by highly qualified science teachers.

Other researchers suggest that science teacher quality shortages are due to the lack in quality of teacher certification and alternative certification programs (Arabaugh, Abell, Lannin, Volkmann, & Boone, 2007; Escalada & Meoller, 2006; Freidrichsen, Lannin, Abel, Arabaugh, & Volkmann, 2008; Ingersoll et al., 2007; Shaw, 2008; Wang et al., 2003). In science education specifically, positions are filled with alternatively certified teachers more than other subject areas (Zumwalt & Craig, 2005). Miller (2013) reported that secondary science teachers are more likely to enter teaching through an alternative means rather than the traditional university-based teacher preparation. Different from a traditional teacher preparation programs, alternative certification programs prepare individuals in pedagogy and practice who already have a degree in a science field. Alternative certified teachers are often hired under a provisional, transitional, and emergency licenses, which allows teachers to teach before they are completely certified. According to Arbaugh et al. (2007), 18-20% of all science teachers are prepared through

alternative routes. Shortages in science teachers results in high numbers of positions filled with teachers who lack high qualifications for teaching science.

Science teacher shortages are not only due to an unbalanced supply and demand of teachers in schools, but also due to high turnover rates. The 2017 National Foundation for Education Research (NFER) analysis of School Workforce Census data reported over 15% of science teachers left the profession in less than one year. The percentage of teachers leaving the profession dropped to about 5% only after six years of teaching. Secondary teachers were also the highest rated population of teachers to leave the profession. In a recent article by Carver-Thomas and Darling-Hammond (2017), the authors state that high turnover rates negatively impact student achievement in all classrooms, not just new teachers. High turnover rates also impact significant financial costs related to recruitment, hiring, and training ranging from $9,000-$20,000 per teacher depending on rural or urban school districts. The authors suggests that this money should also be used to "include mentoring and learning opportunities [for experienced teachers] to increase effectiveness" (Carver-Thomas and Darling-Hammond, 2017).

Day's (2009) research found that much attention has been focused upon the beginning phases of teaching because of the high attrition rates however, less is known about the nature of tensions and challenges faced by veteran teachers. His research indicated that veteran teachers, those teachers with several years of experience teaching, sustained their commitment and effectiveness of teaching when they were influenced by their professional life phases and their identities (Day, 2009). The study also found that that the stability of their identities was influenced by the support of the organization in which they belonged to. The study also suggested that veteran teachers with more than 15 years of service before retirement experienced negative trajectories and may be in more particular need of support (p. 444).

Supporting quality science education requires providing rich learning opportunities for science learning for teachers. The National Science Foundation and the U.S. Department of Education have conducted rigorous research efforts and development to better understand how to best support science teachers.

Effective professional learning also includes active learning, provides consistency across learning experience with school, district, and state policies, has sufficient duration to allow repeated practice and reflection on classroom experiences, and brings together teachers with similar experiences or needs" (Daehler, 2016). With the adoption of the Next Generation Science Standards, teachers are faced with more rigorous expectations and curriculum, thus, causing greater complexity to the science teaching profession. The National Academy of Science (2015) indicated that many science teachers lack sufficiently rich experiences in science education because they often were not taught in the ways of the new standards. Daehler (2016) found that science teachers benefit most from actively engaging in scientific practices such as asking questions, gathering and analyzing data, and engaging in scientific argumentation. Many school districts lack the resources to effectively ensure that teachers are thoroughly grounded in basic science concepts such as life science, earth science and physical science (Daehler, 2016).

I use this study to see mentor teachers as part of a larger community of practice of educators who play a unique role in the teaching community. A community of practice is defined as a group of people who "share a concern or a passion for something they do and learn how to do it better as they interact regularly" (Wenger-Trayner, 2015). Groups that work together for a shared knowledge construction participate in a community of practice (Lave & Wenger, 1999). According to this definition, teachers are inherently part of a community of practice at their campus because they interact with other teachers regularly about student, parents, and policy.

Teachers create and develop a repertoire of resources such as their experience, stories, tools, and way of addressing problems daily.

Being a teacher of science in a secondary school setting is its own community of practice. Etienne and Beverly Wenger-Trayner (2015) describe three crucial characteristics of a community of practice: domain, community, and practice. In domain, the community of practice consists of a shared interest. Science teachers at the secondary level are the essential experts in their given area such as physics, biology, geology, or astronomy. These teachers share an interest in the subject matter in addition to sharing an interest in ensuring student mastery of the subject. In community, the individuals within the community of practice pursue their interest by engaging in joint activities and discussions that help as they share information. Science teachers participate in professional learning communities (PLC's) and professional development (PD) in which opportunities are provided that enable teachers to discuss science curriculum, science pedagogy, and work to develop lesson plans. In practice, the individuals within the community of practice are considered practitioners. Through time and sustained interaction, individuals develop a shared practice that may become autonomous. Science teachers who meet regularly for PLC's may discuss lab procedures connected to the curriculum being taught. In turn, they may not realize that these discussions are one of their main sources of knowledge about lab activities and set up. Wenger-Trayner (2015) notes that only the combination of these three elements constitutes what is meant by a community of practice.

Communities of practice affect educational practices through mutual construction of knowledge. Learning does not take place in a vacuum but is a social and experiential endeavor. Wenger-Trayner (2015) indicates that teacher training is the first application of communities of practice and is a growing area of interest for peer-to-peer professional development activities.

Deneroff's (2013) stresses that professional development with science teachers must enable the growth of new knowledge and be self-sustaining. Professional development should provide opportunities for science teachers to construct knowledge for themselves through the interactions with other science teachers (Cranton, 1996; Lave & Wenger, 1999; Rogoff, 1994; Vygotsky, 1978). Deneroff (2012) argues that professional development is situated, embodied, and storied through a transformation of identity.

Why Study Identity?

The construct of identity has been theorized and evaluated among various geographic regions through multiple contexts. It has been studied through multidimensional sociocultural lenses that aim to create a deeper understanding of teacher development (Rodgers & Scott, 2008). Studying identity helps us to understand the interconnectedness of the individual and the world and according to Gee (2000) acknowledges the social sociocultural nature of learning and development. Identity based research is important to teacher education because according to Bullough (1997), it is the "basis of meaning making and decision making" (p. 21). According to Wenger (1998) identity helps us to examine "how learning changes who we are" (p. 21). In the context of learning to become a teacher, Sutherland, Howard, and Markauskaite (2010) argue that it is necessary to create and re-create their image of themselves in addition to acquiring the complex knowledge, skills, and pedagogical practices. According to Avraamidou (2014) a consensus about the nature and characteristics that exist on studies for teacher identity; 1) teacher identity is social constructed and constituted, 2) teacher identity is dynamic and fluid and constantly being formed and reformed, 3) teacher identity is complex and multifaceted consisting of various sub-identities that are interrelated.

Although minimal review articles exist on teacher identity (Beaucamp & Tomas, 2009; Beijaard, Meijer, & Verloop, 2004; Izadinia, 2013), a greater need exists for literature that focuses specifically on science teacher identity. Research about teacher identity in science education has seen an increase in articles published in leading science education journals in the past decade (Avrammidou, 2014). Varelas (2012) frames identity by describing the multiple identities that students and teachers bring with them to the classroom and how those identities are constructed and re-constructed which can be recognized as "particular types of people" (p. 2). According to Avraamidou (2014) it is important to gain an understanding how teachers develop their science teacher identities. Some interesting and valuable studies have presented conceptual frameworks on teacher identity reflect feminist and post-structuralist views emphasizing the role of positioning and social indicators that shape the development of teacher identity (Moore, 2008b; Rivera Maulucci, 2013).

A consensus exists about the value of identity as a lens for studying science learning, regardless of the differences in frameworks used (Archer et al., 2010; Brickhouse & Potter, 2001; Calabrese-Barton et al., 2013; Lee, 2007). Some research uses identity to examine learning trajectory of youth such as Rahm (2007) research on inner-city community science programs. Brickhouse & Potter (2001), Scantlebury (2007) and Tonso (2007) use identity to investigate gender issues for girls in science. Brickhouse (2012) and Varelas (2012) use the lens of identity related to children's engagement in science. Some researchers use identity to explore links between language and students' positioning with science (Brown & Kelly, 2007; Calabrese-Barton et al., 2013). Although research exists to support the argument that the construct of identity is valuable for the science learning (Shanahan, 2009), only recent studies have be conducted to examine teacher learning and development. Furthermore, Avraamido's (2014)

review of the literature on existing research provides the following assertions about science teacher identity and identity development:

- Identity offers a powerful and multidimensional lens to studying teacher learning and development.
- The construct of teacher identity highlights the role of the context in teacher learning and development.
- The construct of teacher identity has the potential to shed light on teachers' personal histories in relation to science.
- The construct of teacher identity allows us to examine the impact of social markers on teacher learning and development (age, gender, emotions and ethnicity status).

Teachers are constantly transformed by their learning as they actively participate in professional development. When a teacher enters the teaching profession, growth often becomes limited as opportunities for explicit professional development for science diminish. Content-specific professional development offered by large school districts is usually based on federal funding in conjunction with the needs of each district's assessment data. Despite this, science teachers continue to seek other opportunities for professional development to help them reshape, refine, and even redefine their craft. Science teachers learn from their day-to-day interaction with other science teachers, their own experiences, cultural values, background, population of students they serve, and their participation, or lack of participation, within their own teaching community. Science teachers may belong to alternative communities of practice that support their needs. These alternative communities may include outside organizations or groups. They may also be situated within virtual groups or associations consisting with other science teachers from across the nation and globally. Science teachers who serve as mentors to new teachers open the door to a smaller community of practice. Mentor teachers learn to maneuver and emerge within their new space. The new community may consist of mentor teachers who became

mentors by default, by choice, or by appointment. The science teacher community of mentors may affect their professional learning through their perceived professional identity.

Professional communities provide teachers with opportunities for ongoing participation, experiences, and social interpretation of those experiences through and evolving professional identity (Lave, 1991). It is important to understand the experience of teachers within teacher networks as they grow in numbers and become more influential in education reform (Lieberman & Grolnick (1996); Lieberman & Wood, 2003). Wenger (1998) indicates that the formation of a community of practice is the negotiation of identities (p. 149). Parallels between practice and identity within the community involve identity as; 1) a negotiated experience, 2) a community membership, 3) a learning trajectory, 4) a nexus of mulitmemberhsip, and 5) a relation between the local and the global. These concepts are covered in greater detail in the following chapter.

Purpose of the Study

The purpose of this study is to examine what science teachers learn in their experiences as mentors and the role this learning played on their identities as professional educators. According to Bullough (1997), teacher identity is of vital concern to teacher education as it is the "basis of meaning making and decision making" (p. 21). Existing research on science teacher identity indicate that a strong sense of identity leads to resilience, satisfaction, and sustaining and developing (Henderson & Bradey, 2006; Proweller & Michener, 2004; Volkmann & Anderson, 1998). Described by Avraamidou (2014) examining identity is particularly important with the field of teacher education because "it offers a comprehensive construct in with to study teacher learning that goes beyond knowledge and skills" (p. 146).

Research Questions

Guiding Question- "What influence does participation in a mentor program have on science teacher identity and their professional learning?"

1. In what ways are mentor science teachers' identities constructed while serving as a mentor teacher to new science teachers?
2. In what ways do mentor science teachers maintain and sustain a particular identity as a mentor?

Population

The study subjects were adult mentor science teachers who participated in the Border District's Mentor Program between 2016-2018. The program's mission is "All Border District stakeholders will promote personalized support to ensure that the new and experience teachers receive rich, authentic, and collaborative experiences which empower them to take risks, build confidence, be innovative and effective in order to directly impact student success. The goals of the program are to: (1) Provide new teachers, 0-2 years experience, with a one-to-one mentor. (2) Orient new teachers to the campus and district, policies, and procedures. (3) Make new teachers aware of professional practices and expectations. (4) Help new teachers attain high and rigorous teaching standards. (5) Ensure that all new teachers have T-TESS Training. (6) Work with all teachers involved in the M.E.N.T.O.R Program to foster effective classroom management practices (p. 1). It should be noted that unlike most mentor programs, this program's explicit goal is to provide support to not only beginning teachers but mentor teachers as well. Mandated by the state, the district has sustained its Teacher Induction Program for years through Title II state funding, grants, and its past mentor participants have continue to work closely with the program.

Definition of Terms

For the purpose of this study, the following terms and definitions are provided to rationalize their use within the context of this study. The following definitions and terminology were used based on the context of the study, purpose of the study, and focus of the research questions.

- Mentor- although used differently across research settings, for this study the term refers to the classroom-based teacher with three or more years teaching experience who has agreed to work with the beginning teacher on the same campus. In some situations, this teacher is considered to be the expert teacher among their campus community.
- Mentee-is the term applied to the beginning teacher with zero to two years teaching experience on their campus. This term is used interchangeably with the term "beginning teacher" throughout the study based on the context.
- Identity- is the personal a social concept of self through. Through internal processes and external interactions, identity is reflected within and outside one's self.
- Teacher Identity- A teacher's own personal sense of self as a teacher such as their professional role, behavior, emotion, belief and value within society.
- Science Teacher Identity- Much like the development of teacher identity, a science teacher's personal sense of self as a science teacher within society.
- Community of Practice-a theoretical concept that refers to a community of individuals who engage in a common practice. In this study, community of

practice includes, but is not limited to, the science teacher learning community, and the campus faculty in its entirety.

Organization of the Study

This study is organized into five chapters. Chapter 1 presented an introduction to the study, a statement of the problem, the purpose of the study, significance of the study, a theoretical framework, research questions, research setting, population and definition of terms. Chapter 2 contains a comprehensive review of selected literature related to the theoretical framework, professional identities, learning and practice, science pedagogy, and the challenges associated with science education. It also contains information about adult learning, and mentoring. Chapter 3 discusses the methodology of this study through the lens of professional identity of mentor science teachers. Chapter 4 presents the results and analyses from the study. Chapter 5 contains a summary and findings for this study. It also provides the generalizability, limitations, suggestions for further study, and the researcher's reflection.

CHAPTER 2

REVIEW OF THE LITERATURE

Introduction

In this chapter, I examine and discuss how science education reform has impacted the ways in which science education is taught. I also examine research on identity and how it contributes to the understanding of the position of science teachers serving in the role of a mentor to other science teachers. Through a comprehensive review of the literature, I provide an overview of the basic concepts and principles involved in theoretical underpinnings of learning and how identity theory specifically can support our understanding of how mentor teachers learn to be mentors. This chapter includes a contextual background of the mentoring process and of the ways this process is unique in science education.

Literature Review

Science pedagogy

Science pedagogy has evolved over time. A series of influential publications have been published to advocate science education reform nation-wide (Rutherford & Ahlgren, 1989; AAAS, 1993; NRC, 1996). Reform efforts have impacted science education to become more inquiry based and problem-based in which learning places the responsibility of learning on the learner through authentic real-world settings. For this to occur, the teacher must be skilled enough to create environments that allow students to discover and embody scientific thought.

Kirschner, Sweller, and Clark (2006) and Hmelo-Silver, Duncan, and Chinn (2007) found that achievement can be attained through inquiry learning and problem-based learning strategies when teachers employ scaffolding extensively. Hmelo-Silver et al. noted, “Approaches to learning address important goals of education that include content knowledge, epistemic

practices, and soft skills such as collaboration and self-directed learning." The literature indicated that the refinement of these strategies is still taking shape.

Scientific literacy is another component that teachers must embed within their curriculum to promote critical thinking about the world. Teachers should allow students to question natural phenomena and explore ways to produce, describe, explain, and predict answers. These components are important because they allow teachers to understand the requirements for good science teaching and reveal the high degree of complication of a teacher's understanding of pedagogy through content. Shulman (1986) introduced the idea of pedagogical content knowledge and explained the importance of teachers knowing the structure of the content to deliver to students but also knowing common conceptions, misconceptions, and the difficulties students may encounter during their acquisition of content. To put into the context of science education, teachers are responsible for helping students to learn basic facts and applications and to anticipate areas of possible difficulty and misunderstanding. For example, students may have a basic understanding of the states of matter, but teachers should anticipate students believing that because air is seemingly invisible, it must not have matter. Berg and Brower (1991) found that teachers sometimes hold misconceptions themselves and showed that experienced middle school science teachers lacked "crucial knowledge," to promote student learning. To fulfill the needs of students, the state curriculum is adapted from national standards to promote a deeper knowledge base in a local setting. In Texas, teachers follow the Texas Essential Knowledge and Skills curriculum standards, and teachers are expected to have a fundamental understanding of the Texas Essential Knowledge and Skills upon entering the classroom.

Challenges of science education

Teaching science at the secondary level requires a deep understanding of scientific knowledge and concepts through ongoing mediated practice. A good science teacher creates opportunities for students to learn by taking the essences of science and reshaping concepts to meet the specific needs of the students while providing hands-on experiences in deliberate ways. For example, teaching science through inquiry can be a difficult task to begin with. Although lab activities are already developed to help guide students through lab activities, they generally exhibit traditional "cookbook" approaches in which students are told what to do and what to learn (Sundberg & Moncada, 1994). This defeats the purpose of inquiry based learning because it does not allow for student so develop their own research question, variables, procedures and explain their results based on their studies. Chinn & Malhotra (2002), argue that this type of learning varies dramatically from how inquiry really exists in the lab setting. In addition to negotiating opportunities for authentic science learning, teachers must be responsive to the diverse needs of their students. The typical classroom contains students with special needs, students who are learning English as a second language, and students with diverse backgrounds in their knowledge of science and experience with the natural world. The teacher must know each students' situation in relation to the lesson being taught and adhere to these needs to address gaps in their understanding. Teachers' pedagogy and refinement are an organic process that requires teachers' continued learning throughout their career. Researchers indicate that educational reforms efforts will fail if teachers' beliefs, intentions and attitudes are not taking into account (Haney, Czerniak, & Lumpe, 1996). Teachers' knowledge and beliefs about the subject matter, teaching, children, and learning requires an internal change to occur (van Driel,

et.al., 2001). Therefore, the implementation of reforms can be seen as a matter of teacher learning (Ball & Cohen, 1999).

Mentoring

Induction programs

The idea of teacher induction programs centralizes around the theory that teaching is complex works and teacher preparation is often on sufficient enough to provide all the knowledge and skills necessary to successful teaching. It is the idea that skills are mostly acquired while on the job (Feiman-Nemser, 2001; Ganser, 2002; Gold, 1999; Hegstad, 1999). In order for school districts to improve the performance and retention of beginning teachers, it is necessary for programs to exist in which environments are created to support novice teachers. According to Ingersoll & Strong (2011) the ultimate goal of such programs is to improve the performance and retention of beginning teachers. Teacher induction programs offer different types of opportunities and activities for new teachers such as "orientation sessions, faculty collaborative periods, meetings with supervisors, developmental workshops, extra classroom assistance, reduced workloads, and especially, mentoring" (p. 203). In the past decades, teacher mentoring program shave become a dominant form of teacher induction (Britton, Paine, Raizen, & Pimm, 2003; Fideler & Haselkorn, 1999; Hobson, Ashby, Malderez, & Tomlinson, 2009; Strong, 2009). The purpose of teacher mentoring programs is to give new teachers guidance and support. The types of guidance and support vary across different programs and may involve a one-time meeting between the mentor and mentee at the beginning of the school year or could involve a highly structured environment with frequent opportunities for mentors and mentees to meet over the course of multiple years. Programs also vary in the number of new teachers they serve which can depend on hiring trends and programmatic budget constraints. Lastly, programs

differ in the ways in which they select, prepare, assign, and compensate the mentors themselves (Ingersoll & Strong, 2011).

Implications in helping novice teachers

According to Kemmis et al. (2014) mentoring practices produce, reproduce, and transform the dispositions of both mentors and mentees. The researchers indicate that depending on how mentoring is practiced by the mentor, mentees will receive support in different ways that will impact their disposition for teaching. For example, when mentors practice mentoring as supervision, the mentor is likely to develop the disposition of a supervisor and the mentee is likely to develop a disposition of compliance. When a mentor practices mentoring as a supporter, the mentor is likely to develop a disposition as a helpful professional colleague and guide, and the mentee is likely to develop a disposition towards continued professional development. When a mentor practices mentoring through collaboration and self-development, mentors and mentees both are likely to develop dispositions toward engagement in a professional community committed to individual and collective self-development (p. 157). These finding point towards the need to consider the different forms of mentoring in relation to who requires mentoring and for what purpose.

A number of studies have been conducted in which mentoring was examined to measure its effects on student achievement. Fletcher, Strong, and Villar (2008) focused on the effects on student reading achievement of the teachers having different types of mentors. Three school districts participated in the study and used mentors who were released from all teaching duties, sometimes referred to as a "full-release" mentor, with mentor to mentee caseloads of 1:15 in the first year. In the second year, one district changed their mentoring model to and in-school "buddy" mentor with no release time. Another district doubled the mentor caseload, and the last

district sustained the same caseload and thereby maintaining high intense support. The results from this study showed that the district that that sustained the high intense caseload showed higher class reading gains for its beginning teachers that the other two districts. Another study conducted by Fletcher and Strong (2009) compared two groups of beginning elementary teachers in a large, urban, East Coast school district. One group received support from a full-release mentor and the other group were assigned a site-based mentor. The mentors in both studies received the same trainings but did not have the same caseload and release times. The researchers found that the teachers who received the support of the full-time mentor resulted in more low-achieving students than the teachers in the other group. In a study done by Rockoff (2008) the researcher also examined the effects of mentoring on student achievement by comparing teachers who received more time with a mentor to those who received less time. The study found that teachers who received more time with mentors had higher student achievement in math and reading than those teachers that received less time with a mentor.

A model for mentoring practices

Richter et. al. (2013) conducted a study in which a knowledge transformation model for mentoring was practiced. The model reflected the constructivist learning where learners "construct" their knowledge by connecting new information to their prior knowledge (Shuell, 2001). Because learning is an active process, it occurs in the social community, or community of practice (Brown, Collins, & Duguid, 1989; Wenger, 1998). Apprenticeships are described by Lave and Wenger (1991) in which novices are introduced into a community through active participation and authentic tasks. Novices acquire mastery in these skills as they gradually become more involved in their community of practice. This mentoring style is what these researchers consider to be "constructivist-oriented mentoring" (p. 168). Desimone (2009)

indicates that constructivist mentoring helps new teachers develop professional competence such as professional characteristics that affect their professional behavior, overall well-being, and classroom practice. In the study conducted by Richter et. al. (2013) findings suggest that teachers who experienced constructive mentoring show higher level of efficacy, teaching enthusiasm, and job satisfaction along with lower level of emotional exhaustion compared to the teachers without constructivist mentoring. This is in contrast to mentors in the study who supervised their mentees closely and conveyed their ideas of teaching to their mentee which proved to be unsuccessful in fostering beginning teachers' competence and well-being.

Educational Mentoring

Mentoring is often considered a long-term professional relationship between a protégé and an expert. Historically, mentoring has involved training youth or adults in particular skills, acquiring new knowledge, or building upon a current knowledge base (Merriam, 2001). Mentoring has also been described as technical and involving the transfer of skills from an authoritative figure to an apprentice. Some modern alternative mentoring methods involve questioning established hierarchies and favoring new forms of socialization (Darwin, 2000; Hansman, 2003) perhaps creating more room for attention to mentoring learning. Mentoring is an investment for the future (Mullen 2005, 2008; Tang, 2012) and a critical component that fosters supportive nurturing relationships between mentors and mentees and in turn promotes learning, socialization, and identity transformation within the work environments (Johnson, 2006; Mullen, 2008; Tang, 2012). Mentoring is also considered a complex process that embodies innate challenges in learning.

Mentoring is in of itself can be viewed as a form of learning within the context of being an adult. Learning as an adult is known as the theory of andragogy. Knowles (1984) explains this

theory as the idea that adult learning for adults is different from that of pedagogy for children and young adults in that it focuses more on the process and less on the content itself. He provides four principles in which to design training that adheres to the needs of an adult learner. The first principle involves the idea that adults need to be involved in the planning and evaluation of their instruction. In the context of mentoring and with little guidance (Hollins, 2015) mentors must create their own schema for lessons involved in guiding their student teacher. Mentors must negotiate what she/he believes to be necessary for learning. In doing so, she/he may consult with other colleagues, university staff, resources, and/or their own past experiences to help in the negation. The mentor evolves in her/his knowledge of mentoring in the context of the discipline through the process of acquiring information about mentoring itself.

Second, the theory takes into consideration the experience adults have which provides the basis for learning. Mentor teachers have all gone through some type of teacher preparation program in order for them to be considered highly qualified by the state. Whether the preparation was considered positive or negative, the experience itself informs the mentor on what is perceived helpful and important. Third, adults learn based on their interest in immediate relevance for their life (professional or personal). The mentor teacher may deem it necessary to help their student teacher assess learning during a lab activity with students. Although the mentor may have identified this as an area of weakness for their student teacher, she/he may not know how to support the student teacher and must therefore seek resources specifically for assessment. In doing so, the mentor will obtain new knowledge about where to find such resource as well as learn about what is said about assessment. Fourth, adults learn from problem-centered situations rather than the content alone. As in the previously mentioned scenario, the mentor may find the issue of not knowing how to support their student teacher in the area of assessment. The mentor

may be considered quite proficient in assessing her/his own students, helping the student teacher to consequently do the same may not be as easy. The mentor may be driven to learn how to teach someone to assess based on their perception of a need to do so. Although the focus of this study is not to necessarily learn how mentors learn to be better mentors, it is important to acknowledge that when placed in a particular situation when knowledge is not known, mentors will seek knowledge and therefore acquire new knowledge in the process. For this study, it is important to understand that the needs of mentors and their learning must be understood through what mentors find important and learn what those driving forces are.

Mentor teachers encompass two types of mentoring: mentoring that involves assisting new novice teachers already teaching in the classroom and mentoring student teachers enrolled in field experience through a teacher preparation program. In either case, mentor teachers agree to assist protégés and most often do not receive any type of monetary compensation (Cornell, 2003). Mentors must be intrinsically motivated to contribute to their field through efforts to transfer their own perception of important skills necessary for teaching.

Novice teacher mentoring includes campus administrators assigning mentors to mentees at the beginning of the school year. Administrators often choose veteran teachers who are perceived to be the pedagogical and content expert. The leaders of large school districts across Texas spend money on building entire programs to support newly hired teachers. The purpose of such programs is to both "improve performance of beginning teachers and reduce the high rate of their attrition" (Zuckerman, 2001). Novice teachers spend time observing and planning with their mentor. Regular district meetings and professional development are held and provided to participants of the program. Professional development sessions are geared toward best practices in the classroom according to specific district- and state-mandated initiatives.

Teacher candidate mentoring has similar qualities as above. The main difference for this type of mentor is the facilitation of growth in preservice teachers who have not yet held the position of a classroom teacher. Teacher candidates receive support through a triad encompassing the school-based teacher mentor, a field supervisor designated by the university, and faculty and staff from the university. Mentor teachers for student teachers encompass qualities and relationships with their mentees that focus on cultivating relationships geared toward feedback, constructive criticism, and communicating. Mullen & Tuten, (2010) indicate that mentors themselves also benefit from the mentoring relationship as the relationship evolves. They take on new roles as a model, coach, critical friend, and co-enquirer (Furlong and Maynard, 1995, p. 193). The selection process for teacher candidate mentoring is similar to that described above. Mentor teachers are typically selected by their campus administration based on qualifications such as number of years teaching, classroom management skills, or student testing data. Sometimes mentor teachers are chosen based on their seniority within the campus, if they are a teacher of the year awardee, or sometimes simply willingness to volunteer.

Role of the Mentor

Despite how mentor teachers may be selected, they perceive their roles in different ways. Koballa, Bradbury, Glynn, and Deaton (2009) conducted a study in which they focused on the transition and expectations for mentors as they developed a successful working relationship between themselves and their student teacher interns through negotiation. Koballa et al. found three commonly held conceptions or set of beliefs about what mentoring is and what it should look like in practice. The first conception places the mentor in the position of guide or leader. In this position, the mentor perceives themselves to be helpful in nature by attempting to share practical knowledge through demonstration and providing specific advice (Franke & Dahlgren,

1996; Harrison, Dymoke, & Pell, 2006). The second conception of mentoring places the mentor in the position as a moral supporter. In this position, mentors support the personal needs of their student teacher interns through conversation. The mentor acts as an advocate through supporting and encouraging the intern and thus forms a close personal relationship (Abell et al., 1995; Awaya et al., 2003; Koballa et al., in press; Zanting, Verloop, Vermunt, & Van Driel, 1998). Izdinia (2016) noted that mentor teachers consider the significance of the developing relationship to be important when mentoring student teachers. Building mutual trust and respect is the most important element in ensuring that student teachers receive the emotional support needed to build a professional identity for teaching. In the third conception, mentors conceive their roles as collaborative partners. In this role, mentors consider themselves partners rather than being authoritative (Awaya et al., 2003). In this role, both mentors and interns contribute to the learning that occurs through the mentoring relationship. Each individual discusses ideas and together they arrive at solutions. Though not the only conception that has any influence on mentors' professional identities, this particular role is directly connects the idea of professional identity as every changing and always evolving. The mentor teacher takes on the role of learner of new knowledge which thus contributes to the creation of a new professional identity.

Feiman-Nemser (2001) conducted a case study and found that mentors use several different strategies to teach their student teachers, including asking the student teacher questions about individual students' learning, sharing information gathered on students' thinking through observation, and engaging students through coteaching. Athanases and Achinstein (2003) indicated that mentors scaffolded the learning of their protégés by having them focus on individual low-performing students and on strategies to increase their in-depth knowledge of assessments and curriculum for aligning lessons. The importance placed on this type of

mentoring in a "bifocal perspective," included student teachers' knowledge base and the larger perspective of the goals for student achievement in the classroom (Norman & Feinman-Nemser, 2005).

Preparation for Mentors

In 2010, the National Council for Accreditation of Teacher Education reported the accountability of mentor teachers by outlining their responsibility for modeling "highly effective practices" and for "guiding the development of teacher candidate practice." This outline serves as the foundation for new teacher education accreditation expectations for clinical practice. In this regard, mentor teachers then serve as a catalyst for transforming teacher education. Although teachers are generally aware of their responsibilities as mentors (Jenkins & Fortnam, 2010), they are often placed into their role without adequate preparation and sometimes without any training at all. While mentor teachers are ready to take on their role to engage student teachers in classroom practice, they are often uncertain of their other responsibilities related to mentoring and feedback (Morehead & Waters, 1987). The literature here presents the idea that training for mentor teachers is considered to be inadequate and mentor teachers miss out on formal learning opportunities such as specific professional development, training, courses that may assist the learning. These missed opportunities may influence the quality of the mentoring experience which may therefore shape the teacher's professional identity by causing the learning to take place in more unconventional settings.

Mentoring Challenges

Mentoring can be a daunting task when trying to appeal to the needs of the mentee based on what the mentor believes to be important and how that is projected through the mentor's own professional teacher identity. Furthermore, the task may be more challenging when taking into

consideration the intricacies of content-specific pedagogy, such as the field of science education. When science teachers take on the role of mentoring, they face additional challenges not only with pedagogy but also with the negotiation of their perception of what is important to teach new and novice science teachers. Kilburg and Hanckock (2006) noted, "Mentoring programs heavily rely on the use of full-time teachers who often do not possess the time nor skills necessary to effectively mentor" (p. 1321). Moreover, mentor teachers are often not adequately trained or compensated. This may cause mentors to seek other avenues for resources within a community of practice with other mentors seeking experiencing the same challenges. Becoming part of another community of practice may affect the mentor teacher's professional identity. This study looked for evidence of learning about pedagogy in the mentoring process.

Benefits of Mentoring

Although research indicates that mentoring for preservice teachers is the most critical factor in teacher preparation programs and that the interaction and collaboration between mentors and mentees has a lasting effect on the success or lack of success among new teachers, very few researchers have examined the impact of mentoring on mentor teachers. Zuckerman (2011) found that when mentors take on the added responsibility of mentoring student teachers, the interactions can be positive if a collaborative mentoring relationship is established and nourished throughout the experience. Zuckerman found that veteran teachers who had been teaching for more than 10 years had confidence in their professional identity as a teacher. Some felt more confident and ready to take on leadership roles on their campus and in their community. Some teachers felt revitalized and experienced an enhanced sense of professional worth (Zuckerman, 2011). Zuckerman did not say that all mentor teachers feel revitalized after having mentored a student teacher but rather indicated that it is important to focus on the factors

that positively affected mentor teachers in these interactions. Factors such as reciprocal relationships with their mentees and feedback they received enabled mentors to create a sense of agency within their practice which affected their professional identity through an outbound trajectory out of the classroom. In a small-scale study, Thornton (2014) identified enablers and barriers that either caused perceived success or hindered the success of mentors. Mentors were viewed as "educational leaders and change agents" (Thornton, 2014). Thornton found that mentors developed a sense of leadership in her study and took on identities as educational leaders.

Ongoing Learning

The learning process for teachers continues throughout their career therefore the preparation and training of science teachers is necessary (Anderman & Sinatra, 2008). School districts and regional service centers offer formal professional development courses that are often based on the needs of the populations they serve. Funding also drives the types of professional development offered. Professional development attempts to support what and how teachers teach and their ability to be responsive to students. Sometimes the professional development teachers receive is limited to content and primarily focuses on supporting the needs of special populations such as special education, English language learners, and gifted and talented.

Some key issues that affect teacher professional development include the fact that teachers often do not have time to be out of the classroom and away from their students. When they do attend trainings, they are required to attend very specific types that do not necessarily pertain to their own content. As a result, teachers also take on informal learning methods to enhance their teaching strategies in the classroom. For example, teachers learn from their own experiences teaching lessons, from lab activities, and from responses in formative and

summative assessments. Teachers also position themselves as educators through their own cultural background, upbringing, and experience as students. Teachers learn from their associations, surroundings, communities in which they are members, and programs in which they participate. This study is important because special attention was placed on understanding what the already experienced teacher learns themselves while serving as mentor teachers to new teachers.

Theoretical Underpinnings

Before I begin with a look at the theoretical framework I used to understand identity as learning in the mentor teacher experience, I want to begin with how I eventually arrived at my adoption of this theory and its significance in this study. In Lave and Wenger's (1991) communities of practice theory, the scholars suggest that learning occurs in the social relationships in the workplace rather than in a formal setting. For example, teachers learn theory and best practices in their teacher preparation programs however, according to Lave and Wenger's ideas, teachers learn practical knowledge while immersed in the educational setting at their campus. Learning takes place within the informal setting where professionals, like teachers, interact with each other. This could be before and after school, during lunch breaks, or during faculty meetings. This is when, according to Lave and Wenger, gaps in practice are identified and addressed. This idea is important to this study because a person's identity is constantly shaped and reshaped and there is not enough research to focus on the so called experts and how they continue to learn and shape their professional identity. Lave and Wenger's (1991) research focuses on the interactions between novice and experts and how "newcomers create a professional identity," yet the experts' ongoing professional identity is not addressed.

To view communities of practice from another perspective, Liebermen and Grolick (1996) theorized that through teacher networks sometimes alternative communities can emerge. An alternative community contrasts the normal day-to-day community setting which takes place in the workplace. For a teacher, instead of or in addition to feeling part of the campus community, a teacher may belong to an extracurricular activity with other teachers, a teacher's association, or a professional group. In the case of science teachers, a grant funded regional consortium exists in the El Paso region that consists of science teachers from area school districts that come together monthly for professional development. In addition, virtual settings exist in the social media platforms that offer individuals with varying interests to discuss issues and topics related to their discipline. Libermen and Grolnick indicate that these alternative communities help shape teachers' professional identities by providing a third dimensional space for them to participate in outside of the daily setting. More about the third dimensional space is discussed later in this section. The idea of an alternative community allows the "wealth of knowledge about teaching, students, and education (Beynon et al., 2004, p. 15)" to cultivate new facets of professional identity through collaborative structures. Alternative settings also offer opportunities for teachers to feel supported, valued, and validated which may contribute to the ongoing shaping of the professional identity. It is important to understand and acknowledge that alternative communities exist because this study focuses on mentor teachers in the Border District's mentor program which can be considered another avenue for belongingness for experienced science teachers. The mentor teachers teach at different campuses and come together for professional development through the program. They share experiences about mentoring with each other outside of the normal day-to-day classroom environments thus situating themselves within the alternative community of mentor teacher.

Teacher educators are "shifting [their] perspectives to building new communities and co-constructing new facets to identity" (Baynon et al., 2004, p. 106). Thus, a third dimension is formed through the social interactions that teachers experience. Outside of the school setting, science teachers belong to a science network that allows teachers the freedom to discuss successes or issues they experience in the classroom or with other staff and faculty. Such coherence among colleagues enables teachers to continue to develop their sense of identity as a teacher of science. Developing a sense identity as a science teacher is different from teaching other disciplines because it requires the teacher to intuitively embed the nature of science through inquire and lab activities. Britzman (2003) noted that social interactions are not always neat dichotomies; rather, social interactions are dynamic and can sometimes cause tension. The creating of a mentor teacher is an intricate process of practice, learning and identity development. This relationship is dynamic and changes as new information informs the mentor through practice. Identity can be created, affected, or altered by learning something new or practicing something new. In the action of learning something new, this may intern affect practice thus affecting one's identity. Practicing something causes an individual to acquire new knowledge and can also affect the way she/he perceives themselves. For example, becoming a mentor teacher requires socialization into a new community of practice in assuming a new role. The mentor role requires an in depth understanding of knowledge development through classroom laboratory activities and skills development through situated learning activities (Lave & Wenger, 1991).

Adult Learning

In the context of mentor teachers working with new teachers to facilitate pedagogical learning, it is important to understand adult learning theories as they relate to mentoring. As

Bullough (2012) stated, "mentoring is a matter of adult learning and that helping adults learn complex tasks in often-times threatening conditions present unique challenges, particularly of unlearning old habit and remaking established beliefs" (p. 70). The facilitation of on-going professional learning opportunities can be addressed when the learning needs of adults are taken into consideration. Being a good teacher does not necessarily translate in to being a good mentor (Bullough, 2012; Killian & Wilkins, 2009; Lesham, 2014; Martin, 1994; Wang & Odell, 2002) due to the diverse needs of the adult learner. The following three adult learning theories are important for understanding how mentors continue to obtain new knowledge and why this occurs.

Humanistic Learning

Humanistic learning theory is one theory that is used to understand how adults learn. This theory assumes that people (in general) have the natural tendency to learn and the overall goal is the need for professional and personal growth. This theory argues that learning is natural and if put into the context of teachers when they mentor, we begin to understand the idea of how she/he may draw upon her/his experience as a science teacher while determining a learning experience for the mentee which often times is self-guided with minimal external support. Rogers (1983) describes humanistic psychology in a way that focuses upon the "experiencing person" and [her/]his distinctively human qualities such as choice, creativity, valuation dignity and worth, and the development of [her]/his potentials. This theory derives from and existential philosophy of human beings and their worlds. A humanistic approach to learning posits the idea that an individual has the desire and potential to grow (Jackson, 2009). In order for this to occur, teachers must in essence view themselves as lifelong learners. A lifelong learner "requires

progress and an integration of new theories, innovative systems, practices, and assessment (Fischer, Immordino-Yan, and Waber, 2006)."

Maslow's (1943) research on human behavior involves a hierarchy of human needs that are fulfilled through personal growth towards what he describes as "self-actualization." According to his theory, an individual can achieve the level of self-actualization only after achieving the four stages that preceded it. Beginning with the most basic need, humans experience physiological needs. These needs represent the most primal needs such as food, rest and warmth. Once these needs have been met, humans grow to need security and safety. From this humans move on to needing a sense of belonging and love. Once these needs have been met humans need prestige and to feel a sense of accomplishment. Upon satisfying all these needs is when a person can reach her/his full potential through self-fulfillment in the highest state. He describes self-actualization as a "person's desire for self-fulfillment, namely, to the tendency for him to become actualized in what he is potentially." Hoffman (1988) later goes on to state that self-actualization is a continual process of becoming rather than a perfect state one reaches of a "happy ever after." Reaching a state of self-fulfillment is a way for us to understand the driving force behind the adults' innate need for continued learning.

When in the encouraging environment, with the right tools and resources an individual can thrive and professional growth can flourish (Ozuah, 2005). Tough's (1968) work on self-directed learning is explored by first questioning why adults learn. Describing this as an enormous task, he points to reasons centralizing around an individual's own childhood, personality characteristics, long-term goal's and responsibilities. He continues to explain these various elements with a person's "age, previous education, socioeconomic status, occupation, intelligence, optimism, or mobility (p. 45)" which may all be part of the explanation for why

adults learn. From his research (1968), Tough finds that adults learn when she/he has the desire to impart knowledge to others, needs information for future understanding or learning, receives pleasure and higher sense of self-esteem, when an individual receives credit for learning or when she/he receives immediate benefits from the new knowledge.

Andragogy

The term, coined by Alexander Kapp in 1833, Andragogy describes the educational paradigm that describes adult learning (van Enckevort, 1971). Although the use of the term "pedagogy" is prominent in the field of education, Andragogy is less known and just as important. Andragogy is defined as the art and science of teaching adults. Unlike Pedagogy used to teach children in our educational system and which is based on four assumptions. The first assumption implies that learning is based on a person's personality and is therefore incapable of identifying one's own educational needs. The second assumption describes that learning was to be centralized around subjects such as science, mathematics, or geography. The third assumption describes learning based on extrinsic motivation such as prizes for obtaining a concept or punishment for not performing well. The fourth and last assumption describes the notion that prior learning was irrelevant to the learner. Students essentially come with blank slates (Ozuah, 2005). Still practiced to in today's modern educational system, practices of pedagogy are used to teach children and young adults where teachers determine what is learned, when it is learned, and how it should be learned. Since adults have a plethora of experiences, Andragogy predicates on the notion that those experiences be harnessed for the learning to occur. Described by Lindeman, adult learning is to be approached through problems solving rather than taught by subjects. "Facts and information form differentiated spheres of knowledge are used, not for the purpose of accumulation, but because of need in solving problems" (Lindeman, 1926).

Expanding on Lindeman's work, Malcom Knowles and other scholars developed new assumptions about adult learners (Knowles et al., 1998; Tough 1967).

According to Reischmann (2004), three main understandings exist about our understanding of Andragogy. To begin with, many countries accept andragogy as a "scholarly approach to learning" regarding it as the science of understanding and supporting what he describes as "lifelong and lifewide" education of adults. The next understanding labels andragogy as a "specific theoretical and practical approach based on a humanistic conception of the self-directed and autonomous learners and facilitators of learning" (p. 1.). The last understanding described by Reischmann is the notion that andragogy itself is a widely unclear concept. Knowles determined that the idea of andragogy is guided by six principles of adult learning. See Table 1: Andragogical Principals and Descriptions.

Table 2.1: Andragogical Principals and Descriptions

Andragogical Principles	**Description**
I. The need to know	Adults need to know the reason for learning and its value before embarking on the learning.
II. The learner self-concept	Adults have an innate passion and need for autonomy and self-direction.
III. The role of experience	Adults learning takes into consideration prior experiences and recognizes them as rich resources.
IV. Readiness to learn	Adult readiness to learn is dependent on an appreciation and relevancy for the topic
V. Orientation to	Adult learning is problem

learning	centered, task-centers, or life centered. Adults are motivated based on how the task will help them solve a real-world problem.
VI. Motivation	Adults are motivated by intrinsic motived due to pressure, self-esteem, and goal of attainment.

Learning, & Practice

Learning according to Vygotsky (1978), does not take place in a vacuum but occurs through social development and interactions. Although teachers must reach and maintain a rating of "highly qualified" to teaching in the state of Texas, teachers continue to learn and grow over time whether it is deliberate or not. Situated learning is the idea that learning as unintentional and situated within authentic activity, context, and culture. Wenger (1998) describes learning as not just acquiring skills and information but also results in becoming a certain person. For example, within a community of practice certain belief and behaviors are acquired through social interactions among individuals. Individuals naturally fall into a process called "legitimate peripheral participation" where Lave describes learning as naturally occurring within the social setting (1988). Horn (2005) investigated the learning process through knowledge and practice as negotiated within a context. She defined learning as "a change in participating in a community of practice." For this study, I borrow from Horn's neutral definition as it pertains to teachers however, I also add that the particular change in participating community of practice as it pertains to mentor teachers of science. She further describes this by stating teachers' attitudes, ideas, and practices may either perpetuate traditional pedagogy or alter it. Mentor teachers are usually the expert teachers who have extensive experience teaching

whereby attitudes, ideas, and practices have already been established. This study identifies the factors that enable a continuation of evolving practices within in the mentoring community.

Wenger describes the negotiation of meaning in a community of practice through participation and reification. Participation refers to the process of "taking part" of a community of practice (Wenger, 1998, p. 55). Taking part in the social aspect of life includes engaging in activities, conversations, and reflections. In the context of mentoring, this includes professional development activities, professional conversations about content and pedagogy, and reflections in practice. Reification is described as the yield and product of the described participation--the actual "making into an object (Wenger, 1998)." Our experiences from participation which is characterized by reification by "creat[ing] points of focus around which the negotiation of meaning becomes organized (Wenger, 1998)."

Learning to teach is more a process of becoming than a state of being. Mentor teachers have unique experiences in a teacher preparation program that they find valuable or that have hindered success. They then consider highlighting important lessons or avoiding specific pitfalls that they have experienced in the past. Wenger (1998) noted, "The coherence through time connects one's past, present, and future engagement within and across communities (p. 155)." The experiences teachers have navigating their own professional identity help them to determine their trajectory, or a "continuous motion—one that has a momentum of its own in addition to a field of influences (Wenger,1998)."

Theoretical Framework

To understand how a teacher internalizes their role as mentor and learns to navigate as a mentor within a community of practice, it became important to this research study to understand their identity as a mentor teacher. As one of the various components that falls under the broader

theory of communities of practice, identity theory specifically, offers a lens through which to examine the elements that affect mentors' professional identity. The concept of communities of practice is essential and is discussed throughout this research study to help us better understand identity within its context however, identity is the narrow focus. Wenger's (1998) theory of identity indicates that individuals' sense of self is a lived and negotiated experience that is social in nature. Wenger (1998) theorized processes of identity development as "ongoing and pervasive" (p. 163). Individuals' perception of themselves derives from the variety of experiences they encounter throughout their lives. These experiences are based on their background and culture, as well as the communities to which they belong. Identity is a "constant becoming (Wenger, 1998, p. 154)" and is shaped and reshaped as new experiences occur. From these experiences, interpretations from social interactions inform each other and give meaning and context to individuals' environment.

Calabrese-Barton et al., (2013) proposed the idea of "identity work" as the actions an individual takes to form their personal identity. This is constrained by the "historically, culturally, and socially legitimized norms, rules, and expectations that operate within the spaces in which such work takes place" (p. 38). In other words, individuals' sense of who they are is constantly shaped by the actions they take in response to their environment. The identity of a teacher is never fully formed and continues to evolve over time.

For this research study, identity is defined through a combination of Wenger (1998) and Gee's (2001) conceptualization as an individuals' own perceptions of themselves, socially situated and developed continuously from past and ongoing experiences. The professional identity that a teacher continues to navigate is developed through a unique and complex trajectory based on specific experiences within specific discourse.

To understand identity through the context of teaching and one's own profession, it was important to understand how teacher identity is constructed. Carter and Doyle (1996) suggest

that learning to teach involves; 1) transforming an identity, 2) adapting personal understandings and ideals to institutional realities, and 3) deciding how to express one's self in classroom activity (p. 139). From this perspective, the professional identity of a teacher is the process of learning to teach and a process of becoming a teacher. Although the official title of teacher is acquired through education and employment, a teacher's own professional identity requires constant social negotiation build upon investments, commitment, and alignments (Britzman, 2003; Connelly & Clandinin, 1999).

Wenger (1998) indicates that a "profound connections" exists between identity and practice (p. 149). The identity that we construct and negotiate as humans is a result of our participation within a community. According to Wenger, identity functions in various ways to define who one is and the practices that define oneself. Wenger offers the following five parallels which exist between practice and identity and can be construed as characteristics of identity. The following section offers details for the meaning of each characteristic:

- Identity as negotiated experience.
- Identity as a community membership.
- Identity as a learning trajectory.
- Identity as a nexus of multimembership.
- Identity as a relation between the local and the global.

Identity as negotiated experience. This characteristic offers the idea we form our identity through the experiences we have while engaging in practice. Our identity is reified based on what the community pays attention while we engage within our practice. Wenger states that who we are lies in the way we live each day and not necessarily how we perceive our self-image. Identity negotiated is a combination of how we live our lives and how others view us living our

lives. For example, a teacher may be viewed on their campus as a leader and expert teacher by other teachers and their administration. The expert teacher may interact with other teachers by assisting them with ideas for lesson plans or provide advice on classroom management strategies. Being perceived as the expert teacher also comes with certain responsibilities and heightened expectations such as encouragement to serve on campus committees or serve as a mentor teacher to new teachers on campus. Added responsibility gives specific meaning and reifies their practice within the teacher community. These types of situations cause the expert teacher to constantly negotiate themselves through the interplay of participation and reification. It is within these layered events, Wenger describes, that participation and reification through our experiences and its social interpretation inform each other (p. 151).

Identity as a community membership. Wenger argues that identity is how we relate to the world. He describes a community through three dimensions: mutual engagement, a joint enterprise, and shared repertoire. Mutuality of engagement involves interaction with other people and how our individuality is defined with respect to the community (p. 152). For example, the teachers on a campus may interact with other teachers by the ways in which they treat each other, the expectations they develop, how they interact, and how they collaborate with each other. A joint enterprise is the notion that we give value to certain experiences in our participation within a community. The specific participation we embody give us a certain focus that we invest ourselves that forms a type of accountability we place on ourselves which causes us to look at the world in certain ways. For example, being a teacher gives a person a certain focus and perspective which helps them understand the conditions in which they work as a classroom teacher. They focus their actions through the lens of a teacher and to consider certain possibilities, interpretations, choices, and experiences of teaching. A shared repertoire allows an

individual to interpret and make sense of their practice through their personal history of participation within a community. We make sense of this history of practice through artifacts, actions, and language of the community. For example, teaching on a specific campus for many years causes a teacher to experience change that occurs over time. Changes in administration, working with new teachers, and changes in district policy and initiatives all cause a teacher to react to those changes. The teacher was part of that change and thus feels that the change is now part of them. Having experienced this change over an extended period of time impacts the teacher's identity through their negotiated repertoire of practice within their community.

Identity as a learning trajectory. Various types of trajectories are discussed by Wenger (1998) in the context of communities of practice. The first one he describes is peripheral trajectories or legitimate peripheral participation (LPP) which provides a kind access to a community that contributes to one's identity because it has become significant enough to do so. In the context of communities of practice, this is when a mentor teacher takes on the new role of mentor. She/he may attend professional development or trainings that place her/him at the boarder of the new community. Within a training session, new mentors can ask to observe the other experienced mentor teachers and pose questions before they fully participate as mentor teachers. This may be the first step for mentors to situation themselves within the particular community. The second is the idea of an inbound trajectory. Wenger describes this type of trajectory as one in which newcomers join a community with future intentions to become full members of the community. In the case of education, a student teacher participating in the field based internship with future plans to become a teacher and fully enter the educational community setting would exemplify an inbound trajectory. Although not the focus of this study, it is important to understand this concept because every educator who participated in a traditional

teacher preparation shared this identity for future participation in the educational setting while on their path to becoming an educator. For this study, it was important to learn about the mentor's own experience through a teacher preparation program which provided evidence as to why mentors are motivated to behave in certain ways while mentoring.

The Insider trajectory is the third of the five types of identity formation. Wenger indicates that it does not end with "full membership" (p. 155). Instead it is constantly evolving based on new circumstances and events that cause for renegotiation of identity. Insider trajectory is an important lens to view identity negotiation and re-negotiation because teachers are constantly encountering new situations in which they must learn from and adapt to. Science teachers specifically take on new tasks in ensuring that students receive as many opportunities for authentic learning as possible through hands on inquiry based lessons. This may not necessarily be the ways in which they themselves learned science. For mentor teachers, moving from insider and inbound trajectories can be viewed as a transformation they undergo in which insider and inbound trajectories work cohesively to not only maintain an insider identity but enable mentors to advance into new leadership roles. This study used qualitative data to observe how these new situations enabled mentors to adapt their mentoring practices. Mezirow's (1996) theory of transformation, focuses on the learning process as developed through "prior interpretation to construe a new or revised interpretation of the meaning of one' experience in order to guide future action (p. 162). Through this framework, mentor teachers learn through interpreting and filtering out their own ideas about what is important for them to teach their student teacher based on their experiences in teaching and possibly having been a student teacher themselves. Unlike the predictable career patterns for many individuals in the field of education moving towards a leadership role as a principal (Crow & Glascock, 1995; White & Crow, 1993), becoming a

mentor teacher can be viewed as a different type of leadership role on its own. Leibermann and Wood (2003) indicated that, depending on how compelling their reasons and goals are, teachers will choose to take on additional commitments such as mentoring a student teacher intern. Mentor science teachers perceive themselves professionally through the experiences they have in past science courses and the ways they themselves learned to teach. With ongoing professional development, informal and formal assessments in the classroom, the day-to-day interactions with students, colleagues, administration, and parents, the teacher's own practice is being informed. She/he must make adjustments based on the information received through the community of practice which may impact how the teachers sees themselves as a professional. When a teacher takes on the role of mentor, she/he takes on the new set of responsibilities and must therefore take what they understand about their one professional identity and reformulate it within the context of mentor. Insider trajectory directly relates to this study because it is within this constantly evolving perception of who the mentor perceives themselves to be professionally is where this study focuses learning.

The next trajectory is what Wenger discusses is boundary trajectories. This type of trajectory sustains an identity across boundaries and is considered the most delicate challenge. In education, teachers' paths cross continuously throughout their careers. Maintaining relationships with individuals from various communities of practice is important to the teacher's sense of self because the established boundaries it "incorporates the past and the future in the very process of negotiating the present" (p. 155). Outbound trajectories is the last of Wenger's described identity formations. This idea is explained as the type of trajectory that "lead[s] out of a community, as when children grow up" (p. 155). This takes in all the learning that was involved in participating in a community of practice. Once the learning is saturated within the context, a

new identity is formed thus leading to a new sense of self. A teacher that has extensive experience teaching a particular discipline may take an interest in pursuing another career path. This may involve developing new relationships, positioning oneself within a new community, and viewing their professional world in new ways. This idea is important to this study because teachers deemed the experts in their field have taken on the new role as mentor and may perceive themselves on the path to a new outbound trajectory. This research study looked for evidence to suggest that mentors might view their new perceived position as mentor teacher to be administrative in nature. This perception could be viewed as a gateway to more administrative opportunities in their careers. Other observations view mentoring as another dimensions of teaching with no significance towards any type of trajectory.

Identity as a nexus of multimembership. As mentioned before, our identities are produced through the various forms of participation we experience in the many communities we belong to. Wenger states that entities entail 1) an experience of multimembership, and 2) the work of reconciliation necessary to maintain one identity across boundaries (p. 158). Multimembership involves multiplicity to the notion of trajectory. It is considered a matrix of various forms of participation put together like a "puzzle" rather than assembled with "sharp boundaries" between disconnected parts of who we are (p. 159). Reconciliation involves the "maintenance of an identity across boundaries" which requires work. It is the idea that various forms of membership coexist and we find ways to arrive at successful resolutions or we experience a process of constant struggle. Wenger describes reconciliation as challenging for learners who navigate between communities of practice. He states that learners must often "deal with conflicting forms of individuality and competence as defined in different communities" (p. 160). For example,

being a teacher involves making decisions that do justice for her students through and the fundamental demands of the educational institution.

Identity as a relation between the local and the global. This process involves local energy that is directed at global issues and relationships. This means that as we navigate our community we take into consideration how our engagements fits into the broader scheme. Wenger indicates that broader topics attract our attention more than local communities because they are more publicly reified. For example, teachers may discuss state testing changes and procedures within their local community of practice. Their local community of practice may become a productive context in which to internalize and discuss their views on state testing. Their views become part of their participation in their community. The process of local and global interplay reflects the process in which we negotiate "local ways of belonging to broader constellations" (p.149).

This study attempted to understand the effects on mentor teachers' sense of professional teacher identity based on their interactions with their mentees, campus administration, and the College of Science teacher preparation program and staff. This study also attempted to address an enhanced sense of professional identity through the learning process, which is a component that Zuckerman (2011) did not address.

The review of the literature indicated that attention is primarily focused on the perceptions of mentor teachers and their understanding of the mentoring role and not the attainment of professional growth that mentor teachers experience in their role. Serving as a mentor in a science teacher preparation program requires a complex understanding of the content in relation to role of the mentor; therefore, the knowledge and resources that mentors draw from to attempt to mentor their student teachers successfully can illuminate any newly acquired knowledge for the mentor. This study used mentor science teachers' self-perceptions and self-

reflections to establish a sample of educators committed to upholding equitable practices to promote a more scientifically literate society. Through an inductive case study approach, this study collected data through interviews, and formal and informal written reflections to document and analyze mentor teachers' perceptions of the impact of mentoring student teachers. The study might identify components that contribute to mentoring experiences that strengthen mentor teachers' pedagogy and support higher endeavors toward leadership roles within the school community. This study looked for evidence of identity development through positive mentoring experiences that may or may not lead mentors to formal leadership roles. Moreover, considering the components that enable the success of mentor teachers may assist in the future preparation and development of partnerships within the mentoring system. A focus on science teacher mentoring does not exist in the literature. The findings of this study includes suggestions for selecting and supporting mentor teachers toward professional growth in science, technology, engineering, and mathematics (STEM) education and for reducing the attrition rate for STEM educators. Countless researchers have sought to understand the influences on the identities of student teachers and first-year teachers, but research on the impact of mentoring on mentor teachers is lacking. This study's focus was to understand the impact of learning for mentor teachers as they fulfill the role as mentor to a student teacher or novice teacher.

Summary

Chapter two provided an overview of literature related to this study. The theoretical framework was presented with a discussion about identity, learning, and practice. Information about literature on pedagogy involving science education was also provided. The literature then covered a discussion about adult learning involving humanistic learning, Andragogy, and

ongoing learning. Finally, the chapter provides literature on mentoring including educational mentoring, the role of mentors, preparations for mentors, challenges, and benefits of mentoring.

CHAPTER 3

METHODS

Case Studies

Case studies are commonly used in the social sciences and have been shown to be especially valuable in "practice-oriented fields," such as education (Starman, 2013). Stake (1988) defines a case study as "both a process of inquiry about the case and the product of that inquiry." Often seen as a qualitative methodological approach, Yin (2014) argues that a case study approach is comprised of three technical characteristics:

1.) Copes with the technically distinctive situation in which there will be many more variables of interest than data points, and as one result
2.) Re1ies on multiple sources of evidence, with data needing to converge in a triangulating fashion, and as another result
3.) Benefits from the prior development of theoretical propositions to guide data collection and analysis

Creswell (2007) describes a case study as a qualitative approach in which the investigator explores a "bounded system" over time through detailed, in-depth data collection involving multiple sources of information and reports a case description and case-based themes (p. 73). Yin (2014) argues that case studies are an "all encompassing" research strategy. For the reasons listed above, this study was conducted as a qualitative case study. I sought to understand how serving as a mentor teacher shaped mentor science teachers' identity through their professional practices within one academic semester timeframe within the context of the district's Mentor. Program. Considering that the mentor teachers' perceptions and experiences are paramount in

answering my research questions, a case study was the appropriate research design. According to Merriam (1998), this approach is useful in the context of education. In this study, science teachers who mentor new teachers were solicited to participate in the case study to gain an understanding of how serving as a mentor affects their identity. Through a case study approach this research hoped to gain an understanding of the learning that occurred for the mentor teacher. This was accomplished through the triangulation of individual interviews, focus group discussions, and written perceptions of mentor support by the beginning teacher.

Narrative Inquiry in Case Study

This case study used narrative inquiry as a tool to understand mentors' versions of their story. Narrative inquiry is a "way of knowing" the ideas teachers have about teaching (Lyon & LaBoskey, 2002, p. 1). Although not necessarily a new approach, it is one that is has been used by researchers to understand teachers' personal growth and development (Johnson & Golombek, 2002). Narrative inquiry has been used to understand the professional growth and development of teachers and mentoring practices with observational data (Johnson & Golombek, 2002; Schwarz, 2001; Feimen-Nemser, 1998). LeCompte & Schensul, (1999) describe this method as a way of using narratives to "assemble a composite picture of a groups' experiences" (p. 87). The use of this method served to provide the researcher the opportunity to witness multiple situations in which a teachers' identity as impacted by their experience as a mentor. Researchers argue that to fully understand the craft of teaching, one must have an understanding of teachers' lives inside and outside of the classroom because their lived experience provide context for their teaching methods (Clandinin, 1985; Goodson, 1992). Teacher mentors make decisions about what is important to teach new teachers regardless of what research says therefore, it is important to focus on the personal and professional lives of the mentor science teacher. Narrative inquiry also

helped this research study gain a deeper understanding of the mentor teachers' practices and practical knowledge about their craft which provided insight about their identity.

Study Context: The Border District Mentor Program

According to the Border District Mentor Program's handbook, the goal of the program was to provide personalized support to new and experienced teachers through rich, authentic, and collaborative experiences. The components of the program included participation at the three day New Teacher Support Academy, district orientation for mentors and beginning teachers, ongoing professional learning opportunities, one-to-one mentoring support, and professional practices and expectations. The program has been running for several years and has worked hard to receive feedback on ways to improve. In a one-on-one interview with the Director of Staff Development, she discussed the importance of feedback for the program:

> We have tried a lot of things over the years. Part of the ways that we have made changes is from feedback through our teachers who have been mentors and those who have been mentored. We also look at research to see what it is we think that is most necessary and we talked to other key stakeholders like principals and even teacher organizations and groups that might help to give us some feedback on what would be most important (Director of Staff Development, personal communication, April 27, 2018).

During the 2017-2018 academic school year 187 pairs of mentor and beginning teachers were enrolled in the program. Forty eight beginning teachers never had a mentor identified for them by their campus. At the end of the school year 103 pairs of mentor and beginning teachers successfully completed the program. Successful completion was determined by regular attendance at the districtwide staff development workshop sessions offered, online mentoring component, and reflection activities. In order to serve as a mentor, the district adheres to Texas

Administrative Code (Sec. 21.458) which states that mentor teachers are assigned to a teacher with less than two years of teaching experience in the same subject and grade level.

Mentors were expected to attend a one day training in the fall and in the spring semesters. The focus of these trainings was to help orient mentors to mentoring protocols, to help support teachers mentoring new teachers, and provide opportunities for mentors to enhance their mentoring effectiveness as teacher leaders on their campus. Beginning teachers were also expected to participate in four workshops that were scheduled throughout the school year that are intended to provide strategies and resources geared specifically for new teachers. In addition to attending face-to-face workshops, mentors and their mentees were expected to participate in the Performance Academic Coaching Teams (PACT) online training system. PACT is a Research-based initiative of the U.S. Department of Education, Texas Education Agency (TEA) and Texas A & M University System. It is designed to help teachers mentoring new teachers become more effective mentors, provide mentors and beginning teachers with support tools for their new roles and responsibilities, address teacher retention by developing and refining sound teaching practices, and improve student achievement. The online support system provided mentors and mentees various online support through trainings and modules. Mentors and mentees were expected to complete the "Campus Mentor Training" module courses throughout the school year. Mentors and their mentees also participated in Collaborative Reflection Activities (CRA's) in which reflective feedback was provided back to the district about an activity selected by the mentor-mentor pair. This was done four times throughout the school year. The purpose of Collaborative Reflection Activities is to provide purposeful interactions and dialogue opportunities to occur between beginning teachers, mentor teachers, and district staff. Beginning teachers and mentors were able to choose from a number of activities, including: Observation,

co-teaching, modeling a lesson, parent conference/communication, reading an educational article, or viewing an educational video. Activities were based on the need of the beginning teacher and agreed upon by both teachers.

Participants for this study were recruited through face-to-face initial contact with all mentors during the Spring Orientation in late January. I had the opportunity to speak to the mentor teachers for a few minutes to discuss the purpose of the study and invite any secondary science teachers interested in discussing their participating in the program. I indicated that an email invitation would be sent out with a link to the initial survey. On February 1st I sent out the email invitation to participate in the study to all science teachers who served as mentor teachers during the 2016-2017 and 2017-2018 academic school years. The email contained an introduction about myself and information and purpose for the study, along with a link to the initial survey. The survey was created through Qualtircs and contained various questions that allowed participants to rate specific information as well as provide comments. After a week I sent out another email invite and contacted teachers by phone. A month later I received a total of eleven responses from participants who had completed the initial survey and were interested in helping with the study.

Population

This case study focused on 4 individual mentor science teachers who demonstrated a willingness to participate fully in the study through the spring semester of the 2017-2018 academic school year. Teachers were solicited through their participation in the Border District's Mentor Program and discussed their perceived experiences as mentors to new science teachers. This research attempted to understand how the experiences contributed to their science teacher identity through mentoring. By virtue of the state qualifications for the Mentor Program, mentor

teachers must have a minimum of three years teaching experience and have demonstrated strong pedagogical and content knowledge.

Once mentor teachers were selected and agreed to participate, the paired new teacher was also solicited to answer a one-time reflection piece in order to obtain information about their perceptions of interactions between them and their mentor. This information was useful in helping to triangulate the data.

Study Site

This study took place at the Border District's Professional Development Center and took place on campuses where mentors work with their new teachers. Observations took place in classrooms and/or places where mentor teachers met and collaborated with their new teachers such as teacher lounges, outside the building, hallways, or in computer labs.

Methods of Data Collection

Data was gathered during the spring semester of an academic school year, January 2018 to May 2018. Various tools were used to gather the data, which included 1) initial survey, 2) interview transcripts, 3) observation field notes, and 4) teachers' written reflections. All Mentor Teachers who participated in the Border District Program between 2016-2017 and 2017-2018 were recruited to take part in the study. Recruitment efforts were made through face-to-face meetings held at the district during common professional development workshop sessions, through direct phone calls, and internal district email invitations. Mentor science teachers who met this criteria and who demonstrated a willingness to participate were chosen for this study. Teachers were provided detailed information about the study through e-mail and in person during scheduled workshop sessions. Mentor teachers who agreed to participate in the study signed a Consent Form.

Observation Field Notes

I took field notes at various stages throughout the research study. One of the stages was during the Mentor Support Training offered by the district staff development department during the Spring 2018 semester. The purpose of this support training was to help mentor teachers develop skills and knowledge necessary to help them support their new teachers. There were a total of two face-to-face support trainings offered to mentor teachers only throughout the academic school year. The support training from the fall was held in October 2017 and the spring support training was held in February. During the spring support training, mentor teachers had the opportunity to reflect on issues and situations that occurred from the fall semester with their beginning teachers. Mentor teachers discussed and collaborated on solutions to various problems they experienced.

Field notes were also conducted during the one-on-one interviews. Interviews were conducted on a total of nine mentor science teachers throughout the study. The interviews lasted approximately thirty to forty five minutes. The interviews were held at three different high schools, one early college high school, and two middle schools. An audio-recorder was used to record the participants' responses during the interviews. While the audio-recording was conducted, I took separate notes.

I collected field notes from the focus group discussion that five mentor teacher participants took place in. The focus group discussion took place in April of 2017 after all the face-to-face interviews had taken place. The meeting lasted approximately forty five minutes and was held at the professional development center. The participants were audio-recorded and during the meeting.

Mentees' Written Reflections

All nine of the paired mentees submitted a written reflection on their experience with their mentor teacher through the Qualtrix platform in May 2017. It took beginning teachers between ten to fifteen minutes to complete. Although they were encouraged to answer with as much detail as possible, the fields were not character restricted so mentees could type as much or little as necessary to answer each question. The reflection questions that mentees were asked were as follows: Please answer the following questions with as much detail as possible.

- Please describe what your mentor has taught you about science that has made the most impact on your pedagogy?
- How does your mentor decided on what you need to know as a beginning teacher?
- Please discuss any special techniques for teaching science your mentor has helped you to learn.
- Please describe your perception on the preparedness of your mentor in helping to support you as a beginning teacher.
- What are some real-life situations your mentor has exposed you to as a beginning teacher and what did you learn from this?
- Why do you think your mentor wanted to be a mentor?

Data Analysis

Data analysis for this study used qualitative data from the initial survey issued to mentor science teachers, the one-on-one interviews with the selected mentors, the observation field notes, and written reflections from the mentors' beginning teachers. This data helped me to understand the different types of experiences mentor science teachers had during the academic school year when they participated in the districts' formal mentor program. Following Marshall & Rossman's (1999), analytical procedures for analysis, different themes, within each experience, were developed for specificity and to better convey the story of the participants. Data was inputted into NVivo and organized. Folders were created to separate field notes, one-on-one interviews, and written reflections. Once the data was organized it was coded and converted into

themes and grouped into the different types of experiences found based on common patterns that were observed across the data. Careful analysis of the data yielded 27 individual themes that were then categorized into five main themes. These themes reflected the participants' experiences and actions during their process of serving as a mentor science teacher to a beginning science teacher on their campus.

Initial coding created a description of the data to fit together in specific themes that would help to answer the research questions. For example, some of the codes included, general pedagogy, content specific pedagogical knowledge, professional learning, situated learning, trajectories, and perceptions. These all described a form of learning and therefore were placed under the theme, "Mentor Re-Learning."

Focused Coding was essential in the coding process when analyzing data. For example, these two nodes, 1) Mentor Re-Learning, and 2) Tensions, helped to answer research question number one: *In what ways are mentor science teachers' identities constructed while serving as a mentor teacher to new science teachers?* These three nodes, 1) Caring, 2) Relationship Building, and 3) Science Teacher Communities, helped to answer research question two: *In what ways do mentor science teachers maintain and sustain a particular identity as a mentor?*

Initial Survey

During the 2017-2018 academic school year 16 mentor science teachers were identified as active participants in the mentor program. They taught course such as general science, science combo, new technology science, and dual credit science. The survey was adapted from an initial survey conducted by Reinhardt (2015) to gather information about mentor teachers and their conceptions about the mentoring process. Dr. Reinhardt granted me authorization through email correspondence to use her survey questions for this study. The survey was administered through

a Qualtrics online platform. Participation in the study was be completely voluntarily and all prospective participants were made aware of this. Participants were then asked to complete a survey (See Appendix II) which allowed me to gather demographic information about participants as well as gain information about their experience and perceived role as mentors. Participants who filled out the survey took no more than 10-15 minutes to complete.

Mentors who participated in the study were administered a survey that included a solicitation for demographic information, including name, campus site, grade level(s) taught, subjects taught, and preferred e-mail and cell phone contact information. Prospective participants were required to enter the number of years they have taught. Mentor teachers were also be asked to provide information about their experiences and perceptions about mentoring. After I reviewed the answers provided by potential mentor participants, specific individuals were selected based on their responses to participate in a face-to-face interviews and the focus group discussion. Beginning teachers of the selected mentor teachers were solicited to participate in a writing activity prompted through Qualtrics. Patton's, (2002) description of criterion sampling describes the sampling approach that was used for this study. Criterion sampling involved examining "all cases that meet some predetermined criterion of importance" (p. 238). The predetermined criterion for this study was any and all science teacher mentors who participate in the Boarder District's Mentor Program during the 2016-2017 and 2017-2018 academic school year who displayed multiple representations of the experiences of mentors and through their learned identity, what mentoring meant for them.

Interviews

Interviews were conducted with nine individual mentor teachers and one focus group with a total of five mentor teachers during the spring 2018 semester. The process for developing

the interviews were guided by Kvale's (1996) stages of an interview investigation. 1) Thematizing which includes identifying the themes that the interview questions addressed, 2) Designing which is planning the interview questions based on those themes, 3) Interviewing which includes conducting interviews with the selected participants, 4) Transcribing the recordings from the participants' responses in detail, 5) Analyzing by examining the interview transcriptions based on the data analysis process, 6) Verifying by accounting for credibility and trustworthiness of the gathered data, and 7) Reporting by writing and sharing the findings of the conducted interviews.

The interview questions were developed to help answer the research questions. The interview questions were designed on the main goals of the study which were to examine how mentor teachers develop their mentor identity and how that identity was sustained. Below are the question that were used during the interviews.

1. How did you become a mentor teacher?
2. In your opinion, what is the role of the mentor?
3. What do you personally gain from being a mentor?
4. If any, what are some things related to your own teaching abilities that you have learned in your role as mentor?
5. Has being a mentor affected the way(s) you see yourself as a teacher? If so, how?
6. In your opinion, what is the biggest challenge of being a mentor?
7. Do you consider the mentoring role as an administrative role? Why or why not?
8. What kind of mentoring professional development have you received?
9. To what extent is your campus supportive of the mentor role?
10. How likely are you to continue your role as a mentor teacher in the future?

The purpose of using interview protocol was to investigate the extent to which mentor teachers' professional identity was impacted while serving as a mentor teacher to beginning teachers. The responses from the study helped to present evidence of any learning that mentors experience as a result. Upon reviewing the surveys received, I analyzed the information to look for commonalities within the answers provided by multiple mentors. I looked for themes that emerged and identified any outliers or contradictory information, which led to the selection of participants with unique attributes in which teachers were then interviewed. I was able to receive full participation for the study from four mentor science teachers which then allowed me to develop the case study. Interviews were limited to 30-45 minutes for each meeting. I met with each mentor during a preselected time during the school day to collect qualitative data.

Observation Field Notes

Observations were intended to provide more in-depth information about mentors and their interactions with their beginning teachers. For this study, observations were conducted with two mentor/beginning teacher pairs. These observations involve "not only gaining access to and immersing oneself in new social worlds, but also producing written accounts and descriptions that bring versions of these worlds to others" (Atkinson et al., 2001). As specified by Mitchell et al. (2005), three key elements were considered when the classroom observations took place: 1) Building rapport with the participants, 2) Spending enough time interacting to get the needed data, 3) Getting into the location of whatever aspect of the human experience studied.

In order to establish a rapport with the teachers in this study, I generated specific strategies to communicate effectively and eliminate the tendency of bias when they shared information with me. To begin with, I followed Carnegie's (2009) techniques for building relationships which allowed participants to speak freely about their experiences. It should also be

noted that during this study I served as the Assistant Director to the Staff Development in which the position oversaw the district Specialist for the Mentor Program. Although I oversaw the woman in charge of the program, I did not serve as an evaluator to any of the teachers in the program. My role within in the district was to facilitate the program by ensuring that the district Specialist provided learning opportunities for teachers in the program and coordinated various workshop sessions and events for the program. I also recognized my own humanistic nature as the interviewer during the interview and acknowledged instances during the interview when the individuals become distracted or impatient with each other (Denzin & Lincoln, 2005). During the interview, sometimes the interviewee spoke in generalities about experiences. When this occurred I prompted more specific information by asking them to elaborate more about the subject. In addition, I continually self-evaluated my experiences with the given stories in order to recognize my own personal biases. I did not create generalizations based on single stories of the participants' experience while serving as a mentor teacher in the Border District's Mentor Program and their interpretations of the focus of their learning and educational goals.

Mentees' Written Reflections

For each of the mentor teachers, the paired mentee teacher was asked to participate in the study by submitting a short written reflection through Qualtrics. The purpose of obtaining the written reflection was used to help triangulate information for data collection. Each mentee was provided a separate consent form to sign. The questions used for the reflection are below:

1. Please answer the following questions with as much detail as possible.
2. Please describe what your mentor has taught you about science that has made the most impact on your pedagogy?
3. How does your mentor decided on what you need to know as a beginning teacher?

4. Please discuss any special techniques for teaching science your mentor has helped you to learn.

5. Please describe your perception on the preparedness of your mentor in helping to support you as a beginning teacher.

6. What are some real-life situations your mentor has exposed you to as a beginning teacher and what did you learn from this?

7. Why do you think your mentor wanted to be a mentor?

Data and Analysis

Marshall & Rossman (1999), *Designing Qualitative Research,* discuss typical analytic procedures for analysis that proved useful for this study. Based on these steps, I conducted my case study in the following ways:

1) *Organizing the data.* I organized interview transcripts, individually with teachers, focus group discussions transcripts, and field notes with careful attention to how the data was reduced. Marshall & Rossman (p. 153) suggest the use of a 'predeveloped data recording chart' to directly transfer the data. I worked to generate a data chart that enabled me to organize transcripts.

2) *Generating categories, themes, and patterns*. Described by Marshall & Rossman as the most "difficult, complex, ambiguous, creative and fun" part of the analysis, it was necessary for me to have a heightened awareness of the data and focus attention to the "subtle, tacit undercurrents of social life" (p. 154). This was the stage in which an inductive analysis approach was necessary in order to create salient categories for the emergence of data (Patton, 1990). For this qualitative data analysis, a thematic analysis was conducted to help the researcher develop types of knowledge that emerge for the development of mentor identity and how that identity was sustained. The data from this study was also assisted in developing a narrative of the events that occurred for each participant throughout the study and how such events impacted the individuals.

3) *Coding the data.* During this process, data was inputted and organized into a qualitative data analysis computer software program, NVivo. Once the data was inputted and organized, it was then coded. The coding process used phrases, rather than specific words through line-by-line coding, or naming each line of the written data (Glaser, 1978). The codes were then matched to specific categories by using focused coding. The codes were more precise and conceptual and helped to generate considerable pieces of data. The coding used key codes to help generate a more broad view of the data. Once all the data was coded, themes were created and organized into clusters. The analysis focused on generating a story with an explanation, organization, and presentation of the data (Charmaz, 1990) from the beginning of the mentors' participation and throughout their experiences in the program and to the end of the study.

4) *Testing the emergent understandings.* During this phase I evaluated the data for usefulness and centrality. I used the narrative analysis of interview data to obtain and evaluate the plausibility of my understanding of the data. I searched for areas that challenged my understanding, searched for negative instances of the patterns, and worked to incorporate this information into the larger picture. I went back to the research questions to understand how the data was central to the stories that unfolded about the experiences of mentor science teachers and how those experiences affected their identity.

5) *Searching for alternative explanations.* For this part of the analysis I searched for other plausible explanations for the data. Marshall & Rossman argue that alternative explanations 'always' exist and that the researcher should search for, identify and describe them (p. 157). Once this was determined, I then explained why my explanation of the data analysis is the most plausible of all.

6) *Writing the report.* Described as central to the process of analysis, the researcher must engage in the interpretive act by conceptualizing meaning (p. 157). For this case study, I worked to create a sense of vividness and detail about science teachers' experiences mentoring new teachers, the community of professional practice, and identity construction and re-construction while being careful not to describe the data about others' lives as my truth but rather present information as what the data reveals. This helped to maintain ethical practices with sensitivity to the participants. The following Data Planning and Collection Matrix was used to help organize how the data would help answer the research questions.

Table 3.2: Data Planning and Collection Matrix

(adapted from LeCompte and Schensul, 1999)

Research questions	Rationale	What kind of data will answer the question?	Places to find the data
What influence does participation in a mentor program have on science teacher identity and their professional learning? (Guiding question)	To gain an understanding of how teachers perceive themselves as educators of science while serving as a mentor to new science teachers. How is their identity affected during the mentoring process? Is there a difference between how the mentor teacher perceived themselves before having served as a mentor? If so, to what extent did they experience their transformation	Interview data; survey data; observation field notes of interactions between mentors and new teachers; documents	From the Border District's Mentor Program Secondary Science Mentor teachers; Program facilitator and personnel; Classrooms; Site where professional development occurs;
In what ways are mentor science teachers' identities constructed while serving as a mentor teacher to new science teachers?	To explore ways mentor teachers' identity is shaped by their professional practice. Is there a common theme among mentors?	Interview data; survey data; observation field notes of interactions between mentors and new teachers; documents	From the Mentor Program Mentor participants; Program facilitator and personnel; Classrooms; Site where professional development occurs;
In what ways do mentor science teachers maintain and sustain a particular identity as a mentor?	To gain an understanding of how mentor science teachers maintain and sustain a particular identity. Does their involvement within their community of practice impact the ways in which they mentor their new teacher? Where does a science mentor teacher position themselves before the mentoring began, where do they conceptualize themselves while participating in the mentoring experience?	Interview data; demographic information, focus group discussions: audio tape recordings of interviews.	From the Border District Mentor Program teachers; district staff development specialist; Mentor/mentee interactions observations; site where Mentor Program workshops take place.

Note. From Data Planning by LeCompte and Schensul, 1999.

Person as Instrument Statement

I was invested in this study because of my interest in science education and my ties to the educational community within my district. My hope was to gain a deeper understanding of the experiences of science teachers and to help provide more support for them professionally through individual, community and institutional positive change.

As the researcher for this study, I wanted to serve as a participant-observer, participating as the Assistant Director for Staff Development at my district overseeing and facilitating the district's Mentor Program. It also must be stated that I did not, in any way, conduct formal evaluations on the teachers in the program. I also conducted research from "a distance" where I observed, documented, and reflected on information that enabled me to answer my research questions. I recognized that I could not completely disconnect from my own personal experiences as a mentor science teacher but did my best to separate this from my data collection.

Timeline of Data Collection

Upon final IRB approval from the university and the participating school district I was able to begin soliciting participants through e-mail and scheduled district mentor workshops during the Spring 2018 semester. Some rapport with the teachers had already been established since the orientation meeting that took place in October of 2017. Once mentor teachers agreed to participate I was able to send out the initial survey and allowed for one week's time for teachers to fill out and return electronically. The following week I identified individuals to possibility interview and schedule mentors to meet with me which happened within a two week span. In addition I also solicited the new teachers who are partnered with the participating mentor to participate and sign a consent form. When new teachers had agreed to participate in my study I then sent the reflection questions and allowed for two weeks to complete and send back

electronically. Once all interviews for mentors had been conducted, I then worked to schedule the focus group discussion within the next two week span. I worked to continually organize all data as it was received.

Limitation of the Study

The research was limited by various factors. First, the amount of science teachers who participate in the Border District's Mentor Program for the 2016-2017 and 2017-2018 academic school year was limited because the need for mentors is based on the hiring trends for the district in the given year. When the school district hires low numbers of new science teachers, low numbers of mentor teachers are needed. The second factor involves the timing of this study. Since data were collected during the spring semester, this conflicted with state testing and the culture that surrounds its preparation. The pressure of high stakes accountability for teachers may have played a role in the recruitment of participants. Another limitation of this study was the lack of observations of mentor teachers. Although I attempted to visit and observe mentor teachers as often as possible during their conference periods, before and after school, lunch time, and weekend, I was only able to visit when teachers allowed me to. The final limitation of this study involved data collection from mentees of the participants. Written reflections were the only means for data collection of the mentee and one-on-one interviews, observations, or focus group discussions were not conducted.

Summary

This chapter presented the methods that were used in order to conduct this study including the purpose of the study, research questions, information about cases studies and narrative inquiry in case studies was also presented. Methods on how the data was collected was discussed through the use of an initial survey, interviews, observation field notes, and mentee's

written reflections. The chapter also explains how the data were analyzed while taking into consideration the person as an instrument statement, timeline of data collection, and limitations of the study.

CHAPTER 4

FINDINGS

This chapter is divided into two sections, first the findings from the initial survey completed by all eleven participants and second the findings of what was discovered about the four participant case studies selected for this research. For each of the research questions, data from the interview, observations, and focus group discussion are analyzed. Each research question is analyzed for the identification of major themes presented from the data for Chapter five. The interview sample was chosen based on the analysis of the survey data and the willingness of teachers to participate. Data were collected on the survey sample (n=11), interview sample (n=9), observation data (n=2), and focus group discussion sample (n=5), to document and analyze how mentors learning within a culture of practice was consistent with the re-negotiation of identity.

Data Collection

The Initial Survey

The mentors in this study all worked in the Border District as secondary science teachers focusing to help assist new science teachers on their campus. Mentor science teachers worked with the same beginning teacher the entire academic school year. Many of these mentors had prior experience mentoring new teachers. The four selected mentors in the interview sample were all assigned pseudonyms for this research.

The mentors in the survey sample (n=11) taught across six difference science subjects areas-Chemistry (n=1), Biology (n=2), Chemistry and Biology (n=1), Anatomy and Physiology (n=1), Physics (n=1), and general scientific concepts (n=5). Mentor science teachers taught across five different grade levels- 7^{th} grade (n=1), 8^{th} grade (n=2), 10^{th} grade (n=2), 11^{th} grade

(n=2), and 12th grade (n=4). All mentors have several years experience teaching-11-15 years (n=5), 16-20 years (n=3), and 20 + years (n=3). Of the eleven science mentors, all had previously mentored one or more beginning teachers. Nine mentor science teachers reported understanding their purpose as a mentor "moderately well" or better, and ten reported feeling good or very good in their confidence ability in their purpose. Although seven mentor science teacher were selected by their campus administrators or department chairs, only two were selected by their mentee. The program director reported a disconnect in part between some relationships between campus and district.

> We had one campus a couple of years ago kind of decided to do their own mentoring program and so they stayed a little bit connected with us but I really feel like if ours had been as authentic as it needed to be they wouldn't have and try and do their own.

In the survey, mentor science teachers were asked to rank their most important areas to focus on her/his professional growth when working with beginning teachers. As seen in Table 1, the category ranked the highest was classroom management followed by delivering engaging student centered instruction. These rankings align challenges of teaching scientific inquiry and the literature on mentor teachers. The categories that were ranked the lowest included the use of technology to locate instructional materials to deliver instruction. Also ranking the lowest was designing instruction for various cultural backgrounds and perspectives which is related to the New Teacher Center's (NTC) Mentor Practice Standards (3.5):

> Facilities reflect conversations about race, culture, and the diversity of the school and community to improve instruction and ensure that every student has what they need to be successful academically, socially, and emotionally.

Each of the categories was explored in relation to the mentor science teachers' own perceived identity through their level of experience, understanding of their purpose of serving as mentor to beginning teachers, and their perceived confidence, ability, and needs.

Table 4.3: *Eight areas for beginning teacher growth ranked by mentor science teachers*

Area of Growth	Percentage of Mentors Ranking First or Second	Percentage of Mentors Ranking Seventh or Eight
Classroom management	*90%*	0%
Delivering engaging, student centered instruction	63%	0%
Managing the instructional environment (organization of lab experiments, resources, pacing of curriculum, lesson plans	18%	9%
Communicating with faculty (including you), parents, and students Actively	18%	18%
Designing and implementing formative and summative assessments	0%	9%
Immersion into the school community and culture	9%	36%
Use of technology to locate instructional materials to deliver instruction	*0%*	27%
Designing instruction for various cultural backgrounds & perspectives	0%	72%

The survey was designed to allow the participants an opportunity to think about how they relayed information about the ways in which they taught to their mentees. The program's goal to ensure new teachers receive rich, authentic, and collaborative experiences while adhering to the Next Generation Science standards and NTC Mentor Practice Standards. The mentor science teachers in this study had significant mentoring experience but reporting little to no formal preparation at all.

The following section describes the information given by the four selected mentor teachers for their specific initial survey questions. These mentors were selected because they displayed contrasting representations of what it meant for them to serve as mentors to beginning teachers. As discussed in the methods chapter, mentors were selected using Patton's (2002) criterion sampling in which "all cases that meet some predetermined criterion of importance" (p. 238). The predetermined criterion for this study was any and all science teacher mentors who participate in the Boarder District's Mentor Program during the 2016-2017 and 2017-2018 academic school year who displayed contrasting representations of what is meant for them to serve as mentors to beginning teachers.

Selected Mentors Responses to Initial Survey

Lucy

This mentor worked at one of the oldest high schools in the city. She taught 10th grade Chemistry last year and has between 16-20 years teaching experience. She has mentored four beginning teachers since 2008. She was chosen as a mentor with only one year of teaching experience by her administration. Last year she was chosen to serve as mentor by the beginning teacher. She believes that being so new to the profession actually helped her relate better to her mentee because "…you have everything so fresh [in your mind], as opposed to when you have

been in the school for certain number of years and already know the rituals and procedures--you forget the new teacher doesn't know that." On the survey she indicated that she understands her purpose as a mentor teacher very well and felt that answering questions and proving guidance through curriculum and school operating procedures to be her most essential function as a mentor teacher. She selected some areas in need of assistance in training or support in collecting classroom observation data, co-teaching with my beginning teacher, managing my time and workload, and engaging in coaching my beginning teacher. She listed immersion into the school community and culture as the first area of importance that she focuses on for the growth of her mentee and selected classroom management as her second area of focus. The only formal preparation she received as a mentor was the online training that was required by her school district as part of the completion of the Mentor Program. She indicated that her biggest challenge serving as mentor was lack of time spent with mentee. She also mentioned that paperwork required by the Mentor Program and general paperwork required by her campus was also a challenge. She discussed the need for a type of checklist that might benefit mentors in which specific procedures that may normally be overlooked by veteran teachers and seen as "second nature" could possibly be mapped out with the needs of new teachers in mind. Although she found paperwork to be cumbersome, she finds mentoring new teachers to be rewarding and hopes for future opportunities to not only mentor but to have sanctioned time to "help [her] mentee with planning, time to complete forms (which are a lot), and time to observe each other."

Ronald

This mentor taught at a middle school in a part of the city wedged between the mountainous terrain and the city. It is considered one of the more ethnically diverse areas of town due to the high concentration of military families over the past century. According to his

survey results, he has 11-15 years experience teaching in general but this past year was only his second year teaching science. He taught 8th grade science which is one of the state tested subject areas. He describes his appointment to have been conducted informal and possibly out of convenience by his administrator. He believes he was chosen as a mentor teacher because he happened to teach the same discipline and grade level as the newly hired teacher. His mentee was also placed in the classroom next door to his. In his survey results, he selected 'slightly well' in his understanding of his purpose as a mentor teacher and felt that his most essential function as a mentor teacher was to "help ease new teachers into the profession and allow them to learn." For his level of need for assistance, training, or support he selected high need for learning more about what is expected of him as a mentor, collecting classroom observation data, assisting his mentee with classroom management, co-teaching with his mentee, engaging in coaching his mentee, and helping his mentee deal with individual differences among students. For the areas he focused on for growth of his mentee, he chose communicating with faculty and mentor to be the most important area followed by helping his mentee with classroom management. This is directly aligned to a situation he described during my one-on-one interview with him where he coached his mentee through a classroom management situation in which involving campus administration was needed in order to come to a solution to the problem. With only one professional development training, he recalls participating in, he struggles to provide feedback to his mentee in productive ways that are not perceived as negative feedback. He enjoys mentoring new teachers formally and informally and believes it to be rewarding when he feels as though he has built a strong relationship and bond with his mentee.

Luke

This mentor taught at one of the first early college high schools in the region. Early College High Schools (ECHS) award students college credit and an associate's degree upon graduation. High school classes in this type of setting prepare students for full college workloads with some of their classes college classes replacing their high schools. With over twenty years experience teaching, he considers himself a seasoned veteran. He taught physics last year and had the opportunity to formally mentor a new teacher for the first time in his career during the 2016-2017 school year. He recalled being chosen to mentor the new teacher by his department chair and although she taught biology and he taught physics, he believed that the pairing may have been due to his close proximity to her classroom. He selected 'moderately well' when asked how well he understood his purpose of serving as a mentor and indicated that he felt his role was to help his new teacher learn how to "begin a class." He selected a high need of assistance, training, or support in the following areas: Diagnosing the needs of my beginning teacher, using principles of adult learning to facilitate the professional grown of my beginning teacher, engaging in coaching my beginning teacher, helping his beginning teacher assist students with special needs, helping his beginning teacher diagnose student needs, helping his beginning teacher deal with individual differences among students, and helping his beginning teacher evaluate student progress. When working with beginning teachers, he found classroom management to be the most important area to focus on when helping his beginning teacher followed by delivering engaging, student centered instruction. When describing the types of professional development he received in preparation for mentoring he stated in his one-on-one interview that he had a whole day, a half-day training held by the district and an online component. This mentor described his experience mentoring as frustrating at times and he felt as

though he may have caused a disservice to his mentee. He felt unprepared to help his mentee within an area of science that he was unfamiliar.

Demitri

This mentor taught at the same high school as Lucy. He has experience teaching 9th grade through 12th grade Biology and Advanced Placement (AP) Biology. According to the survey results, Demitri indicated that he has between 11-15 years experience teaching and has also served as an assistant principal in his career. He was selected to mentor a new teacher by his science department chair, "I was asked basically the chairperson said, hey does anybody want to mentor some of our new science teachers? We had a high turnover right this year. So, just basically if anybody wanted to and I said yeah, sure. It was kind of, it was very informal." He selected 'Moderately well' when asked how well he understood his purpose as a mentor to a beginning teacher. He felt the most essential function as a mentor teacher was to, "To provide support to the new teacher by providing guidance and resources that the new teacher would not normally have." He selected a high need for assistance, training, or support in managing his time and workload, helping his beginning teacher develop a variety of effective teaching strategies, helping his beginning teacher design a long-range professional development plan. Helping teachers develop long-rang professional plans is characteristic of administrators in which goal-setting and professional development is one of the components of the Texas Teacher Evaluation & Support System (T-TESS). When working with his beginning teacher, this mentor found delivering engaging, student centered instruction to be the most important area to focus on the growth of his mentee. He found classroom management to be the second most important area. This mentor described his preparation for serving as a mentor through his formal higher education at the university and by serving as a formal mentor at another high school. He also

attributed his preparation through his years served as an assistant principal at another high school in the region. He enjoys mentoring and teaching others and aspires towards a future position as a district administrator.

Thematic Analysis

The purpose of this study was to understand how mentor science teachers develop their mentor identity and how that identity was sustained during their participation in a year-long formal mentor program. The key findings were related to their identity development and sustainability through themes of mentor re-learning pedagogy and curriculum, tensions they experienced with perceptions of leadership and fabricating time as a mentor, caring through mentoring, and a legacy for science education through mentoring. Themes are discussed and analyzed through Wenger's (1998) characteristics of identity such as; 1) identity as negotiated experience, 2) identity as community membership, 3) identity through learning trajectory, 4) identity as nexus of multimembership, and 5) identity as a relation between the local and the global. A Characteristics Identity Matrix follows each section to highlight findings.

Research Question One: *In what ways are mentor science teachers' identities constructed while serving as a mentor teacher to new science teachers?*

Identity formation is the key to this research question because mentor teachers were involved in a challenging process wherein they actively sought and negotiated their identity as mentor science teachers through situated learning. Lave & Wenger, (1991) and Wenger, (1998) describe identity formation through situated learning as a process of becoming part of a community of practice. When people become increasingly active participants, Lave and Wenger (1991) suggest that learning and understanding occur. Mentor science teachers' identity is

constantly in a process of reforming as they take on the added task of mentoring the adult learner. The themes that help answer this question include; Mentor Re-Learning and Tensions.

Mentor Re-Learning

One of the main goals of this study was to understand how mentors learn how to be mentors and how that affects their mentor identity. In order to gain an understanding, this discussion blends the responses from the initial survey, one-on-one interviews, focus group discussion, and observations in order to elicit mentors' stories of situations they experienced that may have caused them to acquire new skills pertinent to their role as mentor to a new teacher. Through this analysis, the findings indicate that mentors reconsider their general pedagogy in new ways to help support their mentees. When Lucy's beginning teacher was assigned to teach a new science content months after the school year had begun, Lucy needed to find another way to support her beginning teacher. During the focus group discussion, she indicated that after the change, she was unaware of when his new conference period was and was only occasionally only able to check in on him. "I can help them when they're struggling with some classroom management, direct them to who they need to talk to, in case they have a question about their benefits anything," but she felt limited in her ability to help provide content support because he was no longer teaching the same subject as she was. She felt as though, "he is the expert." This situation caused the mentor the re-evaluate her own understanding of general pedagogy and how she could make it relevant for her mentee adult learner. The mentor allowed for content ownership and afforded her mentee the freedom to make decisions about the delivery of his content while she provided him with classroom protocols. General pedagogy was constantly evaluated and as a result Lucy's mentor identity helped her to determine what was significant for her mentee to learn through what mattered and what did not (Wenger, 1998, p. 155). As a result

of her mentor being moved to another content area, she and a colleague began working on a project to develop resources that would help any new teacher assimilate into the campus culture. Lucy had to re-learn her past in order to offer a future of understanding for her mentee. Wenger describes this learning trajectory as understanding who we are by where we have been and where we are going (1998, p. 149). Lucy described how she needed to reflect on the aspects, non-content based, which were important to her when she began teaching on her campus that would be appropriate for the development of campus resources. As an "old-timer," she was invested in her practice and embodied a new mentor identity that sought out continuity in the practice of teaching in her campus community.

As mentioned in chapter two, learning to teach is more a process of becoming than a state of being and for Lucy, she felt that serving as a mentor teacher helped her to re-examine her own science pedagogy as well. While observing her past mentees delivering instruction on the same lesson plans she delivered in her own classroom, she reflected on the new strategies they used, "I learn a lot from them too because they are so fresh and so new. They bring ideas and perhaps a lesson I have been doing for a couple of years, I end up changing mine because theirs were perfectly fine." This situation challenged Lucy's own pedagogy and caused her to realize that her mentee's pedagogy was effective as well. She developed a mentor identity that did not impose her instructional methods onto her mentee. Lucy learned that mentoring is about realizing that there are other forms of pedagogy that are acceptable and thus re-defined her as a mentor. This helped her to form a new identity that acknowledges that mentorship is not just about passing down knowledge but also about allowing the identity and practice of other to contribute their own ways of understanding pedagogy. The mentor or "old-timer" became exposed as she negotiated her own trajectory of learning as she creating a set of possibilities for her mentee the

"newcomer" (Wenger, 1998, p. 156). She learned to welcome new potentials afforded by new generations. "When we have these new kids with new ideas and thinking outside the box, they also enrich your own teaching."

In Ronald's case, he felt that his beginning teacher needed support in classroom management skills. When a situation occurred in which his beginning teacher felt unable to control a specific discipline issue she was experiencing, she reached out to Ronald for support. In my one-on-one interview Ronald he stated, "I told her, I will only give you ideas, I will not go in there and discipline the class for you." The mentee in this case did not impose his own classroom management strategies onto his mentee. He provided freedom for his mentee to take ownership for her classroom management by only providing her with ideas rather than addressing her students himself. His identity was challenged when he realized that, he himself, could not fix the problem for his mentee because he felt that he would did not want to "take power away from her." He negotiated his past experiences as a new teacher when boundaries were overstepped by others while attempting to help him with his own classroom management. He scaffold her by allowing her to take ownership of her own classroom management skills. This helped her to hone in on her pedagogical craft. He learned that mentoring involved letting go of control. His experience was reified after his mentee experienced success from his suggested strategies. After this experience she felt more open to seeking his advice for more strategies which in turn gave value to his mentorship. Wenger (1998, p. 151) states that identity is created by a layering of events through participation and reification from social interpretations of the self. It is the constant work of negotiating the self.

Luke had the opportunity to watch his mentee deliver a lesson. In doing so, he observed pedagogical strategies that conflicted with his own strategies. During my one-on-on interview, he

stated that he observed various components of the lesson, including looking for student understanding through student responses and artifacts. By observing his mentee's instruction, he gained a sense of what it might be like to observe a classroom from an administrator's perspective.

> I get this, what [administrators] are looking for, I see what they mean, 'okay this is going on', 'I see that, but I don't see that.' I was able to learn through how the kids were acting and what they were focused on… it helped me to go back to see what doesn't work--you even seen it, even watching how the kids interact, I learned more.

Luke experienced identity through a negotiation of what he experienced as an observer and his learning trajectory towards full membership as a mentor. Although serving as a mentor teacher does not equate to campus administrator, through his years of experience as a teacher he recalled his own feedback he received from administration when he was learning to teach. Through this experience he felt he was able to decipher what "good" pedagogy looked like based on the various forms of feedback he himself received. He revealed during my one-on-one interview with him, that observing his mentee gave him the opportunity to compare his own practices against the backdrop his mentee. He indicated that he felt almost "selfish" because watching her provided the validation he needed in his own instruction. This experience reified his identity as an experienced teacher with knowledge and skills that are valuable and could be shared. Mentorship for Luke meant that viewing instruction from a perceived administrative stance would help affirm/reaffirm his understanding of what "good" pedagogy was. He needed to look for the very same practices his administrators provided him with, both in praise and constructive. "When I was able to observe, I was able to see it, maybe through the principal's eyes." Luke reaffirmed that through his observation, the experience helped to enhance instructional strategies not only for his mentee, but for his own as well.

During the focus group discussion, mentors discussed strategies on how they supported their beginning teacher in ways that were not necessarily tied to specific scientific concepts. Mentors placed importance on providing emotion support and a safe place to discussion difficulties they may have experienced in pedagogical strategies. One mentor stated, "I help them with ideas on how to deal with parents or students, that kind of stuff."

In chapter two, the importance of content specific knowledge was discussed. Science teachers must know the structure of the content to deliver, common conceptions, misconceptions, and the difficulties the students may encounter during their acquisition of the content. For mentor teachers in this study, it was necessary for them to not only revisit their understanding of how to teach the content to their students but it was equally important for them to learn how to help their beginning teacher learn how to understand the pedagogy specific to their content. For example, Ronald felt that through his collaboration and dialog between he and his mentee that he was able to reflect back on the original ways in which he delivered content in the past. "I've learnt so much more, little things that I've missed…" Wenger characterizes this as the negotiability of repertoire. Through his sustained engagement in the curriculum with his mentee, he began to recognize historical practices of content delivery. Mentorship for Ronald mean that his new content knowledge is attainable. His practice through a shared repertoire formed a type of competence in understanding the curriculum through what Wenger describes as a "particular mix of familiar and the foreign, the obvious and the mysterious, [and] the transparent and the opaque" (p. 153).

Furthermore, Ronald described that through his new understanding, he felt compelled to continue learning new strategies so he could "pass it on [to his mentee]." This is reminiscent of

Wenger's identity through learning trajectory that incorporates past and the future in the very process of negating the present (p. 155). Ronald was challenged to re-evaluate the ways in which he delivered content to pay more attention to detail within the curriculum and the TEKS. For Ronald mentorship meant building a repertoire of expertise within the curriculum. During my one-on-one interview, Ronald stated, "[Mentoring] has really helped me focus a lot more on the content."

Table 4.4: *Characteristics of Identity Table: Mentor Re-Learning Pedagogy and Curriculum*

Characteristics of Identity	**Description**	**Mentor**	**Data**	**Findings**
Identity as negotiated experience.	Who we are by the ways we experience our selves through participation and how others reify our selves	Luke	I get this, what [administrators] are looking for, I see what they mean, 'okay this is going on', 'I see that, but I don't see that.' I was able to learn through how the kids were acting and what they were focused on… it helped me to go back to see what doesn't work--you even seen it, even watching how the kids interact, I learned more.	Mentorship for Luke meant that viewing instruction from a perceived administrative stance would help affirm/reaffirm his understanding of what "good" pedagogy was.
		Ronald	"I told her, I will only give you ideas, I will not go in there and discipline the class for you." he felt that he would did not want to "take power away from her." "When I was able to observe, I was able to see it, maybe through the principal's eyes."	Letting go of control
Identity as a community membership.	Who we are by the familiar and unfamilar	Ronald	"I've learnt so much more, little things that I've missed…"	New content knowledge is attainable.

Identity as a learning trajectory	Who we are by where we have been and where we are going	Lucy	"I learn a lot from them too because they are so fresh and so new. They bring ideas and perhaps a lesson I have been doing for a couple of years, I end up changing mine because theirs were perfectly fine." "When we have these new kids with new ideas and thinking outside the box, they also enrich your own teaching."	Realizing that there are other forms of pedagogy that are acceptable and thus re-defined her as a mentor.
		Ronald	he felt compelled to continue learning new strategies so he could "pass it on [to his mentee]." "[Mentoring] has really helped me focus a lot more on the content."	Building a repertoire of expertise within the curriculum.
Identity as a nexus of multimembership	who we are by the ways we reconcile our various forms of membership into on identity	Luke	I get this, what [administrators] are looking for, I see what they mean, 'okay this is going on', 'I see that, but I don't see that.' I was able to learn through how the kids were acting and what they were focused on… it helped me to go back to see what doesn't work--you even seen it, even watching how the kids interact, I learned more. "When I was able to observe, I was able to see it, maybe through the principal's eyes."	Viewing instruction from a perceived administrative stance would help affirm/reaffirm his understanding of what "good" pedagogy was.

Tensions

Perceptions of Leadership

Tensions in mentor teachers' re-negotiation of identity derived from internal conflict between personal and professional desires. Although mentor teachers expressed a strong desire to help their beginning teachers, at times they experienced difficulties serving as mentor. One

example presents itself through Demitri's construction of his mentor identity which involved a nexus of multimembership. He experienced reconciliation of through the various forms of membership within his teaching community. Demitri previously served as a campus administrator before returning back to teaching high school students. During the academic school year that this research study took place, Demitri was in a process of learning to integrate himself back into the teaching community while also serving as a formal mentor for the first time. Although he exhibited a sense of confidence in his ability to evaluate pedagogical practices of his mentee, he was in a constant state of learning himself. Demitri used different strategies to help him calibrate his own pedagogical skills before sharing with his mentee. He stated in his one-on-one interview, "…being an administrator I saw lots of teachers, great teachers and bad teachers…I think about my really good teachers and I say, oh! Yeah, we did this and how do you do this? You know, the school, how do we, when the kids didn't do this, what can we do here?" When Demitri considered various aspects of teaching and pedagogy that he would assist his mentee with, he took into consideration campus initiatives and state competency skills required. He also reviewed his mentee's testing data from benchmarks and unit tests to gauge where his mentee's strengths and weaknesses were. These analytical practices are common among campus administrators because they have been trained as instructional leaders. This is what Wenger describes when learners deal with conflicting forms of individuality and competence as defined in different community (p. 160). Demitri was experiencing conflict of his identity as a former administrator, as a classroom teachers, and as a mentor teacher. Demitri's new roles as classroom teacher and mentor caused him to find ways to make his various forms of membership coexist through a process of reconciliation across boundaries. Mentorship for Demitri was an

intrinsic process that required appropriating new pieces of information to provide a more holistic analysis of the type of support required for his mentee.

During my focus group discussion meeting, Luke expressed concern that because in addition to his mentoring role, he was also the department chair. He expressed that he felt his mentee viewed as an administrator which resulted in difficulty getting his mentee to feel a level of comfort and collegiately with him. Formal evaluation of instruction tied to professional performance is not a requirement of mentoring however, Luke proposed the notion that in the perhaps his mentee was not comfortable around him because he might have been viewed as a type of pseudo administrator. He stated, "I think sometimes as a department chair, I think they see you as a boss or like you're in charge of me kind of thing. So, they're sometimes reluctant, even though you want to be more like their friend or colleague, they still kind of have that wall up because you're my mentor." During the same discussion, Demitri contributed to the conversation, "people ask you for advice, so I guess I'm like, oh! I guess I'm a leader, or I guess I'm this, or I guess I'm doing this correctly or you know. Or maybe I should do this. So, I mean I think it's good, it puts you where you kind of measure where you at as far as your profession, it can help you measure." Ronald continued the conversation by stating, "I don't view myself as an ideal teacher, those are the ones who put the late hours, the ones who were here for sixteen hours yesterday because of the basketball game. I always view a mentor should be someone like that, like a leader, I can't say I don't have passion, but not like those teachers that you look at them and you've only been teaching for a week and you already know that's a hell of a teacher." These teachers negotiated multiple identities of themselves as leaders through the reification of their mentees. The boundaries of their practice became the deep personal experiences of

individuality of leadership. For these teachers, mentorship meant taking on a new form of identity as a leader different from an administrative leader.

Table 4.5: *Characteristics of Identity Table: Tensions-Perceptions of Leadership*

Characteristics of Identity	**Description**	**Mentor**	**Data**	**Findings**
Identity as negotiated experience.	Who we are by the ways we experience our selves through participation and how others reify our selves	Demitri	"…being an administrator I saw lots of teachers, great teachers and bad teachers…I think about my really good teachers and I say, oh! Yeah, we did this and how do you do this? You know, the school, how do we, when the kids didn't do this, what can we do here?"	mentorship meant taking on a new form of identity as a leader different from an administrative leader.
		Luke	"I think sometimes as a department chair, I think they see you as a boss or like you're in charge of me kind of thing. So, they're sometimes reluctant, even though you want to be more like their friend or colleague, they still kind of have that wall up because you're my mentor."	

		Ronald	"I don't view myself as an ideal teacher, those are the ones who put the late hours, the ones who were here for sixteen hours yesterday because of the basketball game. I always view a mentor should be someone like that, like a leader, I can't say I don't have passion, but not like those teachers that you look at them and you've only been teaching for a week and you already know that's a hell of a teacher."	
Identity as a nexus of multimembership	Who we are by the ways we reconcile our various forms of membership into on identity	Demitri	"people ask you for advice, so I guess I'm like, oh! I guess I'm a leader, or I guess I'm this, or I guess I'm doing this correctly or you know. Or maybe I should do this. So, I mean I think it's good, it puts you where you kind of measure where you at as far as your profession, it can help you measure."	The boundaries of their practice became the deep personal experiences of individuality of leadership.
		Demitri	"…being an administrator I saw lots of teachers, great teachers and bad teachers…I think about my really good teachers and I say, oh! Yeah, we did this and how do you do this? You know, the school, how do we, when the kids didn't do this,	An intrinsic process that required appropriating new pieces of information to provide a more holistic analysis of the type of support required for

			what can we do here?"	his mentee.
		Luke	"I think sometimes as a department chair, I think they see you as a boss or like you're in charge of me kind of thing. So, they're sometimes reluctant, even though you want to be more like their friend or colleague, they still kind of have that wall up because you're my mentor."	The boundaries of their practice became the deep personal experiences of individuality of leadership.
		Ronald	"I don't view myself as an ideal teacher, those are the ones who put the late hours, the ones who were here for sixteen hours yesterday because of the basketball game. I always view a mentor should be someone like that, like a leader, I can't say I don't have passion, but not like those teachers that you look at them and you've only been teaching for a week and you already know that's a hell of a teacher."	The boundaries of their practice became the deep personal experiences of individuality of leadership.

Fabricating Time

Some learned mentor teacher identity is generated by the different perspectives on appropriation of time spent for various tasks regarding mentoring. Mentors experienced issues with the amount of time spent or not spent on tasks such as paper work, activities, or professional development geared towards supporting their mentee. Demitri for example, expressed feelings of regret and lack of self-fulfillment when he did not feel as though he were setting enough time aside to meet one-on-one to work with his mentee. He stated in my one-on-one interview, "you get a lot of things thrown at you at once, and you know, how do you juggle everything, how do you keep your sanity. What do you put your time in, what do you not put your time in, what's important and what's not important." Learning identity, according to Wenger, is "always simultaneously dealing with specific situations…" The situation presented here is that Dimitri's desire to award more one-on-one time to his mentee in relation to his tasks as a classroom teacher initiated an internal struggle.

Luke's issues of time centralized around a similar internal struggle. He felt he had lost much needed time with his mentee because she began teaching on his campus two months after the school year had started. He stated that in those two months, a long-term substitute had been managing the student and had created an atmosphere that students were beginning to become accustomed to, "there was already a dynamic occurring that could not be overcome so, when the new teacher came in to take over…she needed to have some else helping her." He believed that his mentee experienced push back from the students as a result of the already established classroom culture the long-term substitute had established. This situation proved to be stressful for Luke because he needed to help her reestablish classroom norms and rapport with her students. Luke did not feel equipped to take on such a responsibility. He described feeling as though he had done a "disservice" to his mentee because he was not awarded enough time during

the school day to develop a strong relationship with her. He described wanting support that would enable him to observe her teaching strategies as well as the allowance for her to observe his teaching strategies. “I wanted there to be a way for her to come see me teach, then I can go see her teach to keep getting a better picture [of her teaching strategies].” Luke was conflicted with the time he felt he needed to successfully mentor. For Luke, mentoring was about forming a relationship with his mentee through time spent together. From his past experience with his own mentor teacher when he entered the field of education, he longed for the opportunity develop a relationship with his current mentee in hopes to assist her to become a seasoned teacher in the future. Luke’s trajectory toward full membership as a mentor in part necessitated mentee reification. Mentoring, for Demitri and Luke, meant that he would have to incorporate his past experience as a new teacher, his current experience as a returning teacher, with the future desire to effectively mentor his mentee.

In Lucy’s and Ronald’s case, they both experienced difficulty fulfilling the requirements of the formal district mentoring program tasks due to issues with time. Both mentors struggled to negotiate her time spent with her mentee and the time it took to complete the paperwork aspect for successful completion of the program. Lucy vented during my one-on-one interview when I asked her what she felt was most difficult about being a mentor, “Paperwork! That has been the challenge and it’s not because we [mentors] don’t want to do it, it’s fine, we just need time.” Ronald expressed a similar issue he had with what he perceived to be “harsh timelines for generic activities.” He felt that the timelines mapped out by the program did not allow for flexibility for the timeframe in which activities were to be completed. In addition, he felt that the activities were not authentic enough and therefore chose not to place importance in completing them in a timely manner. Lucy felt that more sanctioned time awarded to her and her mentee

during the school day would prove to be a more authentic approach to the integrity of the district mentoring program. She discussed how her and her mentee's "…conferences doesn't coincide. It's hard for to schedule meetings with him." This often caused the pair to stay after school, arrive before the school day, or spend time during their thirty-minute lunch break thus cutting

Characteristics of Identity	Description	Mentor	Data	Findings

into their personal time. For Ronald, his tensions centralized around the desire to have more opportunities professional development in mentoring yet in my one-on-one interview he expressed difficulty in negotiating time to participate in the online training activities and support provided by the district's mentor program. For Lucy, her tensions lied within her ability to balance time spent guiding her mentee while still performing the day-to-day duties of a teacher. For Ronald, his tensions lied in fulfilling online tasks for mentoring that did not fit his own personal timeline. For both mentors, the negotiation of time through mutual engagement caused them to re-learn how to prioritize time to incorporate mentor duties into their daily routine. As a result, their mentor identity became defined by their ability to engage in their community as a mentor with respect to daily time constrains.

Table 4.6: *Characteristics of Identity Table- Tensions: Complexities of Fabricating Time as a Mentor*

Identity as negotiated experience.	Who we are by the ways we experience our selves through participation and how others reify our selves	Luke	"I wanted there to be a way for her to come see me teach, then I can go see her teach to keep getting a better picture [of her teaching strategies]."	Mentoring was about forming a relationship with his mentee through time spent together.
Identity as a community membership.	Who we are by the familiar and unfamiliar	Lucy	"…conferences doesn't coincide. It's hard for to schedule meetings with him." , "Paperwork! That has been the challenge and it's not because we [mentors] don't want to do it, it's fine, we just need time."	Negotiation of time through mutual engagement caused them to re-learn how to prioritize time to incorporate mentor duties into their daily routine. As a result, their mentor identity became defined by their ability to engage in their community as a mentor with respect to daily time constrains.
		Ronald	"harsh timelines for generic activities."	

Research Question Two: *In what ways do mentor science teachers maintain and sustain a particular identity as a mentor?*

Mentor science teachers take on a performative role in which repeated performance of their role causes them to learn by disrupting and modifying the prior norms assigned to their positons (Butler, 1990). Personal and professional identity of pedagogical value is dependent upon the discovery of new emergent factors. Situated learning is something that is socially constructed and that takes place in a social setting. It is a process of identification through participation in the science community. We must remember that Wenger (1998) describes a

community of as having three defining characteristics; mutual engagement and negotiated by participants, involvement in a joint enterprise, and a shared repertoire. Learning is viewed as an "evolving form of membership" (1991, p. 53). Communities of practice are not well-defined but are "an activity system about which participates share understandings concerning what they are doing and what it means in their lives and for their communities" (Lave & Wenger, 1991, p. 98). In this research, the community of practice is composed of the multiple identities and levels of participation within the science teacher community itself. Learning occurs in conjunction with social engagement to produce individual types of learning. Darling-Hammond (1990) argues that teachers learn through social engagement when they participate in professional development that emphasizes their environment in addition to the pedagogical skills they learn. The relationship between learning and identity is emphasized by Lave, "…learning is, in this purview, more basically a process of coming to be—of forging identities in activities in the world" (1992, p.3). The themes that help answer this question include; Caring, Relationship Building, and Science Teacher Communities.

Caring through Mentoring

Each mentor in this research study felt that placing emphasis on the emotional needs of their mentee was vital to the support process. For example, Lucy considered herself to be a motherly figure within the community of teachers and staff on her campus. When I asked her in my one-on-one interview with her, how mentoring has affected the way she saw herself, she responded with, "[mentoring] makes me feel like a mom, everybody sees me like a mom. When I was the science coach, all my teachers saw me as their mom and I behave like a mom, [I tell teachers] be quiet, be on time, don't do that, don't bring food." By engaging in this practice, Lucy's sense of identity as a mother was reified by her colleagues' view of her. Her expertise of

knowledge and membership within the campus community through her engagement with teachers and staff gave specific meaning to her identity as a mother which she translated to her role as a mentor. Lave & Wenger (1991) suggest that an identity is forged through practice and for Lucy, she believes she developed a sense of mentor identity through her mother-like interactions with faculty and staff.

Demitri also felt as though providing feedback in the form of caring was an effective way of approaching situations to help guide his mentee. During my one-on-one interview, I asked him to discuss what he thought a mentor's role and he mentioned providing his mentee with the opportunity to share challenges and issues the mentee was dealing with. "I think a lot of it is guidance and feedback, because you're more experienced, you can give the mentee some feedback. It can also be a little bit of venting [for the new teacher]." Demitri reminisced about his first year teaching and recalled the various challenges he experienced and as though he were left to "sink or swim." He did not feel he had the emotional support he needed as a new teacher and therefore felt it important to provide to his mentee. He believed that a mentor teacher should be someone who works collaboratively and non-judgmental. He stated that the mentor should "coach the mentee and help them out not only with the delivery of instruction but support them emotionally as well." Demitri's sense of self was in a constant negotiation and interplay as a result of his past experience as a new teacher. Incorporating his past experienced his mentor identity was sustained by his ability to negotiate the present need for emotional support.

Ronald and Luke felt that they needed to support their mentees emotionally. Ronald described a time when his mentee became overwhelmed and expressed frustration while venting and began to cry. He mentioned during the one-on-one interview that offering emotional support to others is something he recognized as personal challenge. "Trying to calm someone down

when I don't know them on a personal level like that…it's hard." Luke felt that he should allow his mentee to vent to him, then offer constructive support. He stated, "I think you should just be there to listen to them and stuff and you may need to bark at them sometimes—hard love!" Also, try to encourage them and be constructive. In order to fulfill the needs of mentees, the mentors in this case needed to negotiate within themselves their ability to exercise empathy and genuine caring for their mentees. In doing so, they were able to fulfil a need for security and trust. Ronald satisfied his mentee's emotional needs while negotiating a vulnerability within him. He allowed himself to create a set of possibilities that exposed his insecurity thrusting his trajectory towards a new unfamiliar mentor identity. Luke's desire to provide "hard love" exposes the idea that as an "old-timer" he's concerned with the investment of practice. In his past, his mentor allowed him to solve challenges and obstacles on his own with little support. Although Luke did not want to engage in this type of practice for his mentee, he continued to believe offering freedom and ownership of challenged faced by his mentee would be the best way to support his mentee. This generational encounter is derived from his participation through his history teaching for over twenty years. Wenger states that exposure to these types of paradigmatic trajectories may prove to be the most influential factor to shape a newcomers. Ronald stated that he felt like his role as a mentor was to "give [his mentee] ideas, kind of help her mentally and emotionally." For Ronald, mentoring was about learning to connect emotionally. Luke stated in my one-on-one interview, "my job is to aid the new teacher in how to teach high school…and pass on [my] knowledge." For Luke, mentoring was about affording new potential to future generations of teachers through emotional support and a level of freedom to take ownership of challenges they faced.

Table 4.7: *Characteristics of Identity Table: Caring through Mentoring*

Characteristics	**Description**	**Mentor**	**Data**	**Findings**

of Identity				
Identity as negotiated experience.	Who we are by the ways we experience our selves through participation and how others reify our selves	Lucy	"[mentoring] makes me feel like a mom, everybody sees me like a mom. When I was the science coach, all my teachers saw me as their mom and I behave like a mom, [I tell teachers] be quiet, be on time, don't do that, don't bring food."	Her expertise of knowledge and membership within the campus community through her engagement with teachers and staff gave specific meaning to her identity as a mother which she translated to her role as a mentor. identity is forged through practice and for Lucy, she believes she developed a sense of mentor identity through her mother-like interactions with faculty and staff.
Identity as a learning trajectory	Who we are by where we have been and where we are going	Demitri	"I think a lot of it is guidance and feedback, because you're more experienced, you can give the mentee some feedback. It can also be a little bit of venting [for the new teacher]." "coach the mentee and help them out not only with the delivery of instruction but support them emotionally as well."	sense of self was in a constant negotiation and interplay as a result of his past experience as a new teacher. Incorporating his past experienced his mentor identity was sustained by his ability to negotiate the present need for emotional support.
		Luke	"I think you should just be there to listen to them and stuff and you may need to bark at them sometimes—hard love!"	mentoring was about affording new potential to future generations of teachers through emotional support and a level of freedom to take ownership of

				challenges they faced--"hard love"
		Ronald	"Trying to calm someone down when I don't know them on a personal level like that…it's hard." "give [his mentee] ideas, kind of help her mentally and emotionally."	He allowed himself to create a set of possibilities that exposed his insecurity thrusting his trajectory towards a new unfamiliar mentor identity.

A Legacy for Science Education through Mentoring

As the mentors invested themselves in the enterprise of mentoring, they felt the need to be able to engage in relations with their mentee that would make a greater impact on the community of science teachers. Ronald indicated to me that he believed that his role as a mentor was not only to support and strengthen his mentee but to "help add value to the overall science department." He also shared with me that he believed his role as a mentor was to "to keep them from quitting." During the focus group discussion meeting, Demitri commented on teacher retention. He stated,

> I think it's more that we want them to stay teaching, that's why we want to help them. We don't want to lose them so, we want to invest some time on them, with them to teach them the ropes hopefully, and hopefully they will stick around because as you know if they don't feel comfortable, what is it? Is it the turnover ratio that they stay, if they don't last like for like two years they're probably going to take off.

These statements are reflective of the consciousness that mentors of the need for good science teachers in a wider sense. They understood how their engagement with their mentees fit into the broader structure of science education. Wenger describes this as an interplay between the local

and the global (p. 162). Mentors understood that if their mentee experienced challenges and obstacles at the local level on their campus that they did not feel capable of handling and could not receive the support they needed, a possibility existed that they could quit teaching all together. This affects the global scheme of things because it impacts teacher retention on their campus. The mentors were invested in their practice and wanted to create capacity for future teachers of science on their campus. Mentoring for Ronald and Demitri meant investing in the future generations of science teachers.

Table 4.8: *Characteristics of Identity Table: A Legacy for Science Education through Mentoring*

Characteristics of Identity	**Description**	**Mentor**	**Data**	**Findings**
Identity as a relation between the local and the global	who we are by negotiating local ways of belonging to the broader sense	Demitri	I think it's more that we want them to stay teaching, that's why we want to help them. We don't want to lose them so, we want to invest some time on them, with them to teach them the ropes hopefully, and hopefully they will stick around because as you know if they don't feel comfortable, what	The mentors were invested in their practice and wanted to create capacity for future teachers of science on their campus. Mentoring meant investing in the future

			is it? Is it the turnover ratio that they stay, if they don't last like for like two years they're probably going to take off.	generations of science teachers.
		Ronald	"help add value to the overall science department."	
		Luke	"my job is to aid the new teacher in how to teach high school…and pass on [my] knowledge."	

Each mentor science teacher revealed a specific point in time that was transformational to their own perception as a mentor. As mentioned before in my early chapters, the identity of a teacher is never fully formed and continues to evolve. When each mentor experienced a specific situation that they perceived to be significant challenge to their practice which resulted by affecting their trajectory as a teacher.

The visual conception below illustrates the process that mentor science teachers within the Mentor Program experienced while serving in the program. The first stage exemplifies the specific challenge the mentor experienced while serving as a mentor. In this initial stage the mentor is already working with a new teachers as a formal mentor and in some cases as an informal mentor. While the mentor attempts to support and assist the mentee, a specific event or challenge is presented that causes the mentor to have a reaction. The reaction the mentor displayed was based on their prior experiences in education. Many times the event or challenge prompted a the mentor to reflect back on their own experience as a beginning teacher working together with a mentor. This reflection caused the mentor to react and adjust to the new situation.

This is the construction of the mentor identity. The next section explains how the mentor then sustained their newly constructed identity. Based on the reaction the mentor chose to exhibit, feedback was received either directly from the mentee, other colleagues, administration, or district personnel. Through the feedback the mentor was able to assess their influence on the reaction to the challenge or event. The mentor was then able to observe how the reaction influenced the desired results. Based on the observations the mentor would decide to either go back and modify the reaction until they achieve the desired results, or move on to the next stage. The next stage involved the transformation in the mentor's perception of themselves as being useful, successful, and relevant. Them mentor can then sustain their new perceived identity by the continued feedback and influence they receive. Their self-perceptions based on this feedback either continue to sustain their conceived professional identity is developed through the navigation of a new trajectory. When a new event or challenge occurs, it starts the process over again. This process continues through the professional experience of the mentor teacher.

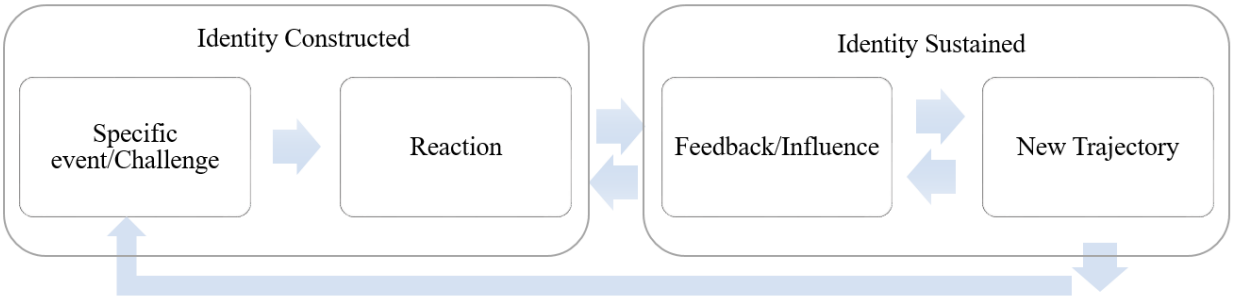

Figure 4.1: Visual Conceptualization: *Mentor Identity Process*

The mentors in the program experienced situations which allowed them to move from one stage of the process to the next. Sometimes the mentors moved forward and backward within the process until they were satisfied with the results. The first question in this study observed how mentor science teachers' identity was constructed while served as a mentor teacher. The

diagram below, Figure 2: Visual Conceptualization: *Mentor Identity Constructed,* describes the specific event or challenge that the mentor was faced with and reveals the reaction to that challenge or event. While Lucy served as a mentor to her new teacher, her administration changed his teaching assignment to a different discipline after the school year had already begun. Although the mentee still taught in a subject area that was considered part of science disciple, she did not feel equipped to assist her mentee through the content. This caused her to change her approach for originally supporting her mentee through content to now provide pedagogical support through the development of a resources folder intended to help all new teachers on her campus. Ronald experienced a challenge where his mentee needed emotional support to help her overcome challenges she faced in regarding classroom management. Although Ronald believed that he was assisting her through a systematic pedagogical approach, he failed to realize that his mentee required emotional assistance as well. Ronald did not feel as though this was an area of expertise for him but he also felt the strong desire to assist his mentee to the best of his ability. As a result, he reacted by learning to offer emotional support by serving as a sound board for her when she needed to vent or cry. He learned important listening skills and how to show empathy towards his mentee's needs. Demitri transitioned from serving as an assistant principal at another high school to becoming a classroom teacher once again. In addition to his return to the classroom, he was asked to mentor a new teacher. Given his leadership skills and his desire to see new teachers succeed, he accepted the opportunity to mentor. He reacted to the new situation by becoming cognizant of his own learning of becoming a teacher again. As he learned to become a teacher again, he payed attention to the strategies he used to interact with students, especially the ELL's students. He shared his strategies with his mentee in hopes to help the mentee avoid pitfalls. He used his skills from serving as an administrator to help his analyze test

data, which provided him and his mentee a deeper understanding of the needs of their students. Luke was given the opportunity to mentor a new teacher two months after the school year had begun. He was not able to assist his mentee with classroom management or setup before students arrived and the classroom culture was already set in motion. He felt discouraged and unsuccessful by his attempts to help her establish rituals and routines. His reaction to this was a deeper reflection of his own practice. He sought out ways to validate the practices that he felt were successful and attempted to improve the practices he felt needed strengthening.

Question 1: Identity Constructed	Specific event/challenge	Reaction
Lucy	New teaching assignment for mentee	Created Pedagogical support
Ronald	Emotional release of mentee	Developed emotional learning and support
Demitri	Transition from assistant principal to classroom teacher	Cognizant of his own learning to teach again
Luke	Feeling of failure as a mentor	Deeper reflection on own pedagogy

Figure 4.2: Visual Conceptualization: *Mentor Identity Constructed*

Mentors in the program reacted to the event or challenge they faced while mentoring their beginning teacher. As a result, mentors were able to receive feedback which caused them to take on a new trajectory through their newly acquired sense of learning. Figure 3: Visual Conceptualization: *Mentor Identity Maintained and Sustained* describes the types of feedback that influenced the mentors to maintain and sustain their new trajectory of identity. Lucy received validation from her colleagues and administrators when her idea for a new resource folder was developed. As a result, teachers and administrators began to see the value in what the resource folders offered for all new teachers on the campus. As more veteran teacher

practitioners or "old timers" bought into the idea of the need for such folders, they began to contribute their own ideas and resources to add to the resource. This helped Lucy take on a new trajectory as a mentor teacher who is not only knowledgeable in her content area, but also knowledgeable about the needs of new teachers in general on her campus. Ronald formed a deeper relationship with his mentee when she began to feel the emotional support he was giving her when she experienced a struggle. From this deeper relationship, more trust was gained and his mentee was able to open herself up to feel safe in her vulnerably as a new teacher. Ronald felt success in the new established relations and therefore became more motivated to help her. Despite his initial feelings of not being "mentor material," he gained a deeper sense of who he was as a mentor through solidarity. Demitri received positive feedback from his department as he took on a new sense of teacher and mentor on his campus. They viewed him as a leader of science teachers because of his past experience of serving as a former assistant principal and former science teacher. He had the opportunity to reflect on his experience as a second time new teacher and used that knowledge to assist him in focusing on specific strategies within the curriculum which helped not only his mentee but the entire science department. Luke received feedback from observing students in his mentee's classroom. He decided on the effectiveness of the strategies helped his mentee with based on how students reacted to the strategies. When students did not respond well to the strategies he used that to influence him to re-work the strategies. As a result, his new trajectory was geared towards becoming a better mentor. He took on the role of mentor the following school year and felt more success.

Question 2: Identity maintained and sustained	Feedback/Influence	New Trajectory
Lucy	Validation from colleagues and administrators	Motivated to help beginning teachers

Ronald	Deeper relationship with mentee	Sense of solidarity, continued motivation
Demitri	Viewed by his science department	Leader of science teachers
Luke	Student observations and behavior in class	Motivated to become a better mentor

Figure 4.3: Visual Conceptualization: *Mentor Identity Sustained*

Mentor teachers had to experience a challenge or significant event which caused them to react and receive feedback. Depending on those results they either reacted again or generated a new trajectory in their professional mentor identity. Despite any challenge the mentor teachers had to overcome, each one was ready and willing to serve as a mentor again in the future. They experienced fulfillment in watching their mentee achieve success. This in turn caused them to become more motivated to support other teachers. Mentor science teachers are able construct new forms of identity through the success they experience while mentoring new science teachers.

CHAPTER 5

DISCUSSIONS

The fundamental assumption of this study was that learning to become a mentor teacher and learning how to sustain the mentoring professional identity was influenced by a specific event that caused various forms of interactions and teacher community to create dynamics that stimulate and encourage mentoring practices. Through this research study, I was able to understand how mentoring identities for science teachers is constructed and how it is sustained. Through a qualitative case study analysis, this study highlighted the various circumstances which shaped the new identity of each mentor. The following is a discussion of the generalizability, implications, limitations, and needs recommendations that emerged after conducting this study.

This research study reflects the context of a single mentoring program and therefore was not meant to be a study that was generalizable to all mentor programs. The subjects and conclusions drawn from this research study may not become evident in a study of another similar program. The existing literature on the challenges of mentoring states that mentor teachers must negotiate their perception of what is important to teacher the new teachers. Since mentors did not receive formal training before mentoring a new teacher, they often reflected back on their own experience as a new teacher. As evidenced in this study and in the literature, mentor teachers' embodiment of their role situated around a significate event can cause the mentor to initiate a transformation in their own professional identity as a mentor teacher. Although the context of other mentor teacher programs may be situated in different contexts, a key component for all mentor programs is communication and support for all mentor teachers as they guide and facilitate learning for the new teacher. The placement of new teachers with their mentor teachers must be strategic, deliberate, and more formalized. The placement of new teachers with mentor

teachers must happen with a great deal of collaboration amongst campus administrators and district personnel. Based on this understanding, other studies may uncover similar findings because mentors' perception of support imbedded in such program may likely reflect those in this study.

Limitations

This study was limited to only one district mentoring program. The data collection only involved secondary science education teachers and spanned one academic school year. The data collection from this study offers a representation of a mentoring program that can be viewed by other mentor programs similar in structure. The survey sample was limited to only secondary science teachers within the school district who had served as a mentor teacher during the 2016-2017 and 2017-2018 academic school year. Teachers whom had mentored more than two years ago were not considered for this study in efforts to gain the perspectives of those who had participated most recently through rich depictions of their reality. The interview sample was limited to mentor science teachers who indicated that their mentoring experience lead to their own sense of learning.

Another limitation this case study presents is the idea that a narrative may bring to surface aspects of human activities that cannot be captured in a quantitative approach. Although narrative approaches have benefits, critics may not be satisfied with this approach. Researchers may question the relationship between a narrative and the events they depict (Denzin & Lincoln, 2005; Creswell, 2007).

Implications

The findings of this study may have tremendous potential benefits to the greater learning community regarding mentor teachers, new teachers, pre-service teachers, school district

personnel and administrators, school policy makers, university faculty, researchers, and professional development programs. These findings can inform others by indicating what influences mentor science teacher identities within their specific circumstances, location, and time. The ways in which we support mentor teachers in their endeavors to assist and support new teachers must undergo substantial change. Ingersoll & Strong's (2011) research suggests that the implementation of mentoring can accelerate professional growth for teachers and thus impact student learning. This may take time to reform thinking about the ways in which we look to advance teacher growth. According to Holmes Group (1995) in order for educational reform to take place, they system itself must undergo reform. This includes the transformation of teaching, of schools, and of professional education. A transformation of mentoring programs cannot happen overnight and will require much time and specific place for it to marinade and occur. It is evident from this study that a collaboration must exist between not only campus and district administration but must also a partnership must occur with all stakeholders having input, and creating a shared vision of what a mentor program should look like (Guskey, 2000). The process of how we will fulfil this vision should be of high concern and immediately necessary. This study may help in the construction of the components necessary for such reformation.

Needs and Recommendations

One other goal of this study was to explore the needs of mentor science teachers that may enable them to become more effective mentors through their practice. Tok (2012) indicates that interpersonal relationships between mentors and their protégés are the most critical characteristic a mentor can develop. In my interviews with mentors, they all described their interpersonal relationships to be challenging and important for effective mentoring. When specifically asked in the survey to list any needs mentors felt they need that were not specifically addressed in the

survey, 64% of participants stated little to no need for preparation or on-going support in interpersonal skills in relation to my beginning teacher. Only one person indicated a high need for development in this area and none of the participants selected an urgent need for development in this area.

Although mentors did not directly select a specific need for developing their interpersonal skills, the indirect analysis of their needs through survey and interview data reveal that mentors do in fact have needs for preparation and support. Bullough (2012) indicates that challenges for mentors occur when they do not have a strong understanding of the principals of adult learning. Only 64% of mentors indicated they had some, high, or urgent need in this area making this a more suggestive area identified for support. The inability to address the needs of adult learners can place a mentor in uncomfortable and threatening positions since opposition with the beginning teacher may cause a rift in communication and rapport between the two.

Luke, the veteran teacher of physics education and mentor, described a lack of "connection" with his mentee which left him feeling helpless and conflicted professionally about his perceived lack of ability to help her. Gardiner (2009) describes one of the most significant challenges as mentor's own ability to conceptualize her or his role. Luke attempted to help his mentee to the best of his ability, he still felt conflicted in his confidence to mentor successfully the following year because of the strained relationship he experienced. The management of adults is related to issues of professionalism in contrasting philosophies of teaching will conflict with a mentor's perception to whether they can be resourceful, viewed as a role model, or a friend (Gardiner, 2009).

The research found by Kemmis et al. (2014) indicated that a mentor's disposition towards supporting new teachers can significantly alter the ways in which mentees internalize their role.

As mentioned in chapter two, if a mentor takes on the role as 'supervisor' the mentee will develop a disposition of compliance. When mentors have a disposition as a supporter and professional colleague, the mentee can develop a disposition of continued professional development. When mentors collaborate and practice self-development, the mentee can develop a disposition of teaching that focuses on engagement in professional communities and also self-development. Research also indicates that knowledge is constructed from prior knowledge and can be reflected in a mentoring model of "constructivist mentoring" (Desimone, 2009). This means that constructivist mentoring helps teachers develop professional competence. This research study has shown evidence that mentors themselves constructed new knowledge through the mentoring process. It can be said that mentors in this study had a constructivist mentoring disposition. Richter and colleagues (2013) found that "constructivist-oriented mentoring" lead to higher levels of efficacy, teaching enthusiasm, and job satisfaction with lower levels of emotional exhaustion. When mentor teachers in this study experienced perceived success with their mentee, it compelled them to work harder to support their mentee. Mentor teachers' disposition of mentoring that reflected a constructivist type mentoring model may have impacted mentees to also perceive their knowledge of teaching to also be constructed. This adds to the body of knowledge that we already know about the work of Kemmis and colleagues research of mentor and mentee dispositions. Constructed knowledge could then be placed between mentor dispositions of supporter and collaborator.

The Border District's Mentor program is one that only lasts one academic school year. In that year, mentors have been historically challenged in receiving a lack a of clear guidelines regarding what exactly was expected of them as mentors and what type of new teacher development the mentors were responsible for. Once again, 64% of participants from the survey

indicated that they needed some need or high need for this clarity. In addition to this need for clarity, 90% survey participants indicated some need or high need for support in diagnosing the needs of their mentees. The desire for growth in these areas indicates that mentors do seek to move more towards more effective mentoring practices and because of unclear roles of mentoring within the programmatic structures, mentors are not ready to purse this action. According to Gardiner (2009), mentors are also challenged with managing their protégés with the general day-to-day operations of being a teacher.

Another need mentors expressed on the survey was a need for significant focus in assisting their mentee with classroom management skills. As much as 81% of participants indicated that they had some need, high need, and urgent need in assisting their mentee with classroom management. This is reminiscent of Santoli & Martin's (2012) research which indicates that a mentor's greatest need is to become prepared to assist their mentee with classroom management. It can be inferred that mentors in this study recognize that classroom management is a challenging and it might benefit the mentor to receive support in this area for assisting their mentee and perhaps to rejuvenate their own professional practice.

Since mentors in this study felt unclear about their role in their district's mentor program they perceived their purpose to be more practical in nature tending to the day-to-day experiences in teaching rather than taking on a more educative role. They rarely challenged themselves to explore issues of diversity, student outcomes, or beginning teacher's own learning outcomes. A mentor's belief that they require little to no support in areas related to interpersonal skills related to their beginning teacher may be due to Vygotsky's (1978) idea of "fossilized behaviors" in which mentor practices which reflect polar ideas about teaching the "right ways" and the "wrong ways" of teaching which may or may not necessarily meet the needs of the beginning teachers. It

is apparent that the explicit role of the mentor is vital yet a clear model does not exist. For purposes of district mentor programs targeted to support new teachers, a program must be reflexive and rooted in the real experiences of mentors and their beginning teachers.

Although the district mentoring program was in invaluable resources for new teachers to have formal access to a designated mentor, logistical details emerged from this study that presented challenges for the mentors. To begin with, the type and amount of sanctioned time (if any) varied from campus to campus throughout the district. Where some mentors had frequent opportunities to meet with their mentee, others needed to create a new "space" in which they connected with their mentee. Relationship building between mentors and mentees is vital in creating satisfaction among mentor/mentees. According to Tok (2012) interpersonal relationships between mentors and mentees may be the most important characteristic a mentor can develop. The mentors in this study expresses the importance of positive relationships with their mentee. Wenger (1998) argues that "identities are constituted not only by what we are but also by what we are not" (p. 164). Situations in which mentors and mentee partnerships did not collaborate effectively may prove to be detrimental to both parties involved. Some mentors connected with their mentees before or after the school day, informally during lunch, or some even carpooled to and from school each day in order to have time to collaborate and have the types of discussion necessary to support their mentee.

One way to remedy this situation would be to create more collaboration with campus administrators placing more attention to the importance of providing mentors and their mentee sanctioned time and space to work together during the school day and week. The school district could also work in collaboration with key stakeholders to develop a systematic approach to

allowing mentors and mentees time to collaborate more frequently through guided, specific, and purposeful tasks.

Another challenge that mentors in this study experienced were the ways in which mentor and mentee partnerships were assigned. Sometime the pairing was mismatched by means of personality, content area, and/or proximity to each other's classroom. Attention to the overall goals, objectives, and requirements of the program should be the first and foremost anchor in deciding on the partnerships. One way to adhere to this might be to involve key stakeholders in the decision making process for the selection process that should be taken into consideration when deciding on who mentors should be on campus. The selection process should be specific in that it encompasses state requirements while being aligned to district initiatives and campus goals. This should be communicated across the district.

Finally, many mentors experienced difficulty positioning themselves as mentors from the onset of having been "chosen" to mentor the new teacher. This may be due to the lack in professional development that is geared towards helping teachers to understand and grow their own professional identity as mentors. Teachers' identities are continually taking new shape. According to Rodgers and Scott (2008) the ideas of teachers' professional identity implicitly enables teachers to take agency in becoming the kind of teachers they want to be. Mentor teachers have the ability to help shape new teachers in becoming effective and therefore they themselves need help doing so. This study is important for mentor teacher training specifically because it helps us understand that mentor teachers must possess the ability to access identity development resources and professional training that will cultivate effective mentoring. This redefines mentoring in ways that support a new way of thinking about professional development of teachers, specifically the already experienced teacher. This means that the relationship

between mentors and mentees must be constructed in strategic and deliberate ways through the program. Pairing of the mentor and mentee should consider that both mentor and mentee will learn from the experience and measures should be taken into consideration that will enable growth for both teachers. It is also important to take into consideration the type of disposition towards mentoring teachers have in relation to their assigned beginning teacher's personality.

This qualitative case study contributes to the research base for science teacher identities. Many research question related to this study still remain and can be further developed. Some of these questions are:

1. What is the role of inquiry related to the mentoring process for science mentor teachers?
2. What is the extent to which mentor science teachers assess and evaluate their role as mentor teachers?
3. How would assessment/evaluation tools and documents support mentor science teachers? How might these be created? What might they look like? Who would generate them?
4. How might the use of web-based online platforms such as Schoology be employed as a means of collaboration and discussion threads be used to specifically focus on the facilitation of mentor and mentee interactions?

Researcher's Reflections

Due to the limited amount of literature that focused specifically mentor science teachers, it was difficult to make specific connections that could support and/or make comparisons of these findings of this research study with existing research. The most challenging aspect of this study was methodically analyzing the qualitative data in ways that would generate emergent trustworthy themes that accurately portrayed the experiences of teacher mentors. Therefore, the data analysis procedures were intricate and numerous in repetition through coding.

In addition, a similar challenge was encountered when one-on-one interviews were conducted. Participants seemed to feel more open to discuss their experiences in a deeper level with the use of content specific vocabulary only after I shared my background and experience teaching the content area and grade levels with them. When mentors would use content specific vocabulary that I was not familiar with, it required more depth and understanding on my part to development more knowledge that would enable me to better understand the shared information. Field notes and audio-recordings were essential in the analysis of the four cases to better understand their experiences as mentor science teachers. Further discussions (outside of the audio-recordings) were necessary to clarify some of the mentors' thinking as well as to ensure the evidence presented in the data was accurate and truly reflective of their personal stories as participants of this study.

The world of education strives to do what is best for students and sometimes, this includes the need to do what is best for teachers as well. The best way to help students is to help those who teach them. Although significant attention should be placed on helping new teachers develop and hone in on their craft of teaching, experienced veteran teachers should also be taken into consideration for opportunities to help sustain and possibly even revitalize their craft as well. Ensuring effectiveness in supporting mentors as they mentor new beginning teacher can have a rippled effect on the identity of all teachers involved thus impacting students.

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APPENDIX I

Consent Form for Participation in an online survey

University of University of Texas at El Paso

Researcher(s):	*Melissa N. Ortega, Ph.D. Candidate*
Study Title:	**Mentor Teaching as a form of Professional Development: Interactions and learning outcomes in a secondary science educational setting**

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1. WHAT IS THIS FORM?

This form is called a Consent Form. It will give you information about the study so you can make an informed decision about participation in this research.

2. WHO IS ELIGIBLE TO PARTICIPATE?

Subjects must be at least 18 years old to participate. Subjects must be identified as science teachers who currently participate in the Border District's 2017-2018 Mentor Program.

3. WHAT IS THE PURPOSE OF THIS STUDY?

The purpose of this study is to understand the extent to which mentor teachers employ andragogical principles when mentoring a beginning teacher. From the results of this study the researcher hopes to gain an understanding of the learning that occurs for these mentors from this experiences.

4. WHERE WILL THE STUDY TAKE PLACE AND HOW LONG WILL IT LAST?

The study will take place online through a link using Qualtrics. The survey will take approximately 15 minutes to complete.

5. WHAT WILL I BE ASKED TO DO?

If you agree to take part in this study, you will be asked a series of questions about yourself and your experience as a Mentor Teacher. You may skip any question you feel uncomfortable answering.

6. WHAT ARE MY BENEFITS OF BEING IN THIS STUDY?

You may not directly benefit from this research; however, it is the hope of the researcher that your participation in the study may help you to network with other professionals, enhance your pedagogy, and provide a sense of fulfillment.

7. WHAT ARE MY RISKS OF being in THIS STUDY?

No known risks associated with this research study; however, a possible time inconvenience may exist while answering the survey questions.

8. HOW WILL MY PERSONAL INFORMATION BE PROTECTED?

The following procedures will be used to protect the confidentiality of your study records. Study records will include survey results data in an excel sheet. The researcher will keep all study records, including any codes to your data, in a secure location. This location will be a locked cabinet and encrypted data on my personal computer. Research records will be labeled with a code. A master key that links names and codes will be maintained in a separate and secure location. The master audio will be destroyed three (3) years after the close of the study. At the conclusion of this study, the researcher may publish the findings. Information will be presented in summary format and you will not be identified in any publications or presentations. Please be advised that the researcher will take every precaution to maintain the highest level of confidentiality of the data.

9. WHAT IF I HAVE QUESTIONS?

Take as long as you like before you make a decision. The researcher will be happy to answer any question you have about this study. If you have further questions about this project or if you have a research-related problem, you may contact the researcher, Melissa Ortega, 915-219-0444. If you have any questions concerning your rights as a research subject, you may contact the University of Texas at El Paso Human Subjects Compliance Office at (915) 747-6478 or complianceoffice@utep.edu

10. CAN I STOP BEING IN THE STUDY?

You do not have to be in this study if you do not want to. If you agree to be in the study, but later change your mind, you may drop out at any time. There are no penalties or consequences of any kind if you decide that you do not want to participate.

11. WHAT IF I AM INJURED?

Although there is no anticipated chance of getting hurt during the interview and/or focus group discussion, The University of Texas at El Paso does not have a program for compensating subjects for injury or complications related to human subject research. If a situation were to occur where the participant were to need assistance due to any harm from the interview and/or focus group discussion the researcher would contact the appropriate health care facility or local police department for assistance.

12. SUBJECT STATEMENT OF VOLUNTARY CONSENT

By signing this form I am agreeing to voluntarily enter this study. I have had a chance to read this consent form, and it was explained to me in a language which I use and understand. By signing this consent form I also understand that I will be audio taped and agree to maintain the confidentiality of the information discussed by all participants and researchers during the focus group session. I have had the opportunity to ask questions and have received satisfactory answers.

I understand that I can withdraw at any time. A copy of this signed Informed Consent Form has been given to me.

If you cannot agree to the above stipulation please see the researcher as you may be ineligible to participate in this study.

_____	_____	_____
Participant Signature:	Print Name:	Date:

By signing below I indicate that the participant has read and, to the best of my knowledge, understands the details contained in this document and has been given a copy.

_____	_____	_____
Signature of researcher	Print Name:	Date:

APPENDIX II

Survey Questions for Participation in an online initial survey for Mentor Teachers

University of University of Texas at El Paso

Researcher(s):	*Melissa N. Ortega, Ph.D. Candidate*
Study Title:	**Mentor Teaching as a form of Professional Development: Interactions and learning outcomes in a secondary science educational setting**

(This survey will be administered through Qualtrics and a link will be sent to each possible participant through their email)

1. I would like to take this survey (yes/no)

2. Please fill out your information for the following questions:

    a. Name:
    b. Campus site:
    c. Grade level:
    d. Subject:
    e. Preferred email:
    f. Cell phone number:

3. How many years have you been teaching? (3-5, 6-10, 11-15, 15 or more)

4. How many beginning teachers have you mentored during your teaching career and from which programs? (ie., Boarder District Mentor Program, Local University, Teacher preparation program through Regional Services, online Teacher preparation program etc…)

5. How well do you understand your purpose as a mentor teacher for beginning teachers? (Extremely well, Very Well, Moderately Well, Slightly Well, Not well at all)

6. What do you feel is your most essential function as a mentor teacher for beginning teachers?

7. When working with beginning teachers which are the most important areas you focus on for her/his growth? Please rank the following choices:

    a. Immersion into the school community and culture
    b. Classroom management
    c. Delivering engaging, student centered instruction
    d. Communicating with faculty (including you), parents, and students actively
    e. Designing and implementing formative and summative assessments
    f. Managing the instructional environment (organization of lab experiments, resources, pacing of curriculum, lesson plans

8. How do you rate your confidence in your ability to be a good mentor? (Very good, good, poor, very poor)

9. Please describe any preparation you have received to be a mentor teacher. Please indicate if this preparation was provided by your district (or some other organization) to specifically mentor beginning teachers.

10. How were you selected to be a mentor for the Border District's Mentor Program?

11. What has been your greatest reward as a mentor teacher of beginning teachers?

12. What has been your greatest challenge as a mentor teacher of beginning teachers?

13. Did you participate in Border District's Mentor Program as a beginning teacher yourself?

14. For each statement, please select your level of need for assistance, training, or support in the described item. (Little or no need, some need, high need, urgent need)

    a. Learn more about what is expected of me as a mentor
    b. Collecting classroom observation data.
    c. Diagnosing needs of my beginning teacher.
    d. Interpersonal skills in relation to my beginning teacher.
    e. Assisting my beginning teacher with classroom management.
    f. Using principles of adult learning to facilitate the professional growth of my beginning teacher.
    g. Socializing my beginning teacher into the school culture.
    h. Finding resources and materials for my beginning teacher.
    i. Providing emotional support for my beginning teacher.
    j. Co-Teaching with my beginning teacher.
    k. Managing my time and workload.

l. Problem-solving strategies
m. Engaging in coaching my beginning teacher.
n. Helping my beginning teacher develop a variety of effective teaching strategies
o. Helping my beginning teacher design a long-range professional development plan.
p. Helping my beginning teacher motivate students.
q. Helping my beginning teacher assist students with special needs.
r. Helping my beginning teacher diagnose student needs.
s. Helping my beginning teacher deal with individual differences among students.
t. Helping my beginning teacher evaluate student progress.
u. Helping my beginning teacher navigate the science curriculum and scope and sequence.

15. Please list any needs you have as a mentor that are not addressed in the preceding items.

16. What types of support would you recommend the school district or university provide to you and other mentors?

17. Thank you for your participation in this survey.

APPENDIX III

Interview Participation in a Research Study

University of University of Texas at El Paso

Researcher(s):	*Melissa N. Ortega, Ph.D. Candidate*
Study Title:	**Mentor Teaching as a form of Professional Development: Interactions and learning outcomes in a secondary science educational setting**

Good evening and welcome to this interview session. Thank you for taking the time to join me in talking about your experiences mentoring a beginning teacher in the Border District's Mentor Program. My name is Melissa Ortega and I'm a graduate student in the University of Texas at El Paso's Teaching, Learning, and Culture Ph.D. Program. The purpose of this interview is to learn about your experiences as a mentor teacher. This research study wants to understand what it means to you to be a mentor, how you teach your mentor, what you believe to be important for your beginning teacher, to know what your needs are, struggles, and what are some of the positive experiences you've had being a mentor.

You were invited because you are a mentor science teacher for the 2017-2018 school year.

There are no wrong answers. Please feel free to share your point of view. Keep in mind that this research is just as interested in negative comments as positive comments, and at times the negative comments are the most helpful.

You've probably noticed a recording device. This interview will be recorded because I don't want to miss any of your comments. People often say very helpful things in these interviews and it can be quite difficult to write fast enough to get them all down. We will be on a first name basis tonight, and the use of any names will not be used in the reports. You may be assured of complete confidentiality. The reports will remain on my computer in a secured database.

Well, let's begin.

Interview Questions

11. How did you become a mentor teacher?
12. In your opinion, what is the role of the mentor?
13. What do you personally gain from being a mentor?
14. If any, what are some things related to your own teaching abilities that you have learned in your role as mentor?
15. Has being a mentor affected the way(s) you see yourself as a teacher? If so, how?
16. In your opinion, what is the biggest challenge of being a mentor?
17. Do you consider the mentoring role as an administrative role? Why or why not?
18. What kind of mentoring professional development have you received?
19. To what extent is your campus supportive of the mentor role?
20. How likely are you to continue your role as a mentor teacher in the future?

Thank you for participating, this concludes our interview. If you have any additional information you would like to share please feel free to contact me at: 915-219-0444 or by email at:

Have a great afternoon!

APPENDIX IV

Focused Group Discussion Questions for Participation in a Research Study

University of University of Texas at El Paso

Researcher(s):	*Melissa N. Ortega, Ph.D. Candidate*
Study Title:	**Mentor Teaching as a form of Professional Development: Interactions and learning outcomes in a secondary science educational setting**

Good evening and welcome to our session. Thanks for taking the time to join us to talk about your experiences mentoring a beginning teacher in the Border District's Mentor Program. My name is Melissa Ortega and I'm a graduate student in the University of Texas at El Paso's Teaching, Learning, and Culture Ph.D. Program. The purpose of this group discussion is to learn about your experiences as a mentor teacher. This research study wants to understand what it means to you to be a mentor, how you teach your mentor, what you believe to be important for your beginning teacher to know, what are your needs, struggles, and what are some of the positive experiences you've had being a mentor.

You were invited because you are a mentor science teacher for the 2017-2018 school year.

There are no wrong answers but rather differing points of view. Please feel free to share your point of view even if it differs from what others have said. Keep in mind that this research is just as interested in negative comments as positive comments, and at times the negative comments are the most helpful.

You've probably noticed a recording device. This session will be recorded because I don't want to miss any of your comments. People often say very helpful things in these discussions and it can be quite difficult to write fast enough to get them all down. We will be on a first name basis tonight, and the use of any names will not be used in the reports. You may be assured of complete confidentiality. The reports will remain on my computer in a secured database.

Well, let's begin. We've placed name cards on the table in front of you to help us remember each other's names. Let's find out some more about each other by going around the table. Tell us your name and where you teach.

Beginning Questions:

1. How many years/semesters have you been involved in the Mentor Program in your district?

2. What are some other ways you have been involved in the Mentor Program (i.e., Workshops, campus initiatives, presentations, teaching test preparation etc.)?

3. Think back over all the years that you've participated and tell me about your fondest memory. (The most enjoyable memory.)

4. Think back over the past year of the things that Mentor Program did to support you as a mentor. What went particularly well?

5. What needs improvement?

6. Have you ever mentored a student teacher not from the Border District's Mentor Program? If so, how was that experience similar or different from your experience participating with the Mentor Program?

7. If you were inviting a friend to participate as a mentor in the Mentor Program, what would you say in the invitation?

8. Suppose that you were in charge and could make one change that would make the program better. What would you do?

Secondary Questions:

1. What does it mean to you to be a mentor teacher?

2. How do you decide what is important to teach a beginning teacher of science?

3. Describe some challenges that come with mentoring beginning science teachers.

4. Describe any mentor preparation training you have experienced.

5. How are challenges of mentoring related to teaching science specifically?

6. How has your own pedagogy been affected since becoming a mentor teacher to a beginning teacher?

7. Let's list these on the flip chart. If you had to pick only one factor that was most important to you, what would it be? You can pick something that you mentioned or something that was said by others.

8. Of all the things we've talked about, what is most important to you?

Thank you everyone for participating, this concludes our session. If you have any additional information you would like to share please feel free to contact me at: 915-219-0444 or by email at: mnortega@utep.edu

Have a great afternoon!

APPENDIX V

Survey reflective questions for beginning teachers of mentors participating in the research study

University of University of Texas at El Paso

Researcher:	*Melissa N. Ortega, Ph.D. Candidate*
Study Title:	**Mentor Teaching as a form of Professional Development: Interactions and learning outcomes in a secondary science educational setting**

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1. Please answer the following questions with as much detail as possible.

2. Please describe what your mentor has taught you about science that has made the most impact on your pedagogy?

3. How does your mentor decided on what you need to know as a beginning teacher?

4. Please discuss any special techniques for teaching science your mentor has helped you to learn.

5. Please describe your perception on the preparedness of your mentor in helping to support you as a beginning teacher.

6. What are some real-life situations your mentor has exposed you to as a beginning teacher and what did you learn from this?

7. Why do you think your mentor wanted to be a mentor?

Thank you for your time.

APPENDIX VI

NVivo Codes for all Case Study Participants

1. Nodes:
2. Challenges
    a. Challenges as a teacher in general
    b. Challenges in Mentoring a beginning teacher
    c. Challenges teaching science
    d. Programmatic Structure
3. Communities of Practice
        i. Joint enterprise
4. Mutual engagement
5. Negotiated meaning in practice
6. Shared repertoire
7. Identity
    a. Alignment
    b. Engagement
8. Imagination
9. Leadership
10. Science teacher identity
11. transformation
12. Learning
    a. General Pedagogy
    b. LPP
13. Observations
14. Pedagogical Content Knowledge
15. Professional Learning
16. Situated
17. Trajectories
18. Perceptions
19. Perceptions
20. Feelings of satisfaction
21. Filtering
22. Mentor Perceptions
23. Perceptions of beginning teachers
24. Roles and responsibilities

CURRICULUM VITA

As a Hispanic female, first generation graduate student, and single mother of three, I have learned the value of higher education and have developed a deeper love and appreciation for the field of education. Working in the public school setting and university setting for the last twelve years has caused me to become passionate about science education and gender equitable education for students from Kindergarten through college. I have had the opportunity to learn about science education first hand while teaching middle school students. In addition, I have also served as a university instructor for seniors on pedagogical practices in the delivery of science content for elementary, secondary, and Bilingual education. With my background in gender studies, I have had the opportunity to travel to Umea, Sweden to study Transnational Feminism. In doing so, I was able to experience the structures and pedagogical practices, culture, and the content itself that contributed to my own identity development as an educator. With this background, I am eager for the possibility to continue working on projects that involve science education and gender studies. I believe my experiences have prepared me for the educational and administrative challenges that may emerge in the future. I have a Bachelor's Degree in Interdisciplinary Studies and a Master's Degree in Education as an Instructional Specialist in Science. I am now currently a doctoral candidate in the Teaching, Learning, and Culture Program in the College of Education concluding a Doctor of Philosophy (Ph.D.).

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