ABSTRACT

HOLLEY, DOROTHY ELAINE TALLEY. Investigating Factors Impacting Commitment and Retention of Mid and Late Career High School Science Teachers in North Carolina. (Under the direction of Dr. Soonhye Park).

Teacher turnover hurts school stability and costs school systems valuable resources. Retaining experienced teachers increases financial resources, academic achievement, institutional knowledge, discipline expertise, and human capital for the schools in which they teach. There is a dearth of research focusing on why mid and late career high school science teachers, who have survived many of the novice teacher challenges, chose to leave the profession and what can be done to stall their departure.

This study examined (1) the relationship between teacher self-efficacy and commitment to students, teaching, school, and the profession, (2) explored the personal, environmental, and behavioral factors that encourage teachers to stay in the profession and (3) the coping strategies used to confront challenges and times when they consider leaving. A mixed methods design including quantitative data collected through closed-ended survey questions and qualitative data collected through open-ended survey questions and with a semi-structured interview given to a subset of the sample was utilized. The survey (N=147) was administered online to facilitate data collection. Follow-up questions were asked through a personal interview (n=25) conducted through Zoom in order to add depth of understanding to the examination of the research questions.

Survey data found strong, significant correlations between high school science teachers’ self-efficacy and commitment. Higher levels of correlation were found between Personal Science Teaching Efficacy (PSTE) and Science Teaching Outcome Expectancy (STOE) constructs and Teacher Commitment than Overall Self-efficacy and Teacher Commitment. STOE was found to
be highly correlated to each of the four commitment subscales – Commitment to Students, to Teaching, to School, and to the Profession. PSTE was also found to be highly correlated to each of the four commitment subscales, although correlations with Students and Teaching subscales were stronger than correlation with School and Profession subscales. T-tests, analysis of variance (ANOVA) and regression analyses examined the impact of demographic teacher variables on the relationship. Science teachers teaching in Suburban communities reported higher Teacher Commitment compared to those working in Urban and Rural areas. Science teachers at Non-Title 1 schools reported higher Teacher Commitment compared to their Title 1 counterparts. Teachers in non-traditional schools (private, public charter, public magnet) reported higher Commitment to School compared to their traditional public-school counterparts. As teachers age increases, Commitment to Teaching also increases.

Qualitative findings were used to inform the quantitative results. Open-ended responses to the survey questions and responses from the interviews focused on factors that contribute to mid and late high school science teachers’ intention to stay. Positive critical incidents described themes of student success, teacher success, and teachers who have control over the instances that cause success are more likely to stay. Findings also showed that Personal and Environmental triggers to leave the profession are Sociocultural (Administrative leadership/ support), Relatedness (Student misbehavior), Institutional (Teacher Salary), and Autonomy (Lack of input into school policy). While there are a variety of triggers, self-efficacy is largely missing as a reason to consider leaving. Teachers feel confident in their ability to teach and those who stay cope by focusing on their own environment.

Findings of this study describe the strongest relationship is between self-efficacy and commitment to students. Teachers care about student success and tend to leave when they do not
believe they are being successful at teaching their students. Teachers in this study suggest that teachers move from schools lacking high academic standards for students and move to schools where they believe practices support students' learning. Teachers in this study focused on what they can control. Implications for policy, practice and future research include strengthening relatedness for mid and late career high school science teachers and provide additional coping strategies.
Investigating Factors Impacting Commitment and Retention of Mid and Late Career High School Science Teachers in North Carolina

by
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DEDICATION

To my family. To John and Elaine, and those whose memories we hold, who encouraged me to embark on this intellectual journey in my educational career and who have cheered and supported me to its fulfillment.
BIOGRAPHY

Dorothy Elaine Talley Holley was born in Knightdale, North Carolina, attending Wake County Public schools - Carver Elementary, Knightdale Elementary, Whitley Middle, and East Wake High. She took an advanced math course at NCSU the summer of her junior year to make room in her senior year schedule for extra science courses. Upon graduation, she attended Wake Forest University where she earned a B.A. in Chemistry and minor in Religion, and she then continued her education entering a teacher certification (licensure) program at the University of North Carolina at Chapel Hill. In the process of earning her certification, she student taught at Hillside High School in Durham. Upon completion of this assignment, she became the sole middle and high school science teacher (and junior-senior prom sponsor) of Flora Macdonald Academy, a small, private school in Red Springs, NC, and finished certification coursework at the University of North Carolina at Pembroke. Ms. Holley taught at Franklinton High School and Leesville Road Middle School before returning to teach at her high school alma mater, East Wake. She married John Holley, Jr. and took an extended maternity leave after the birth of their son. She was recruited and taught at Leesville Road High School until the birth of their daughter, upon which she temporarily left her high school students, taking on new roles of science supporter, class parent, and Science Olympiad Sponsor at her children’s schools. Ms. Holley returned to the East Wake campus for the second time to teach at East Wake School of Integrated Technology, a small school redesign. After teaching seven different science courses in two different platforms, under five different principals in seven years, she left her alma mater for the stability of teaching only chemistry at Clayton High School. While there, Ms. Holley earned a M.S. in Environmental Education from Montreat College and later transitioned to another high school in Johnston County. Her first day at West Johnston High School was March 16, 2020, the first day of remote
learning due to the pandemic. Upon completion of her doctoral degree, she will continue to search for ways to educate and collaborate for quality science teaching and learning, examining ways to better empower educators to experience fulfillment in their chosen career.
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I come from a long line of people who value the development of becoming an educated person and have taken their role in the process seriously. Impactful and dedicated educators permeate my life and my family tree from my maternal grandmother, who was principal and teacher of a two-room schoolhouse, to a cousin, who, owning the first automobile in the county, gladly drove her students up and down the bumpy farm roads to and from school to countless committed preschool, elementary, middle, and high school teachers, music teachers, Sunday School teachers, career technical teachers, school librarians, orchestra teachers, and university professors. I am thankful for the active role they have played in my life and the ways they have modeled curiosity, generosity, and creativity. I am grateful for many people who have shared this part of the journey with me and without whom this dissertation would not be possible.

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CHAPTER ONE

INTRODUCTION

“Teachers are the school system's most valuable resource.” ~Tom Benton, Former School Board member in a North Carolina Public School System

Importance of Public Education

American Education reformer Horace Mann described the importance of education in a free society. He stated that the goal of education is to “inculcate democratic idealism” and ensure the unity of the nation (Mann, 1868). Education was seen by Mann as a way to help citizens learn and think independently so that they might be productive members of a free society. No republic, he argued, could endure unless its citizens were literate and educated (Mann, 1868). To that end, all levels of government spend a substantial portion of their budgets on public education. Federal, state, and local tax dollars fund public schools so that our children may learn. In turn, schools spend the majority of their resources to train and equip teachers. The quality of the classroom teacher has been linked to quality student outcomes such as higher achievement, higher earnings, and better health (Darling-Hammond, 2000; Hattie, 2012; Johnston, 2020). The Alliance for Excellent Education (2008) found that the caliber of the classroom teacher is the single most important factor in determining a student's performance. Specific to science, student achievement is significantly tied to science teachers who are credentialed, prepared, and experienced (Coble, Smith, & Berry, 2009).

While schools work to educate all students equitably, disparities between groups of students exist (Johnson, C. C., 2009; Morgan, Farkas, Hillemeier, & Maczuga, 2016). These “opportunity gaps” are identified by their consistency and persistence across school settings. School reform efforts are aimed at identifying and closing these gaps (Morgan et al., 2016). Considerable research attention has been focused on understanding and closing the gap between
white and minority students, between male and female students, and between higher income and lower income households and communities.

**Teacher Turnover**

When teachers who have been prepared and equipped for their job leave their school, it is called attrition (Borman & Dowling, 2008). New teachers for those jobs must now be recruited and supported in their new jobs. On the national level, expenses incurred to onboard new teachers are upwards of $7.34 billion annually (Alliance for Excellent Education, 2008). This figure does not include the hard to measure costs of lost human capital, institutional knowledge, and diminished potential in academic achievement (Alliance for Excellent Education, 2008; Shen, 1997; Simon & Johnson, 2015).

When there are not enough new teachers in the labor pool to replace those who leave, there is a shortage (Ingersoll, Richard M., 2002). Teacher shortages were predicted in the 1980s due to increasing student enrollment and retirement of the baby boomers (Ingersoll, 2002). Ingersoll (2001) has posited that policy initiatives aimed solely at recruiting new teachers to the profession do not adequately address teacher shortages because of the high numbers of teachers who leave the profession before retirement. Turnover, teacher shortages combined with high rates of attrition, has been an increasing problem in United States public schools for the last three decades (Ingersoll, Richard M., 2001; Simon & Johnson, 2015) but is seen all over the world (Özoglu, 2015). Specific to this study, science teacher turnover has mirrored the turnover rates of all teachers based on data from the nationally representative Schools and Staffing Survey and the Teacher Follow-Up Survey (Ingersoll, Richard & May, 2012).

Teacher turnover impacts schools differently. Underserved schools, often high-poverty and high-minority, are found to be the hardest to staff (Southeast Center for Teaching Quality,
Schools that struggle with filling vacancies also struggle with retaining teachers (Simon & Johnson, 2015). Underserved schools spend on average of 50% more than their more affluent counterparts in hiring and equipping new teachers each year (Alliance for Excellent Education, 2008). Filling large numbers of vacancies, underserved schools tend to conduct mass hiring of teachers who might not be the best fit for the school. When these teachers leave, the instability cycle is perpetuated (Simon & Johnson, 2015), what Ingersoll (2001) described as a “revolving door.” Large numbers of teachers leave their jobs for reasons other than retirement, with underserved schools hiring less experienced teachers and other schools recruiting more experienced teachers to fill vacancies (Ingersoll, 2001).

Examining teacher mobility patterns can help school leaders to understand how to reduce teacher attrition and increase teacher retention. “Movers” are teachers who move to a different school (often one more affluent) but continue teaching; “leavers” are teachers who leave the profession; “stayers” are teachers who stay in the same school but are impacted by attrition when movers and leavers exit their schools (National Center for Education Statistics, [NCES], 1991).

The purpose of this study is to examine factors that contribute to high school science teacher commitment. Understanding how these factors can support mid and late career teachers is important to retaining experienced teachers and increasing student achievement and learning outcomes. This study examines science teacher movers and stayers.

Underserved schools are already disadvantaged as students face many economic hardships (Simon & Johnson, 2015). Teacher turnover further diverts the resources needed to replace them and undermines the learning process for students (Ronfeldt, Loeb, & Wyckoff, 2013). Additional burdens associated with higher rates of teacher turnover include: a disproportionate number of novice teachers, disruption to coursework, disruption to efforts to
stabilize family relationships with the education community, and a depletion of human capital to effectively mentor new teachers (Johnson, S. M., Kraft, & Papay, 2012); (Meister & Ahrens, 2011); (Roberts, 2016); Simon & Johnson, 2015). Teacher turnover is the largest contributor to the problem many schools face in staffing their classrooms with qualified science teachers (Ingersoll, Richard, Merrill, & May, 2014). The loss of human capital, institutional knowledge, expertise in science teaching and academic achievement resulting from teacher turnover exacerbates opportunity gaps in underserved schools.

Studies have reported that up to 50% of beginning teachers leave the profession within the first five years (Darling-Hammond, 2000; Ingersoll, 2001). Teachers with an undergraduate degree in science or math are almost twice as likely to leave as those in other content areas (Borman & Dowling, 2008). Darling-Hammond (2000) describes a U-shaped plot of teacher attrition against age or experience, where the highest attrition is among beginning and late career teachers. Much research has been done to address beginning teacher retention and success of mentor and induction programs (Patterson, Roehrig, & Luft, 2003; Redding & Henry, 2019; Shen, 1997). Research is lacking on retention of mid and late career teachers, those who have already survived many of the novice teacher challenges. Understanding mid and late career science teacher retention can help schools reduce teacher turnover and improve achievement and opportunity for all students.

Factors Contributing to Teacher Retention

Data collected from the North Carolina Teacher Working Conditions Survey (TWCS) have consistently demonstrated a link between teaching conditions and both teaching retention and student achievement (New Teacher Center, 2016). The North Carolina TWCS is given biannually to NC public school teachers in an effort to quantify teacher perceptions of factors in
the schools in which they teach (New Teacher Center, 2016). Built on large-scale empirical studies connecting teacher retention with teaching conditions, the North Carolina TWCS solicits teacher perceptions of eight teaching conditions such as administrative support (Boyd et al., 2011), school facilities (Loeb, Darling-Hammond, & Luczak, 2005), and salaries (Geiger & Pivovarova, 2018). Although teacher working conditions have been positively correlated with teacher mobility decisions, a deeper understanding of these decisions is warranted as even schools with high TWCS scores experience issues with teacher retention.

Teacher commitment to teaching has been used to describe teachers’ mobility decisions (Chesnut, Steven Randall & Burley, 2015). Chesnut and Cullen (2014) define commitment as the psychological bond of attachment and identification to the role, occupation, or institution of teaching. When teachers feel a level of commitment, they are more motivated to continue in the field (Chesnut, Steven R. & Cullen, 2014) and choose to stay in the profession.

Teacher commitment has been tied to teacher efficacy (Klassen & Chiu, 2010; Skaalvik & Skaalvik, 2007; Ware & Kitsantas, 2007). For example, Ware and Kitsantas (2007) used large scale School and Staffing Survey data to develop valid and reliable scales to predict teacher professional commitment based on the teachers’ perceptions of their teaching. Teacher efficacy in enlisting administration support, influencing policies at their school, and controlling classroom management was related significantly to teacher commitment (Ware & Kitsantas, 2007).

Self-efficacy is a behavioral construct centered on the understanding that teachers develop specific beliefs about their own abilities (Bandura, 1977; Bandura, 1986). Self-efficacy increases when science teachers help students understand science concepts, answer students’ science questions, and continually find better ways to teach science (Riggs & Enochs, 1990). Teachers with high efficacy have students with higher achievement (Wang, Tan, Li, Tan, & Lim,
2017). Science teachers’ beliefs about their ability to teach science have been linked to their personal teaching ideas and their expected outcome of the students in their classrooms (Riggs & Enochs, 1990).

More research with a larger effect size is needed to more fully examine whether self-efficacy is a predictor of commitment to the teaching profession. A meta-analysis of self-efficacy as a predictor of commitment to the teaching profession (Chesnut & Burley, 2015) examined 33 studies conducted since 1980. Of the 19 studies representing inservice teachers, six were studies conducted in North America. The authors determined inclusion criteria for self-efficacy studies was specific, and conceptually accurate only when reflecting what a respondent can do (Chesnut & Burley, 2015). Inclusion criteria for commitment studies was general, being commitment to the teaching profession, but could be described as commitment, intention, retention, burnout, attrition, or turnover (Chesnut & Burley, 2015). As teaching is very context specific (Bandura, 1986; Riggs & Enochs, 1990), a more nuanced understanding of commitment is needed. For instance, North Carolina and others are “right to work” states, without teacher unions or a presence of collective bargaining power. Accordingly, organizational commitment might not adequately explain teachers’ persistence in the profession. The current study will operationalize commitment in four ways – commitment to students, commitment to teaching, commitment to school, and commitment to the profession specifically examining mid and late career high school science teachers’ perceptions. Understanding the relationship between self-efficacy and teacher commitment as well as the impact of personal factors, environmental factors, and coping strategies will help us better understand and support high school science teacher retention.
Deficit-Based vs Asset-Based Approach to Teacher Retention

Traditional research studies supporting school effectiveness have followed the traditional dominant culture deficit-based approach (Bourdieu, 1986). Deficit-based perspectives seek to change behaviors instead of building on funds of knowledge. Deficit-based approach perspectives can perpetuate misunderstandings about teaching and what it means to be in the classroom. For teacher retention, the deficit-based approach reports factors or incidents that have lowered motivation or decreased teachers’ persistence in the field (Borman & Dowling, 2008; Guarino, Santibañez, & Daley, 2006). The deficit-based approach is not appropriate for pre-service or beginning teachers who do not yet have experiences upon which to draw. More importantly, the deficit-based approach assumes that reducing the factors that deter teachers will ultimately increase teacher retention. As the teaching workforce has become more diverse, approaching teacher retention through an additive perspective can be key in developing mutually beneficial relationships amongst all stakeholders – administration, parents, students, community, and teachers.

Shifting away from a deficit-based approach toward an asset-based approach to teacher retention must be intentional. Few asset-based studies have been seen in the literature (Battle & Looney, 2014; Wong & Luft, 2015). Teachers’ perspectives and specific experiences are at the heart of these studies. For example, Wong and Luft (2015) conducted a five-year mixed methods study examining the perceptions of 35 beginning secondary science teachers to explore teacher persistence in the field. These studies help to organize meaningful support systems that are reflective of teachers’ needs, their communities of practice, their lived experiences, and their cultural practices. This approach has the potential to empower teachers and improve teacher retention efforts. As teachers have chosen a career of teaching, a better approach would be one
that builds on their strengths. This asset-based approach seeks to identify factors that actually support teachers to persist. An additive lens is used to inform teacher educators and policy researchers about factors and coping strategies that can help teachers persist. My study adds to the asset-based perspective of teacher retention, eliciting perspectives from mid and late career high school science teachers who are still teaching.

**Purpose of the Study**

Teacher retention and attrition has been widely studied, but research specific to experienced high school science teachers is needed. If teachers are confident in themselves, they might be more likely to stay teaching during times of stress. Understanding the relationship between self-efficacy and commitment to students, teaching, school, and the profession, especially for high school science teachers, will help better support teachers. Examining factors that encourage teachers to stay in the profession as well as coping strategies used to confront challenges and times when they consider leaving the profession can improve science teacher retention and high-quality teaching and learning. The purpose of my study is to examine the relationship of self-efficacy to the commitment to students, to teaching, to school, and to the profession of mid and late career high school science teachers in North Carolina. In addition, this study aims to explore factors and coping strategies that contribute to their persistence. This study will investigate factors impacting commitment and retention, employing Bandura’s (1986) Social Cognitive Theory as a theoretical framework. Research questions that will guide this study are:

1. How does mid and late career high school science teachers’ self-efficacy relate to their commitment to students, teaching, school, and the profession?

2. What personal, environmental, and behavioral factors contribute to high school science teachers’ intention to stay in the teaching profession?
3. What coping strategies do mid and late career science teachers use to confront challenges and times when they consider leaving the teaching profession?

**Significance of the Study**

Teacher salaries represent the largest part of the budget for each level of education (Alliance for Excellent Education, 2008). It is financially responsible to spend this money wisely. School systems benefit when teachers stay because they do not have to allocate funds for large numbers of new teachers each year and can divert more resources to instruction (Carver-Thomas & Darling-Hammond, 2019). School systems able to retain their teachers are more stable, have better programs, and are categorically more effective (Johnson et al., 2012; Ronfeldt, Loeb, & Wyckoff, 2013) than schools with more difficulty keeping teachers. Other teachers in the school are more effective when they are surrounded by experienced teachers (Ronfeldt et al., 2013). Finally, and most importantly, students learn more from experienced teachers (Coble, Smith & Berry, 2009; Simon & Johnson, 2015). Retaining experienced teachers increases the financial resources, institutional knowledge, and academic achievement of the schools in which they teach (Darling-Hammond, 2000; Johnson, Andrew P., 2012; Macdonald, 1999; Ronfeldt et al., 2013).

Teacher turnover exacerbates “opportunity gaps” in underserved schools (Carver-Thomas & Darling-Hammond, 2019) and is especially troublesome for science and math fields (Ingersoll & May, 2012). Many studies have focused on retaining beginning teachers. There is a gap in the literature examining why mid and late career science teachers chose to leave their school or leave the teaching profession.

This study will contribute to the asset-based perspective of teacher retention by soliciting the perceptions of teachers who are still teaching. Previous studies have focused on the
relationship between self-efficacy and organizational commitment. This study explores the relationship between self-efficacy and commitment to students, to teaching, to school, and to the profession while controlling for teacher and school characteristics. In addition, in this study, I examine factors that encourage teachers to stay in the profession as well as coping strategies used to confront challenges and times when they consider leaving the profession.

This is one of few studies that deals with mid and late career teachers. Being able to understand and support mid and late career science teachers will allow teacher educators and policy makers to make more informed decisions to support mid and late career science teachers. Retaining experienced teachers will increase student achievement and learning outcomes for all students.

**Summary**

Public education is the bedrock of a free society. Students are impacted in negative ways when experienced teachers leave the school in which they are teaching. Students in underserved schools are impacted disproportionally when teachers leave. This study will examine the relationship of self-efficacy to the commitment of mid and late career high school science teachers in North Carolina. In addition, this study aims to explore factors that contribute to their retention as well as strategies and coping strategies used with challenges that lead them to consider leaving the teaching profession.

Chapter 2, the Literature Review, begins with an exploration of the theoretical frameworks followed by an examination of teacher quality and the factors that impact teacher turnover seen in the literature. Additional sections in Chapter 2 include exploration of self-efficacy and commitment factors. Chapter 3, the Methods section, describes the procedures and
analysis used in this study and included limitations. Chapter 4 provides the results of this study and Chapter 5 summarizes these results through discussion, implications, and policy suggestions.
CHAPTER TWO
LITERATURE REVIEW

This Literature Review begins with an exploration of the theoretical frameworks used to guide this study. An examination of teacher quality and how teacher turnover impacts school equity is followed by the attributes of teacher experience and the context of North Carolina educational policy. After discussing the asset-based approach to teacher retention used in this study, demographic and other factors that impact teacher decisions seen in the literature are presented. Final sections discuss teacher commitment and self-efficacy.

Theoretical Frameworks

The theoretical framework guiding this study is Bandura’s (1986) Social Cognitive Theory. Social Cognitive Theory explains how a teacher’s personal factors, environmental factors, and behavioral factors work together to impact the teacher’s level of job commitment. Furthermore, Transition Theory (Schlossberg, Nancy K., 1995) frames the ways these factors are internalized by teachers during critical incidents of the school year.

Bandura’s (1986) Social Cognitive Theory (SCT)

Bandura’s (1986) Social Cognitive Theory (SCT) suggests teacher persistence can be explained by the interplay of personal factors with environmental as well as behavioral factors as they impact teachers’ decisions to remain in the classroom. Autonomy, relatedness, and competency are personal factors representing the teacher’s internal outlook. Institutional and sociocultural influences are external factors determined by the teacher’s environment. Self-efficacy is a behavioral construct describing the teacher’s belief in his/her ability. Personal, environmental, and behavioral factors are interrelated and individually impact teacher commitment as illustrated in Figure 2.1.
**Personal Factors of Bandura’s (1986) Social Cognitive Theory**

Teachers are impacted by their interacting cognition, attitudes, and beliefs (Bandura, 1986). These personal factors include autonomy, relatedness, and competence.

**Autonomy.** A teacher’s need for autonomy refers to the teacher’s perception of being the sources of his/her own behavior. Studies exploring autonomy often depict some aspect of independence such as having a measure of control over their actions and input into decisions that affect their jobs (McConnell, 2017). The need to make decisions in their own classrooms concerning curriculum, behaviors, teaching, and learning expectations is rooted in the need to make those decisions as they are aligned with their personal teaching philosophies. For example, (Ryan, R. M. & Deci, 2000) found the need to be autonomous in making policy decisions that impact how the school runs stems from the need to represent their own core values.

**Relatedness.** Research describes relatedness as an ease of cooperation, collaboration interdependence, and collegiality (Darling-Hammond, 2000). Teachers satisfy their need for relatedness when they plan and coordinate lessons with colleagues. Positive colleague
interactions build instructional capital and contribute to teacher satisfaction (Simon & Johnson, 2015). Students who cooperate with lessons, show respect for classroom boundaries, and meet behavioral expectations also satisfy a teacher’s need for relatedness. Parents, guardians, and community stakeholders such as local businesses, government agencies, and civic organizations who partner with teachers to support student learning contribute to teacher relatedness. Examples of interdependence include volunteering for school functions and making donations such as financial contributions or household items to use during science lab activities.

A teacher’s need for relatedness refers to the teacher’s sense of belonging with other individuals, with the school as a whole, and a connection to the teaching profession itself. Teachers may relate personally to other professionals in the building, students, parents, and the community surrounding the school in which they work (Darling-Hammond, 2000; Olsen & Huang, 2018). Teachers at all schools are impacted by interactions (Simon & Johnson, 2015). When colleagues leave, other teachers tend to follow (Meister & Ahrens, 2011; Ronfeldt et al., 2013; Simon and Johnson, 2015). Positive colleague interactions build instructional capital and contribute to teacher satisfaction (Simon & Johnson, 2015). Mid and late career teachers who are continuing to develop teaching strategies rely on peers and community partners (Wong & Luft, 2015). (Moller, Childs-Bowen, Scrivner, & SERVE: SouthEastern Regional Vision, for Education, 2001) posit the importance of colleague interaction in school and district learning communities with teacher leaders.

**Competence.** A teacher’s need for competence refers to the teacher’s feeling of effectiveness in his/her interactions. Opportunities to interact and demonstrate effectiveness build competence. Competence is not a skill to be attained, but rather a feeling to be continually developed throughout a teaching career (Bandura, 1986). The desire to quantify competence has
tied it to standardized scores including student test scores and teacher licensing exam scores (Dworkin, 2009; Ronfeldt et al., 2013).

**Environmental Factors of Bandura’s (1986) Social Cognitive Theory**

Teachers are impacted by the structures in the education system that guide schools in which teachers work. Structures determined mainly at the district level, called institutional factors, establish the rules, norms, and behaviors of the school system. Structures determined mainly at the local school level, referred to as sociocultural factors, include rules, norms and behaviors followed by the personnel at the school. How teachers experience their environments influences their personal and behavioral beliefs (Bandura, 1986).

**Institutional.** Institutional factors include Salary, Facilities, Resources, Workload/Time, and Out of Field (OOF) teaching. Salary, or compensation paid for the job of teaching, includes benefits and the larger picture of how raises and bonuses are distributed. Facility refers to the physical space accessible for teachers to teach and for students to learn. Facilities include classrooms, laboratories, storage space as well as the spaces students utilize such as the cafeteria, auditorium, and outside areas. Unique to science teaching, access to electric outlets, lab tables, burners, hotplates, fume hoods, faucets and sinks is important to science teachers. Resources are items that are freely available to teachers for use or consumption in order to fulfill their job of teaching science. Examples of the many kinds of resources include financial resources often allocated in school budgets for science are equipment and supplies, technology, textbooks, curriculum, consumables, office supplies, and copy machines. Science teachers often spend personal resources in order to teach their subject. Workload/Time encompasses all the responsibilities of the teacher to fulfill his/her job requirements. Workload may be heightened if the teacher has multiple subjects to teach during the year. Other mitigating factors include school
duty responsibilities, meetings with students, parents, colleagues and administration, extracurricular clubs, departmental responsibilities, and paperwork, including legal paperwork for special population students. Unique to science teaching, time is needed for laboratory preparation in their classrooms. Finally, out of field (OOF) teaching involves the responsibility of teaching a subject the teacher has had no formal training or preparation to teach. This means the teacher did not take classes to major or minor in the subject, nor did the teacher do any student teaching in the subject. Ingersoll (2001) posited that principals often choose to misassign teachers as a way to save schools money in the short term, but the long-term consequences of staffing science classes without fully qualified teachers include decreased student achievement (Ingersoll, 2001; (Nixon, Luft, & Ross, 2017). The institutional factors of salary, facilities, resources, workload/time and OOF, determined mainly at the district level, are generally referred to as the teacher’s working conditions. Previous research has suggested improving teacher working conditions (TWC) as a way to prevent teacher attrition (Geiger & Pivovarova, 2018; New Teacher Center, 2016) and will be discussed later in this chapter.

**Sociocultural.** Sociocultural factors are the social and cultural interactions among members of the local school including school climate, administrative support, professional development and enforced instructional practices. School climate is the environment of the school beyond the physical space. It encapsulates the culture of accountability, how the school is run, and what is acceptable behavior for all members. School climate is described by student behaviors and misbehaviors, tardiness, and attendance, who is responsible for enforcing the rules, and the overarching perception of a positive school environment. Administrative support describes how the school leadership interfaces with the faculty, including communication, trust, and encouragement. Teachers express feeling supported when the principal “has my back.”
Professional development (PD) is the growth mechanism in schools for teachers to learn new pedagogy and new content knowledge. PD can be focused according to school level, departmental, or subject specific needs. Finally, enforced instructional practices include school-wide initiatives to promote learning in the context of the local school. For example, standards-based grading or project-based learning practices have been used by some schools as ways to promote school reform efforts. Science teachers might be unique perspectives on certain initiatives as being sound pedagogies for teaching science. The sociocultural factors of school climate, administrative support, PD, and enforced instructional practices as determined at the local school educational level can impact teachers’ decisions to remain teaching.

**Behavioral Factors of Bandura’s (1986) Social Cognitive Theory**

Teachers are impacted by their own behaviors as they do the work of education. Self-efficacy is a construct of behavior centered on the belief about a person’s own ability to perform in a certain capacity (Bandura, 1986). Self-efficacy can be increased when science teachers help students understand science concepts, answer students’ science questions, and continually find better ways to teach science (Riggs & Enochs, 1990).

**Self-efficacy.** Self-efficacy is a behavioral construct centered on the understanding that teachers develop specific beliefs about their own abilities (Bandura, 1986, 1977). Teachers develop generalized expectancy based on life experiences, increasing when they help students understand concepts, answer students’ questions, and finding better ways to teach (Riggs & Enochs, 1990). Those who have been teaching longer have had more opportunities to develop higher levels of self-efficacy, developing specific beliefs concerning their own coping capabilities. Higher levels of efficacy demonstrate more enthusiasm, more student-centered pedagogies, and more flexibility for teachers (Utley, Moseley, & Bryant, 2005). Teachers’ self-
efficacy has been correlated with student achievement (Bandura, 1995). Education research has reported that teaching experiences contribute to teachers’ self-efficacy development, leading to a focus of pre-service and beginning teacher research (Bandura, 1989; Chesnut, Steven R. & Cullen, 2014; Mostofo, 2013).

Teacher efficacy belief consists of two constructs: personal teaching beliefs of the teacher and expected outcome for the students in their classrooms (Bandura, 1986; Riggs & Enochs, 1990). Personal teaching beliefs are subject-specific. For example, elementary teachers who teach all subjects will have different personal teaching beliefs across subject areas. Wilhelm and Berebitsky (2019) found that experience, subject area, and course load influence teachers’ efficacy beliefs. The second construct, outcome expectancy, describes the belief that effective teaching will result in positive learning outcomes for students (Bandura, 1986). Riggs and Enochs (1990) developed the Science Teaching Efficacy Belief Instrument (STEBI) used in this study (Deehan, 2017; Riggs & Enochs, 1990). Personal teaching beliefs and outcome expectancy are interrelated and conceptually different (Bandura, 1986).

Understanding the subject-specific and outcome expectancy teaching efficacy of experienced science teachers can help support and retain mid and late career teachers. Bandura’s (1986) Social Cognitive Theory (SCT) guides this study by providing the framework to examine the relationship between teachers’ science teaching efficacy belief and outcome expectancy with their teacher commitment. Understanding what personal environmental, and behavioral factors contribute in positive and negative ways to high school science teachers’ intention to continue teaching can also help support and retain them. SCT provides the framework to examine the interplay of factors and how they might individually and collectively impact teacher retention.
Schlossberg’s (1995) Transition Theory

The second theoretical framework guiding this study was developed by transition theorist Nancy Schlossberg. Transition Theory (Schlossberg, 1995) further explains how normal transition events in a teacher’s routine job might impact the teacher’s decision to remain in the profession. Schlossberg describes a transition as “any event, or non-event, resulting in changed relationships, routines, assumptions, and roles” (Schlossberg, 1995, p. 27). During a normal school year, teachers experience frequent transitions as classes, personnel, and resources have hard start and end dates. At the beginning of the school year, teachers will experience different students, and the opportunity for new class loads, school duties, and colleagues. During the school day, classes transition from one time period to another. Teachers experience heightened changes in expectations and roles at the ends of marking periods as well as big school events and holiday breaks. The end of the traditional school year also brings a transition period, accentuated by the necessity of signing a new contract due to the elimination of tenure status for North Carolina teachers. Mid and late career teachers are likely to experience unique transitions due to their aging families. A transition can be a critical incident, resulting in a decision to take a different approach or a new direction (Hanuscin, 2013).

Critical incidents describe specific points in time which cause the teacher to reflect and interpret a situation. They arise in practice and can be a positive or negative experience (Hanuscin, 2013; Shapira-Lishchinsky, 2011). “Growth in the knowledge for teaching (self-efficacy) comes about when reflection on critical incidents involve challenges and critique of the teachers’ self and professional values, which in turn can lead to changes in practice” (Hanuscin, 2013, p 937). Critical incidents can reinforce teachers’ decisions to become a teacher or act as catalysis for attrition (Skaalvik & Skaalvik, 2015).
Schlossberg (1995) uses the broader term trigger to describe events or non-events that might culminate in a transition. This study will report triggers, factors that make teachers consider leaving, and critical incidents, fuller descriptions of the coping strategies and resources used by teachers.

Transition theory (Schlossberg, 1995) describes how teachers move in, move through, and move out of transitions (Anderson, 2011). The 4-S system of potential resources a teacher might utilize during and after a transition include support, situation, self, and strategies (Anderson, 2011). Figure 2.2 illustrates Schlossberg’s (1995) Transition Theory. A trigger that might influence a teacher to otherwise leave the profession can be moderated by a teachers’ access to strategies. Teachers who have been teaching longer will have more strategies from which to draw (Pearlin & Schooler, 1978; Schlossberg, Nancy K., 1995). Pearlin and Schooler (1978) describe effective coping as being able to access a range of strategies, regardless of the frequency of individual strategy use. This study explores qualitatively with open ended survey questions the strategies teachers perceive they use to help them persist in the profession during transitions.

**Figure 2.2**

*Transition Theory (Schlossberg, 1995)*
Transition Theory guides this study by framing the critical incidents of mid and late career science teachers in the second and third research questions, what personal, environmental, and behavioral factors contribute to high school science teachers’ intention to stay in the teaching profession and what coping strategies do mid and late career science teachers use to confront challenges and times when they consider leaving the profession. Understanding the impact of critical incidents of experienced science teachers can help support and retain them. Transition Theory helps explain the triggers and the coping strategies that mid and late career science teachers use to confront challenges and times when they consider leaving the teaching profession.

**Teacher Quality**

The quality of the classroom teacher has been linked to student outcomes such as higher achievement, higher earnings, more classroom engagement, and better health (Alliance for Excellent Education, 2008; Chesnut, Steven R. & Cullen, 2014; Darling-Hammond, 2000; Johnston, 2020; Stronge, Ward, & Grant, 2011; Zhang & Zeller, 2016). A report by the Alliance for Excellent Education (2008) states the quality of the classroom teacher is the single most important factor in determining a student's performance. Chetty, Friedman, and Rockoff (2012) and Hanushek, Kain, and Rivkin (2002) linked teacher quality to student learning gains with highly effective teachers contributing significant dollar amounts to student future earnings. The influence of first-rate teaching on student success goes beyond academic performance and income. Students with teachers rated high quality have even been reported to have lower teenage fertility and greater health (Johnston, 2020). Empirical evidence has consistently demonstrated that students do better when they have high quality teachers, it is in the best interest of students
to have high quality teachers teaching them (Chetty, Friedman, & Rockoff, 2012; Hanushek, Kain, & Rivkin, 2002).

**Teacher Turnover Impacts Teacher Quality**

Experienced teachers are more effective than beginning teachers (Özoğlu, 2015; Simon & Johnson, 2015) and student achievement is positively influenced by the teachers’ level of experience (Coble, Smith & Berry, 2009). But teacher turnover is rampant (Carver-Thomas & Darling-Hammond, 2019; Ingersoll, 2001). Compared to other high-status, high-paying professions, turnover rates for teachers are much higher (Simon & Johnson, 2015). More teachers leave their profession than architects, nurses, lawyers, engineers, and pharmacists (Ingersoll, Richard M., Merrill, Stuckey, & Collins, 2018).

Researchers have examined teacher turnover by focusing on whether or not the teacher simply changed schools (migration) or completely left the profession (attrition). There have been a number of ways teacher movement has been measured. The National Center for Educational Statistics (NCES) in the United States has termed “movers” as teachers who move to a different school, often one more affluent, but continue teaching (Simon & Johnson, 2015). “Leavers” are teachers who leave the profession all together. “Stayers” are teachers who stay in the same school. Stayers are potentially impacted in negative ways by the movement of movers and leavers. This study examines stayers and movers. In this research, those teachers who have changed schools are called movers and those teachers who have remained in the same school throughout their teaching career are referred to as stayers.

Early career teachers, also called novice teachers, leave the teaching profession at high rates. Up to 50% of new teachers leave the profession within the first five years (Darling-Hammond, 2000). Mid-career teachers, those with at least 10 years of experience and are vested
in the educational system, have traditionally been the most stable group of teachers in terms of attrition. Late career teachers who leave teaching exit with some if not full benefits. Mid-career and late career teachers are often referred to as veteran teachers.

Darling-Hammond (2000) describes a U-shaped plot of teacher attrition against age or experience, where the highest attrition is among early career and late career teachers. Much research has been done to address early career teacher retention and success of mentor and induction programs (Patterson, Roehrig, & Luft, 2003; Redding & Henry, 2019; Shen, 1997). Solutions to and implications of early career teacher attrition are well represented in the literature. Faculty mentor, induction programs and targeted pre-service interventions have been shown to increase teacher retention for novice teachers (Freedman & Appleman, 2009; Henry, Fortner, & Bastian, 2012; Johnson, S. M. & Birkeland, 2003). According to Darling-Hammond (2000), late career teachers leave teaching at as high a rate as early career teachers. They retire from teaching, but many do not leave the workforce. Late career teachers who leave teaching take with them at least 20 years of experiences and some, if not full, benefits. Ingersoll, Richard and Perda (2010) posited that school systems should stop spending money on teacher recruitment until issues with teacher retention have been addressed. The analogy is that districts should not pour money into a faucet until the leaks have been fixed (Borman & Dowling 2008; Guarino et al. 2006; Ingersoll & May 2012).

Research is lacking on why mid and late career teachers, who have survived many of the novice teacher challenges, chose to leave the profession and what can be done to stall their departure. My research adds to this literature through an examination of the effects of control and independent variables on teacher commitment, an important predictor of staying or leaving the
profession. I also examine factors that contribute to teacher retention which have implications for policy and efforts to reduce teacher turnover.

**Teacher Turnover Impacts School Equity**

When teachers leave their position, they must be replaced by another teacher. The rate of teacher turnover in United States public schools has been increasing since the 1980s (Ingersoll & Perda, 2010). Teacher shortages occur when vacant positions are not able to be filled in a timely manner. In 2008, the Alliance for Excellent Education reported that 12% of the 3.5 million public school teachers left their school but did not leave the workforce. That is 500 thousand teachers who transferred to another school or left the profession all together. This figure does not include the number of teachers that retired and left their classrooms (Alliance for Excellent Education, 2008). Understanding and preventing teacher attrition will reduce teacher shortages and help students.

Despite efforts to educate all students equally, achievement gaps exist between groups of students (Johnson, C. C., 2009; Morgan et al., 2016). Gaps in achievement translate into gaps in opportunity. In order to close achievement and opportunity gaps, building and maintaining a high-quality workforce is important (Özoglu, 2015; WestEd, Learning Policy Institute, & Friday Institute for Educational Innovation at North Carolina State University, 2019). Since teachers have the primary task of providing the educational experience, it is necessary to understand how to support teachers in order to reduce teacher turnover and subsequent negative effects on students.

Schools experience inequity when faculties have disproportionate numbers of high-quality teachers or, conversely less qualified teachers. High-poverty, high-minority schools are often the hardest to staff (Özoğlu, 2015; Shen, 1997; Simon & Johnson, 2015; Southeast Center
for Teaching Quality, 2001) and are therefore underserved. Only 15% of the teachers in underserved schools are categorized as “expert teachers” (Amrein-Beardsley, 2007). Disproportionate teacher quality exacerbates opportunity gap disparity.

School systems often try to close opportunity gaps with a focus on STEM content. The underlying belief is that achievement in science courses will increase student opportunities in future endeavors. However, science and math are the areas that suffer most from teacher shortage (Ingersoll & Merrill, 2014) and science teachers often struggle with the conflicting goals of constructivist teaching and preparing students for standardized tests (Battle & Looney, 2014). Schools that are trying to raise test scores on high-stakes tests might not be prioritizing quality science pedagogies. For example, a practice aimed at improving standardized test scores could encourage teaching to the test (Ryan, S. V. et al., 2017). Closing achievement gaps in science might require different strategies than closing achievement gaps in other education settings.

**Impact of Mid and Late Career Teachers on Educational Quality**

Experienced teachers are more effective than beginning teachers so schools who retain experienced teachers are categorically more effective (Özoğlu, 2015; Simon & Johnson, 2015). As stated earlier, student achievement is positively influenced by the teachers’ level of experience (WestEd, Learning Policy Institute, & Friday Institute for Educational Innovation at North Carolina State University, 2019). Schools with high percentages of experienced teachers will be more effective than schools with high percentages of beginning teachers.

In addition to student achievement, schools with high teacher retention save financial resources. Separation costs include payouts in sick leave, vacation pay, and administrative costs of documenting files in addition to the onboarding expenses of recruitment, hiring costs, hiring incentives and professional development to train new teachers (Watlington, Shockley,
Guglielmino, & Felsher, 2010). Urban districts spend upwards of $20,000 per teacher (Carver-Thomas & Darling-Hammond, 2019). In 2008, over seven billion dollars in US public funds were spent just in replacing the teachers who left positions to do something different (Alliance for Excellent Education, 2008). Resources spent to train and equip replacement teachers can be spent elsewhere by schools who successfully retain teachers.

A less tangible but more important benefit of teacher retention is directly tied to the instructional capacity of the school (Johnson et al., 2012; Ronfeldt et al., 2013). Courses are stronger and new courses can be created when teaching assignments are built on the strengths and capabilities of teachers in the building. It is easier to coordinate effective student interventions and schoolwide instructional programs with established teachers (Johnson et al., 2012).

Schools with high teacher retention are more stable. Academic courses, school clubs, and enrichment programs can be built and strengthened without the disrupting impact of personnel changes. Relationships between students, teachers, and families are built over time (Meister & Ahrens, 2011; Simon & Johnson, 2015). Families with multiple children build trust in the educational system as each child moves through the school. They know what to expect of teachers, principals, and policies. Teachers are the first point of contact and represent the stability of the education system for the family (Ronfeldt et al., 2013). Family situations in underserved schools are often volatile (Johnson et al., 2012; Simon & Johnson, 2015) and their issues can be exacerbated with high rates of teacher turnover.

Experienced teachers provide human capital and institutional knowledge of the school to effectively mentor new teachers (Meister & Ahrens, 2011; Roberts, 2016; Simon & Johnson, 2015). Mid and late career teachers can more easily acclimate others to the school’s culture –
what works well, where the cafeteria is, even how to operate the copy machine. When teachers leave a school, all of the accumulated knowledge of interacting with the school population is lost. High levels of teacher retention increase levels of trust between colleagues (Ronfeldt et al., 2013).

Retaining mid and late career science teachers could benefit the school by increasing trust and cooperation among the stakeholders. Retaining experienced teachers increases the financial resources, academic achievement, institutional knowledge, discipline expertise, and human capital of the schools in which they teach (Darling-Hammond, 2000; Macdonald, 1999; Ronfeldt, Loeb, & Wyckoff, 2013). Mid and late career teacher retention is not studied as widely. Research is lacking on why mid and late career teachers, who have survived many of the novice teacher challenges, chose to leave the profession and what can be done to stall their departure.

Specific to science, experienced science teachers are a source of science capital (Archer, Dawson, DeWitt, Seakins, & Wong, 2015). They know the science resources that are available, specifically in the school. Experienced science teachers have a working knowledge of what lab equipment has been purchased, how it has been maintained, cleaned, and where it is stored. They have experienced district supports such as lab kit programs or microscope repair rotations. Being more familiar with the science curriculum, experienced science teachers would have valuable insights on how to best scaffold classes while a new teacher would not. Science capital on the school level can improve student access to extra-curricular science clubs and science course participation (Archer et al., 2015).

Retaining experienced teachers will increase student achievement and learning outcomes. Research demonstrates that teacher turnover has a negative impact on student learning,
particularly those students in underserved and rural areas. The current study can inform this problem by increasing understanding in how to support mid and late career high school science teachers.

**North Carolina Context and Factors that Influence Teacher Retention and Commitment**

North Carolina’s constitution mandates the state to provide a free and basic education to every child in the state. In a 1977 landmark decision, Leandro v North Carolina, the Supreme Court of North Carolina found that the state was negligent in providing a sound basic education to the most disadvantaged students. The comprehensive 2019 report compiled jointly by WestEd, the Learning Policy Institute, and the Friday Institute for Educational Innovation at North Carolina State University entitled “Sound Basic Education for All: An action Plan for North Carolina” identified eight critical needs for NC students. One identified critical need, access to a qualified and well-prepared teacher, identified eleven findings and nine recommendations concerning teachers. The report found that experienced, licensed teachers have the lowest annual attrition rates, but did not seek to understand the nature of commitment or how it was developed. Only three of the nine recommendations made in the report go beyond access to the teaching pipeline and support for beginning teachers. The three recommendations - increase compensation, develop professional development, and implement differentiated staffing models such as advanced teaching roles (WestEd, Learning Policy Institute, & Friday Institute for Educational Innovation at North Carolina State University, 2019) – do little to address career teachers’ unique interests or how to support them in their continued role of teacher rather than create new and different administrative or peer mentoring staffing models.

Teacher attrition data provided by the North Carolina Department of Public Instruction describes an increase in teachers who chose to leave the profession or chose to move to a
different school district. In 2016-2017, 8,249 NC teachers, 13.45% of the public-school teaching workforce, left their LEA or left the profession altogether. The largest self-reported reasons include retirement with full benefits (18.7%) family relocation (12.3%) and “unknown reason” (11.16%). As described earlier, attrition is higher in underserved schools. For example, 33% of teachers in the high poverty NC Warren County School district left their job in 2017-2018 while only 4% of teachers left in the affluent NC Macon County School district.

North Carolina was the first state to implement the Teacher Working Conditions Survey (TWCS) with 16 other states following suit (New Teacher Center, 2016). Since 2002, each public-school employee in North Carolina has been required to complete a TWC anonymous survey every two years. The survey itself is a valid and reliable instrument designed to measure educator perceptions. Information is compiled in eight general categories – Time, Facilities and Resources, Community Support and Involvement, Managing Student Conduct, Teacher Leadership, School Leadership, Professional Development, and Instructional Practices and Support – teaching and learning conditions that research has shown increase student learning and teacher retention (North Carolina TWC Survey, 2016). In addition to teaching in an affluent school, working conditions that correlate with low rates of attrition include strong leadership, professional development, and a positive school climate (WestEd, Learning Policy Institute, & Friday Institute for Educational Innovation at North Carolina State University, 2019). When instructional practices are aligned to increase standardized test scores, as is the case in underserved schools where scores are inherently low, North Carolina follows the national trend for having high rates of teacher attrition (Clotfelter, Ladd, Vigdor, & Diaz, 2004; Sutcher, Darling-Hammond, & Carver-Thomas, 2019). The self-reported reason for 25% of teachers leaving the profession in a 2012 national survey was dissatisfaction with student testing and
accountability (WestEd, Learning Policy Institute, & Friday Institute for Educational Innovation at North Carolina State University, 2019).

North Carolina legislatures have sought to address teacher shortfalls through special programs such as Teaching Fellows and alternative licensure (Darling-Hammond, 2000; Zhang & Zeller, 2016). The Teaching Fellows program recruits high school students to commit to pursuing teaching careers in exchange for paying college tuition costs. The program was terminated in 2013 in an effort to save the state money but has been reinstated for hard to staff Special Education or STEM fields. NC Teach, an alternative licensure program, recruits and prepares mid-career professionals to enter teaching through lateral entry certification. Long term results of lateral entry programs such as NC Teach yield discouraging results, with significantly more teachers leaving the profession compared with teachers prepared through traditional college schools of education (Zhang & Zeller, 2016). Research is lacking in how these policies have impacted science teachers in NC.

Professional development has been seen to impact science teachers (Battle & Looney, 2014). In North Carolina, legislated changes have resulted in the elimination of state funds for professional development. Professional learning opportunities across the state vary between schools and districts, not necessarily meeting the standards of high-quality learning which includes content focus, collaboration, and the opportunity over time to develop new practices (Johnson, C. C. & Sondergeld, 2016; WestEd, Learning Policy Institute, & Friday Institute for Educational Innovation at North Carolina State University, 2019).

The data for the current study come from a sample of 147 North Carolina mid and late career science teachers who responded. It is therefore important to consider the findings from this study in the context of the policies of the state. I examine factors that influence teacher
decisions to stay or move and examine research questions focusing on personal, environmental, and behavior factors contributing to staying or moving and subsequent coping strategies. I expect that factors such as emphasis on testing, social class of schools, and commitment to students will be identified in this research.

**Deficit-based vs Asset-based Approach to Teacher Retention**

Constructs such as teacher burnout and teacher job satisfaction or job dissatisfaction have been suggested in the literature as ways to quantify teacher persistence to remain in the profession (Banilower et al., 2018; Johnson, S. M. et al., 2012; Malinen & Savolainen, 2016). Both burnout and job dissatisfaction suggest teachers teach until the negative overpowers the positive, until the teacher “burns out” and loses motivation or becomes dissatisfied enough to leave their chosen profession. Measures such as the Teacher Working Conditions Survey (TWCS) are correlated to attrition, or conditions that might make a teacher want to leave the profession. This deficit-based approach focuses on negative experiences, is not appropriate for pre-service teachers who lack teaching experiences and does little to build support for in service teachers to persist in teaching.

Many studies including Ingersoll (2001) and Bozeman, Scogin, and Stuessy (2013) have correlated high school science teachers’ job satisfaction with teacher retention. Science teachers who are satisfied with their job will continue to teach. This asset-based approach is more appropriate to build understanding and support for teachers’ positive experiences. Similar to an asset-based to teaching, building on teachers’ strengths and career choice is a more desirable approach to examining teacher retention. This asset-based approach seeks to identify factors that actually support teachers to persist. An additive lens is used to inform teacher educators and policy researchers about factors and coping strategies that can help teachers persist. This study
adds to the asset-based perspective of teacher retention, eliciting perspectives from mid and late career high school science teachers who are still teaching.

This study focuses on teacher commitment. Conceptually similar to burnout, commitment to teaching is another lens to understand the motivation to persist, focusing entirely on the positive. Chesnut and Cullen (2014) describe commitment as a psychological bond between an individual and teaching (Chesnut & Cullen, 2014). Teachers’ commitment to professional aspects provides the motivation to continue in the field (Chesnut & Cullen, 2014). This asset-based approach study uses data from teachers who are currently choosing to remain in the field, exploring their perceptions and strategies of factors that help them stay.

**Factors that Impact Teacher Retention**

**Demographic of Teachers, Teaching Assignments and Schools that Impact Retention**

Studies exploring teacher mobility patterns have found mixed results describing demographic characteristics. Categories examined include Teacher Characteristics, Teaching Assignment Characteristics, and School Characteristics. These categories can impact teacher mobility decisions and can impact teacher self-efficacy which in turn can impact teacher mobility or commitment decisions (Borman & Dowling, 2008; Klassen & Chiu, 2010).

**Teacher Characteristics**

Demographic variables found in the literature describe teachers’ gender, age, level of education, career status, and mobility status. Male teachers are more likely to persist in teaching as compared to female teachers (Borman & Dowling, 2008; Guarino et al., 2006). Previous research found that teachers who were older as compared to younger teachers were more likely to stay in their current school (Guarino et al., 2006; Malinen & Savolainen, 2016). Middle-aged teachers are more likely to stay, with younger teachers 171% more likely than middle-aged
teachers to leave in the first five years (Borman & Dowling, 2008). Science teachers with more pedagogical preparation are more likely to stay in the profession than those with less preparation (Ingersoll & May, 2012). Teachers who chose to stay are often less educated, and fewer have advanced degrees or national board certification compared to those who leave (Amrein-Beardsley, 2007; Malinen & Savolainen, 2016; Shen, 1997; Simon & Johnson, 2015). Science and math teachers with advanced degrees have been shown to have greater impact on student achievement than those with only a bachelor’s degree (Goldhaber & Brewer, 1996), yet they are also at a greater risk of pursuing alternative career opportunities. Teachers who are engaged in research or interested in increasing their qualifications through an advanced degree are more likely to leave the classroom and seek out other areas of employment than their counterparts (Struyven & Vanthournout, 2014). Using US 2000 SASS data, Provasmik and Dorfman (2005) found that 16% of the teacher workforce left their school and half were leavers and half were movers.

**Teaching Assignment Characteristics**

Additional demographic variables found in the literature describe the teaching assignment and include years at current school, course continuity, and if the teacher currently teaches an Advanced Placement (AP) course. Teachers with more experience and who teach higher level science courses are less likely to leave their school (Shen, 1997).

Teachers assigned to teach a science discipline for which they do not hold a major or minor are said to be teaching out of field (OOF). Rushton et al. (2014) report that 20.3% of all science teachers are teaching OOF. However, more new career teachers (23.2%) teach OOF than late career teachers (14.5%) (Ingersoll, R., 1999; Soares, Lock, & Foster, 2008). Teachers teach OOF more in rural and urban communities than in suburban communities (Ingersoll et al., 2004).
Science teachers in underserved schools teach more OOF than teachers in more affluent schools (Taylor, Banilower, & Clayton, 2020).

**School Characteristics**

Variables in the literature examining the effects of the teachers’ school examined include school type, community size, and socioeconomic status. Teachers in private schools are more likely to leave teaching than teachers in public schools (Provasnik & Dorfman, 2005). Teachers at urban schools are more likely to leave than teachers at suburban or rural schools (Ingersoll, 2001; Ronfeldt et al., 2013). The region of the US with the highest turnover rates is the South, realizing 16% turnover in cities and suburbs and 14% in rural areas (Carver-Thomas & Darling-Hammond, 2019). Student body demographics of schools with low teacher turnover tend to be low minority and high socioeconomic (Özoğlu, 2015; Shen, 1997; Simon & Johnson, 2015). These schools have fewer English language learners and smaller student to teacher ratios (Amrein-Beardsley, 2007). Socioeconomic status has been measured in the literature through Title 1 status or the percentage of students in the school receiving a free or reduced cost lunch (Carver-Thomas & Darling-Hammond, 2019). Teachers are more likely to leave Title 1 schools than non-Title 1 schools. The turnover rate for science teachers at Title 1 schools is 70% higher than the turnover rate for science teachers at non-Title 1 schools (Carver-Thomas & Darling-Hammond, 2019; Ingersoll, 2001). Small, rural areas tend to have less science teacher turnover (Ingersoll & May, 2012).

There is a dearth of research on demographic factors that might uniquely affect the commitment and stability of mid and late career high school science teachers. Given the importance of retaining mid and late career teachers in their schools and in the profession, it is
important to find out how to best support them. This study explores perceptions of movers and stayers.

**Other Factors that Impact Retention**

Studies exploring the impact of other factors on teacher mobility patterns have also found mixed results. Factors examined in this study follow Bandura’s (1986) Social Cognitive Theory. According to Bandura (1985) teacher persistence can be explained by the interplay of personal, environmental, and behavioral factors as they impact teachers’ mobility decisions. Autonomy, relatedness, and competency are personal factors representing the teacher’s internal outlook. Institutional and sociocultural influences are external factors determined by the teacher’s environment. Self-efficacy is a behavioral construct describing the teacher’s belief in his/her ability. There are several components of each factor as seen in the literature.

**Personal Factor: Autonomy**

Previous research has suggested implementing advanced teaching roles or strengthening the role of teacher-leader as a way to encourage teachers to stay in the profession (Freeman & Fields, 2020; Wenner & Campbell, 2017). A stated goal of these strategies is to keep teachers in the classroom through opportunity and encouragement through actions in mentoring beginning teachers and taking on administrative responsibilities.

**Personal Factor: Relatedness**

Previous research on teacher retention has focused on teacher relationships with other colleagues in the building (Bigler, 2000; Johnson, S. M. et al., 2012; Meister & Ahrens, 2011; Roberts, 2016). For example, Amrein-Beardsley (2007) found that the potential attitude of other teachers would impact the decision of expert teachers to move to an underserved school. Teachers need to know that other teachers in the building are dedicated to their work, especially
when the work will be challenging (Amrein-Beardsley, 2007). Studies have also described teachers as wanting to mentor other teachers (Amrein-Beardsley, 2007; Bigler, 2000; Meister & Ahrens, 2011; Roberts, 2016). Personal relatedness also includes relationships with students and parents. Student behavior, motivation, and discipline, as well as parental involvement, have been correlated to teacher retention (Amrein-Beardsley, 2007; Özoğlu, 2015). Some studies suggest that Collegiality is more important to teacher retention than the Facilities or Resources used to teach (Johnson, Kraft and Papay, 2011; New Teacher Center, 2016).

**Personal Factor: Competency**

As found in the literature, competence is described based on another person’s perception of a teacher’s ability to teach (Ronfeldt et al., 2013). As such, external factors correlated with competence include teacher preparation requirements, path to licensure, and college courses or major. Constructs associated with ability to teach include content knowledge, pedagogical content knowledge (PCK), pedagogical knowledge, and effectiveness. Many studies have reported impacts of stresses resulting from standardized test scores on teacher retention (e.g. Dworkin, 2009; Ingersoll, Richard et al., 2014). Teachers’ perceptions of their own competency rarely rely solely on external metrics and often factor out impacts of school characteristics that are out of their control. For example, in a 2003 study, novice teachers describe their “ability to teach” through school climate rather than student test scores (Johnson, Susan Moore & Birkeland, 2003).

**Environmental Factor: Institutional**

Institutional factors include Salary, Facilities, Resources, Workload/Time, and Out of Field (OOF) teaching and have been the focus of many teacher retention studies. Salary increases have been a constant theme (Ingersoll, Richard M., 2001; Judge, Piccolo, Podsakoff, Shaw, &
Rich, 2010; Kelly, 2004). Many districts structure salary increases on a tiered or step plan based on the number of years of service. Salary increases, signing bonus, promotion and extra benefits have been suggested as ways to attract and keep teachers (Amrein-Beardsley, 2007). For example, the state of Georgia pays teachers a $10,000 signing bonus, added to their base salary, to transfer to an underserved school (Amrein-Beardsley, 2007). North Carolina lawmakers eliminated teacher tenure in 2013 and also eliminated longevity pay for teachers with 10 years of service or more in 2014. Facility quality, especially for science teachers, might be a factor that contributes to teacher retention (Buckley, Schneider, & Shang, 2004; Macdonald, 1999). For example, Buckley (2004) and colleagues found support for school districts decreasing teacher mobility through facility improvements instead of teacher raises. Finally, the prevalence of out of field (OOF) teaching assignments has been linked to teacher attrition (Nixon, Luft & Ross, 2017; Soares, Lock & Foster, 2008). Studies have described teacher difficulties with choosing instructional strategies as well as strained relationships with student motivation, parents, and colleagues when teaching OOF (du Plessis, 2015).

The institutional factors of salary, facilities, resources, workload/time, and OOF, determined mainly at the district level, are considered a part of a teacher’s working conditions. Previous research has suggested improving teacher working conditions as a way to prevent teacher attrition (Geiger & Pivovarova, 2018; New Teacher Center, 2016; North Carolina TWC Survey, 2016).

Environmental Factor: Sociocultural

Sociocultural factors are the social and cultural interactions among members of the local school including school climate, administrative support, professional development, and enforced instructional practices. The communication, trust, and encouragement from school leadership has
bees shown to be an important factor influencing teacher retention in many contexts (Amrein-Beardsley, 2007; Boyd et al., 2011; Vail, 2005). For example, Amrein-Beardsley (2007) found that the single most important factor in encouraging expert teachers to teach in an underserved school is the quality of the principal. The 2016 North Carolina Teacher Working Conditions Survey found that principal support was cited by teachers as the number one factor in determining whether or not they would stay at their current school (North Carolina TWC Survey, 2016). Beginning teachers who reported poor communication relationships with their administrators were less motivated to stay in the profession (Vail, 2005). Boyd (2011) and colleagues reported the greatest influence on retention decisions of first-year teachers and teachers who have recently left teaching was their (negative) perception of their administrators. Factors impacting teacher retention could be different between beginning teachers and those who have chosen to stay. Additional studies specific to how mid and late career science teachers cope with administrators who are poor communicators are needed.

Teacher retention has been positively correlated with school culture components such as teacher empowerment (Shen, 1997; Vail, 2005) and open communication (Gonzales, 2014). In a review of the literature surrounding organizational structure, Gonzales (2014) found that schools with more teacher input had less staff disharmony and less student misbehavior. Vail (2005) also listed communication as a way to create a great school climate. Treating teachers as professionals, supporting teachers, and empowering them with decision making responsibilities are described as ways to improve school culture by increasing teacher morale (Vail, 2005). Some studies conclude that Environmental Sociocultural factors of Administrative Leadership, Support, and School Climate are more important to teacher retention than Environmental
Institutional factors of Facilities and Resources (Johnson, Kraft and Papay, 2011; New Teacher Center, 2016).

**Behavioral Factor: Self-efficacy**

Teachers’ self-efficacy has been correlated with student achievement and teacher commitment (Utley et al., 2005). However, many of the studies have been done with pre-service or beginning teachers (Chesnut & Cullen, 2014). Since self-efficacy is subject specific and can continue to develop through teaching experiences, examining experienced science teachers’ self-efficacy can be helpful to increase student achievement. Research is lacking on how experienced science teachers’ self-efficacy impacts their commitment. My study examines the relationship of self-efficacy to the commitment of mid and late career high school science teachers in North Carolina. In addition, this study aims to explore how teachers describe influences and cope with challenges that lead them to consider leaving the teaching profession. Understanding the relationship of self-efficacy and experience on science teachers’ decisions to remain in the classroom can improve science teacher retention and high-quality teaching and learning.

**Teacher Commitment**

Teacher Commitment describes “the psychological bond that an individual has with teaching, as a role, as an occupation, and as an institution” (Chesnut & Cullen, 2014 pg 3). There are a number of ways Teacher Commitment has been conceptualized and discussed within the teacher research literature. Brown (1996) used the factors ‘focus, terms, and strength’ as being common to all commitments. Whereas ‘strength’ describes the intensity of commitment, and ‘terms’ describes the particular school and defined period of time, a teacher might have several ‘foci’ of attachment (Brown, 1996). (Razak, Darmawan, & Keeves, 2009) proposed possibly five types of teacher commitment foci including commitment to the school, to the student, to the
teaching work, to the profession, and to a body of knowledge, attitudes, and skills. While many studies synthesize commitment under a broad umbrella (Ware & Kitsantas, 2007), in this study I parse out the commitment of teachers to their students, to their school, to their teaching, and to their profession.

Teachers’ commitment to students influences their levels of sensitivity, dedication, and expectation as they manage their students’ learning environment (Chesnut, Steven R. & Cullen, 2014; Dannetta, 2002; Thien & Razak, 2014). Teachers demonstrate commitment to students through sensitivity and awareness of the unique needs of adolescent students, focusing on student learning regardless of academic difficulties and social background, and holding high expectations by introducing new ways of learning while working hard to make classroom activities meaningful (Thien & Razak, 2014).

A second aspect of Teacher Commitment, commitment to teaching, describes the willingness to be meaningfully engaged in the work of teaching (Chapman, 1984; Thien & Razak, 2014). Teachers show a willingness to improve their knowledge basis of subject content, a willingness to engage in positive ways with their working environment, and a willingness to spend extra time and exert extra effort for the sake of their teaching (Thien & Razak, 2014).

Teachers who demonstrate commitment to their schools believe and accept the goals and values of the school (Kushman, 1992). Two manifestations include commitment to the local organization and commitment to their school duties. Teachers express a school specific loyalty by accepting the specific school culture and seeking to promote it (Thien & Razak, 2014). They perform duty assignments as a way of helping the school run.

Commitment to the teaching profession is demonstrated through a willingness to be involved in and to improve the profession (Razak, Darmawan & Keeves, 2009). Teachers
actively participate as members in professional educational organizations and view teaching as a career rather than a job (Thien & Razak, 2014).

Factors that impact teacher retention, discussed earlier, have also been studied as components that impact teacher commitment (Borman & Dowling, 2008; Carver-Thomas & Darling-Hammond, 2019; Guarino et al., 2006). However, one additional factor that directly influences working conditions and school leadership, thus indirectly influencing levels of commitment in many school districts, is the presence of teacher unions (Spaull, 1998). Collective bargaining power and union-based activities designed to equalize on the organizational level can shift teacher foci from school commitment to professional commitment (Razak, Darmawan, & Keeves, 2009). To understand the more individual foci of teacher commitment, a more nuanced context is needed. My study will solicit perspectives from teachers in North Carolina, a “right to work” state that constitutionally does not legally allow teacher unions.

**Teacher Commitment and Teacher Retention**

Teacher commitment has been linked to student commitment and high academic achievement (Bryk & Driscoll, 1988; Park, 2005; Reyes, 1990). Reyes (1990) further identified positive characteristics of committed teachers including better work performance, exerting extra effort, less tardiness, and being less likely to leave the workplace. Teachers who are more committed are more likely to remain in their school or in the profession (Chesnut & Cullen, 2014; Reyes, 1990; Ware & Kitsantas, 2007). My study will evaluate teacher retention by the level of teacher commitment (Chesnut & Cullen, 2014; Ware & Kitsantas, 2007). Understanding different constructs of commitment in teacher retention, especially for high school science teachers, will help better develop teacher commitment and better support teachers (Razak et al., 2009).
Teacher Commitment and Self-efficacy

Previous research has identified a significant correlation between teacher self-efficacy and teacher commitment (Chan, Lau, Nie, Lim, & Hogan, 2008; Coladarci, 1992; Klassen & Chiu, 2010). Teachers with strong self-efficacy beliefs believe they can make a difference in their environment and are more likely to be committed to the profession. Many of the published studies were conducted in areas that had strong teacher unions, perhaps melding together school, organizational, and professional commitment. For example, Coladarci’s (1992) study measured professional commitment of 364 elementary-level teachers in Maine and Chan (2008) and colleagues’ study measured professional commitment of 3,715 teachers in Singapore. Both Maine and Singapore have strong teacher unions. The Netherlands also has active teacher unions. In a more descriptive view of commitment, deJong Moolenaar, Osagie and Phielix (2016) found teacher self-efficacy to be highly correlated to commitment to students and commitment to profession but not highly correlated to commitment to the school in the sample of 114 Dutch teachers. My study extends prior research by examining four constructs of teacher commitment - commitment to teaching, to school, to students, and to the profession - in North Carolina, a “right to work” state.

Teacher commitment has been tied to teacher efficacy in the literature (Klassen & Chiu, 2010; Skaalvik & Skaalvik, 2007; Ware & Kitsantas, 2007). For example, Ware and Kitsantas (2007) used large scale School and Staffing survey data to develop valid and reliable scales to predict teacher commitment based on the teachers’ perceptions of their teaching. Teacher efficacy in enlisting administration support, influencing policies at their school, and controlling classroom management was significantly related to teacher commitment (Ware & Kitsantas, 2007). Many of the studies focused on general teaching efficacy beliefs (Chan et al., 2008;
Coladacci, 1992; deJong, Moolenaar, Osagie, & Phielix, 2016) or pre-service teachers’ efficacy beliefs (Chesnut & Cullen, 2014; Klsasen & Chiu, 2011). Considering that self-efficacy has two conceptually distinct constructs (Bandura, 1986), my study extends prior research by individually examining both constructs of teacher efficacy – personal science teaching efficacy belief and outcome expectancy – in mid and late career science teachers. In this research, I examine the relationship of high school science teacher’s self-efficacy on their commitment to students, commitment to teaching, commitment to school, and commitment to the profession. I further examine personal and environmental factors and as well as the ability of teacher or school characteristics to predict the level of teacher commitment. Understanding the relationship of self-efficacy and experience on science teacher commitment can improve science teacher retention and high-quality teaching and learning.

**Summary**

This chapter synthesized the literature around teacher retention and the major research studies and meta-analyses completed to date. My study will examine factors that contribute to high school science teacher commitment and to explore the relationship between self-efficacy and teacher commitment constructs. Critical incidents, positive and negative, will explore personal, environmental, and behavioral factors that contribute to high school science teachers’ intention to stay in the teaching profession as well as coping strategies utilized when they consider leaving. Chapter 3, Research Methods, will describe the logistics of the study in terms of its design, context, participants, ethical considerations, data collection, instruments, data analysis, and limitations.
CHAPTER THREE

METHODOLOGY

A mixed method study measuring the effects of teacher and school characteristics, as well as teacher self-efficacy on teacher commitment among mid and late career high school science teachers in North Carolina schools was conducted. Teachers responded to qualitative and quantitative questions to answer three research questions: (1) How does mid and late career high school science teachers’ self-efficacy relate to their commitment to students, teaching, school, and the profession?, (2) What personal, environmental and behavioral factors contribute to high school science teachers’ intention to stay in the teaching profession?, and (3) What coping strategies do mid and late career science teachers use to confront challenges and times when they consider leaving the teaching profession?

Research Design

A mixed methods study was done to examine the relationship between self-efficacy and teacher commitment constructs of mid and late career high school science teachers in North Carolina. In addition, this study sought to explore how teachers describe influences and cope with challenges that lead them to consider leaving the teaching profession. A mixed methods approach combined both quantitative and qualitative research techniques into one empirical study in order to develop a more inclusive understanding of an issue and provide additional support for the quantitative findings of the study (Creswell & Plano Clark, 2011; Ivankova, Creswell, & Stick, 2006; R. Burke Johnson & Anthony J. Onwuegbuzie, 2004). This approach is appropriate because a combination of questions could be utilized using pre-identified themes as well as open-ended prompts which gave teachers the opportunity to complete the survey easily with minimal demands on time due to a balance of open and closed-ended questions while
allowing teachers to express their views in a more detailed way. The goal is to provide data that is both quantitative and systematic while simultaneously providing rich detail in order to better understand the role of experience and self-efficacy on science teacher commitment.

**Research Context**

This study explores the role of teacher and school characteristics and self-efficacy in the commitment to teaching in a sample of mid and late career high school science teachers in North Carolina (NC). In addition, this study explores how teachers describe influences and cope with challenges that lead them to consider leaving the teaching profession. Experienced teachers are more effective than beginning teachers, have institutional knowledge of school resources and culture, and provide the human capital to effectively mentor new teachers (Johnson et al., 2012; Ronfeldt et al., 2013; Simon & Johnson, 2015). The state of North Carolina has a historically decreasing investment in teachers. In 1983, NC lawmakers legislated significant educational investments aimed at improving teacher salaries and salary equity. These investments included 1) increasing teacher pay at all levels, 2) creating a career development program increasing pay for teachers with advanced degrees or National Board Certification, 3) incentivizing National Board Certification, 4) beginning a pathway for high school students to matriculate into the teaching field through teacher fellowship scholarships, 5) requiring teacher education programs to be professionally accredited by the accrediting institution National Council for the Accreditation of Teacher Education (NCATE), 6) increasing requirements for licensure for teachers and principals, 7) improving teacher education curriculum with financial resources, 8) creating academies for teacher professional development including NCCAT, North Carolina Center for the Advancement of Teaching, 9) developing teacher development networks, and 10) launching a beginning teacher mentoring program (Darling-Hammond, 2000). Darling-
Hammond (2000) focusing on state standards and reviews of existing research, reported significant increases in reading scores and math achievement levels following these investments, suggesting an increase of teacher sense of belonging to the profession positively correlates with student achievement.

Recently, NC lawmakers rolled back these programs. Legislation passed in 2013 made changes in the career development program including removing teacher tenure, terminating longevity, and eliminating higher pay for advanced degrees. Bonus pay is given to teachers whose students score above a specified level on AP exams. Lawmakers have also legislated specific items such as grading scales and AP exam credits usually left to educational institutions to decide. Increased requirements for teachers have also been relaxed and alternative licensure programs have been expanded as teacher shortages are on the rise (Zhang & Zeller, 2016).

These legislative changes to educational policy in North Carolina set the stage for teacher treatment and subsequent teacher evaluation about their commitment to their profession. The more recent legislative changes remove some of the gains that teachers had made in earlier time periods. Even though I am not directly asking teachers how they view the role of the State in their teaching, these changes have the potential to affect teacher commitment of those who have been in the profession longer and form the context for my research focus on mid and late career science teachers.

Participants

Survey Participants

The survey participants (N=147) were high school science teachers working in the state of North Carolina. Of the 187 teachers who began taking the survey, 147 teachers completed the entire survey. Perceptions of factors that impact the participants’ decisions to remain in the
classroom were measured through an online survey. The online survey link was distributed by
blind copy email to a list of NC high school science teachers. The list was created by accessing
public school district websites, navigating to the high schools listed, and then searching the
teacher directories for science teachers. NC private school science teachers were not easily
identifiable from websites, so a separate email was sent to the head administrator at each private
school asking him/her to forward the survey to the secondary science teachers in their school.
There were 1,484 known potential participants, including 1,312 traditional and magnet public
school teachers, 147 charter public school teachers, and 25 private school teachers or
headmasters. All recipients were encouraged to forward the survey to other high school science
teachers and to answer the survey only once. Since the list of potential participants was compiled
from school websites, it is not a complete list and potentially included teachers who might have
recently left the school or excluded new teachers in North Carolina. There was no way to
determine how many people read the invitation to participate in the study and the response rate
was not able to be calculated because the number of respondents invited to participate is
unknown. After submitting their data, teachers who completed the online survey were taken to a
page where they could give their email address and were emailed a $20 Amazon gift card.
Money for the gift cards came from a Departmental grant. Email address information was not
linked to the survey responses and was not included in the data set. Teachers who indicated they
had less than 10 years of science teaching experience were not given the survey questions as my
research focuses on mid and late career teachers. Survey demographic information is shown in
Table 3.1.
Table 3.1

Survey Teacher and School Demographic Characteristics (N=147)

<table>
<thead>
<tr>
<th>Demographics</th>
<th>Characteristics</th>
<th>Frequency</th>
<th>%</th>
</tr>
</thead>
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<tr>
<td></td>
<td>Female</td>
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<tr>
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<tr>
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<td>40-49</td>
<td>52</td>
<td>35.4</td>
</tr>
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<td></td>
<td>50-59</td>
<td>46</td>
<td>31.3</td>
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<td></td>
<td>60+</td>
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<td>.7</td>
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<td>Pacific Islander or Native Hawaiian</td>
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<td>.7</td>
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<td>Native American, American Indian, or Alaska Native</td>
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<td>.7</td>
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<td>Master’s Degree</td>
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<td></td>
<td>Mover (moved schools at least once)</td>
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<td>Years at Current School</td>
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<td>5-10</td>
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<td>11-20</td>
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<td>21-30</td>
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<td></td>
<td>31+</td>
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<td>.7</td>
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<td>Currently teach AP</td>
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<tr>
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<td>No</td>
<td>83</td>
<td>56.5</td>
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**Table 3.1** (continued).

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<td>Private</td>
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<td></td>
<td>Rural</td>
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<td>Non-Title 1</td>
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<tr>
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<td>25-50%</td>
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<td>50-75%</td>
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<tr>
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<td>75-100%</td>
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</table>

*Note:* Years Teaching (Teaching Career Status) was asked at the beginning of the survey. All other demographic questions were asked at the end of the survey.

**Semi-structured Interview Participants**

The interview participants (n=25) were a subset of the survey participants (N=147). After completing the online survey, teachers were asked if they would be interested in volunteering for an open-ended interview. Volunteering to be interviewed did not result in any additional compensation. Not volunteering to be interviewed did not eliminate the compensation provided for taking the survey. The interviews provided clarity and insight from participants in addition to the information they provided as survey respondents. Interviews were conducted virtually through Zoom. Teachers who completed the interview were mailed another $20 Amazon gift card. Money for the gift cards came from a dissertation support grant. Interview demographic information is shown in Table 3.2.
Table 3.2

Interview Teacher and School Demographic Characteristics (N=25)

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<th>Demographics</th>
<th>Characteristics</th>
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<tbody>
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<td>Teacher Gender</td>
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<td>36.0</td>
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<td>Female</td>
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<td>White / Caucasian</td>
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<td>Licensure Path</td>
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<td>Lateral Entry or Alternative Licensure</td>
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<td>16.0</td>
</tr>
<tr>
<td></td>
<td>Master’s Degree</td>
<td>14</td>
<td>56.0</td>
</tr>
<tr>
<td></td>
<td>Some Doctoral Coursework</td>
<td>3</td>
<td>12.0</td>
</tr>
<tr>
<td></td>
<td>Doctoral Degree</td>
<td>1</td>
<td>4.0</td>
</tr>
<tr>
<td>Teaching Career Status</td>
<td>Mid Career (10-20)</td>
<td>14</td>
<td>56.0</td>
</tr>
<tr>
<td></td>
<td>Late Career (21+)</td>
<td>11</td>
<td>44.0</td>
</tr>
<tr>
<td>Mobility Status</td>
<td>Stayer</td>
<td>4</td>
<td>16.0</td>
</tr>
<tr>
<td></td>
<td>Mover</td>
<td>21</td>
<td>84.0</td>
</tr>
<tr>
<td>Currently teach AP</td>
<td>Yes</td>
<td>9</td>
<td>36.0</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>16</td>
<td>64.0</td>
</tr>
<tr>
<td>School Type</td>
<td>Public Traditional</td>
<td>18</td>
<td>72.0</td>
</tr>
<tr>
<td></td>
<td>Public Magnet</td>
<td>4</td>
<td>16.0</td>
</tr>
<tr>
<td></td>
<td>Public Charter</td>
<td>3</td>
<td>12.0</td>
</tr>
<tr>
<td></td>
<td>Private</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>School Schedule</td>
<td>Semester Block</td>
<td>19</td>
<td>76.0</td>
</tr>
<tr>
<td></td>
<td>A/B Yearlong Block</td>
<td>3</td>
<td>12.0</td>
</tr>
<tr>
<td></td>
<td>Every day Yearlong</td>
<td>3</td>
<td>12.0</td>
</tr>
<tr>
<td>Community Location</td>
<td>Urban</td>
<td>13</td>
<td>52.0</td>
</tr>
<tr>
<td></td>
<td>Suburban</td>
<td>7</td>
<td>28.0</td>
</tr>
<tr>
<td></td>
<td>Rural</td>
<td>5</td>
<td>20.0</td>
</tr>
<tr>
<td>School Title 1 Status</td>
<td>Title 1</td>
<td>4</td>
<td>16.0</td>
</tr>
<tr>
<td></td>
<td>Non-Title 1</td>
<td>17</td>
<td>68.0</td>
</tr>
<tr>
<td>% school free and reduced lunch</td>
<td>0-25%</td>
<td>6</td>
<td>24.0</td>
</tr>
<tr>
<td></td>
<td>25-50%</td>
<td>12</td>
<td>48.0</td>
</tr>
<tr>
<td></td>
<td>50-75%</td>
<td>5</td>
<td>28.0</td>
</tr>
<tr>
<td></td>
<td>75-100%</td>
<td>2</td>
<td>8.0</td>
</tr>
</tbody>
</table>
Ethical Considerations and IRB

Institutional Review Board (IRB) approval was received from North Carolina State University. For the survey, general participant consent was described in the email requesting participation. The email also included the URL to the Qualtrics survey. The teachers were informed that no identifying information would be stored with their survey responses. Teachers provided consent to have their data collected and separate consent to have their data stored and used for future research. Teacher name, the name of their school, and any other personal identifying information was not included in the data set. The consent information is included in Appendix A. The survey questions are included in Appendix B.

For the semi-structured personal interview, additional consent was solicited by email and verbally before the interview. Teachers provided additional consent to have their data collected and separate consent to have their data stored and used for future research. Teacher name, the name of their school, and any other personal identifying information was not included in this data set. The consent information is included Appendix C. The interview questions are included in Appendix D. No identifying information is reported. Personal quotes are used with general respondent characteristics that cannot be linked back to any individual participant. All identifying information will be deleted by the researcher at the end of the study.

Data Collection

Two methods of data collection assisted in bringing validity to the study included survey and interviews. Data were gathered both quantitatively through closed-ended survey questions and qualitatively through open-ended survey questions and with a semi-structured interview given to a subset of the sample. The survey was administered online to facilitate data collection. Follow-up questions were asked through a personal interview in order to clarify quantitative
findings and add depth of understanding to the examination of the research questions. Online survey questions were appropriate because they are cost effective, easily shared with a large audience, allow teachers to answer them on their own time (Malhotra, 2008) and are effective in a social distancing environment. Semi-structure follow-up questions were appropriate because they can elicit responses from a smaller number of participants who have self-selected to give additional explanations.

**Instruments**

One large online survey was administered that consisted of four main parts: Self-efficacy survey (STEBI), Teacher Commitment survey, Teacher Retention Survey, and Demographic questions. To establish credibility and rigor of the survey items, peer debriefing of the survey was conducted with five consultation experts (Rossman & Rallis, 2016). The consultation experts are a faculty member in STEM Education, two doctoral students in STEM Education with secondary science teaching experience, and two current secondary science teachers with more than 10 years teaching experience. The experts gave feedback on the ease of taking the survey and individually concluded that the survey questions could give credible measurements of commitment, self-efficacy, and factors that contribute to their intention to stay in the teaching profession. In addition, peer debriefing of the semi-structured interview questions was conducted to establish credibility and rigor of the semi-structured interview questions (Rossman & Rallis, 2016).

**Self-efficacy Survey (STEBI, Riggs & Enochs, 1990).** Part I contained 25 closed-ended self-efficacy questions examining teachers’ personal science teaching efficacy beliefs and science teaching outcome expectancy. The number of questions for each construct is shown in Table 3.3.
Table 3.3

**Efficacy Items and Descriptions**

<table>
<thead>
<tr>
<th>Dimension</th>
<th># items</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Personal Science Teaching Efficacy Beliefs</td>
<td>13</td>
<td>continually finding better ways to teach; welcome student questions; know the steps necessary to teach science concepts effectively</td>
</tr>
<tr>
<td>Science Teaching Outcome Expectancy</td>
<td>12</td>
<td>teacher responsible for the achievement of students in science; when a student does better it is because the teacher exerted extra effort, when students’ grades improve it is because their teacher found a more effective teaching approach</td>
</tr>
</tbody>
</table>

*Construction.* The 25 self-efficacy questions came from the Science Teaching Efficacy Belief Instrument (STEBI-A), comprised of the Personal Science Efficacy Belief Scale (PSTE) and the Science Teaching Outcome Expectancy Scale (STOE) (Riggs & Enochs, 1990). The items for Overall Self-efficacy and the Personal Science Efficacy Beliefs Scale (PSTE) and the Science Teaching Outcome Expectancy Scale (STOE) were created by recoding the items in the direction of a higher score indicating higher PSTE and STOE. The items were summed to create the Overall Self-efficacy Scale.

*Reliability.* Cronbach’s alphas, a measure that indicates whether a set of survey items measure the same idea, served as the reliability measure for all multi-item concepts. Alphas over .7 are considered to be acceptable (Tavakol & Dennick, 2011). Riggs & Enochs (1990) reported Cronbach alphas for the subscales. The PSTE subscale had a Cronbach Alpha reliability coefficient of .91 and the STOE subscale has a Cronbach Alpha reliability coefficient of .73. Cronbach’s alphas were calculated for each scale and subscale to ensure that the survey items measured the expected constructs. These are reported in Table 3.4. A fuller description of individual loadings is reported in Appendix E.
Table 3.4

Cronbach’s Alpha for Overall Efficacy and each Subscale (N=147)

<table>
<thead>
<tr>
<th>Construct</th>
<th>items</th>
<th>Cronbach’s Alpha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall Efficacy</td>
<td>24</td>
<td>.788</td>
</tr>
<tr>
<td>Personal Science Efficacy Belief Scale (PSTE)</td>
<td>12</td>
<td>.725</td>
</tr>
<tr>
<td>Science Teaching Outcome Expectancy Scale (STOE)</td>
<td>12</td>
<td>.740</td>
</tr>
</tbody>
</table>

Note: PSTE achieved this alpha value by dropping question 8, Survey Part 1.

Validity. The STEBI is a previously validated self-efficacy instrument (Deehan, 2017) and is sufficient for use in this study.

Teacher Commitment Survey. Part II contained 17 closed-ended commitment questions examining teachers’ commitment to students, commitment to teaching, commitment to school, and commitment to the profession. The number of questions for each construct is shown in Tables 3.5.

Table 3.5

Teacher Commitment Items and Descriptions

<table>
<thead>
<tr>
<th>Dimension</th>
<th># items</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commitment to Students</td>
<td>5</td>
<td>Sensitive, dedicated, holds high expectations</td>
</tr>
<tr>
<td>Commitment to Teaching</td>
<td>5</td>
<td>Academic basis, psychological attachment, extra efforts</td>
</tr>
<tr>
<td>Commitment to School</td>
<td>4</td>
<td>Local organization, duties</td>
</tr>
<tr>
<td>Commitment to Profession</td>
<td>3</td>
<td>Organizational context, sum greater than parts</td>
</tr>
</tbody>
</table>
**Construction.** The 17 commitment questions came from the Teacher Commitment Scale with four subscales (Thien & Razak, 2014). The items for Teacher Commitment and for each of the four commitment subscales were recorded in the direction of a higher value indicating higher commitment and the items were summed to create the four subscales and the Teacher Commitment Scale.

**Reliability.** The Commitment to School subscale has a Cronbach Alpha reliability coefficient of .89, the Commitment to Students subscale has a Cronbach Alpha reliability coefficient of .82, the Commitment to Teaching subscale has a Cronbach Alpha reliability coefficient of .73, and the Commitment to Profession subscale has a Cronbach Alpha reliability coefficient of .71. Cronbach’s alphas were calculated for each scale in my study and subscale and are reported in Table 3.6.

**Table 3.6**

*Cronbach’s Alpha for Teacher Commitment and each Subscale (N=147)*

<table>
<thead>
<tr>
<th>Construct</th>
<th>items</th>
<th>Cronbach’s Alpha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall Teacher Commitment</td>
<td>16</td>
<td>.841</td>
</tr>
<tr>
<td>Commitment to Students</td>
<td>5</td>
<td>.655</td>
</tr>
<tr>
<td>Commitment to Teaching</td>
<td>4</td>
<td>.539</td>
</tr>
<tr>
<td>Commitment to School</td>
<td>4</td>
<td>.835</td>
</tr>
<tr>
<td>Commitment to Profession</td>
<td>3</td>
<td>.765</td>
</tr>
</tbody>
</table>

*Note: Commitment to Teaching achieved this alpha value by dropping question 1, Survey Part 2*

The values of Commitment to Students and Commitment to Teaching had values below the desired .7 threshold (Taber, 2017). Alpha values are affected by the number of items in a scale with a greater number of items resulting in a higher alpha (Taber, 2017). Both of the scales
with alpha values under .7 have only five items, so their alpha values were acceptable (Tavakol & Dennick, 2011). A fuller discussion of individual loadings is reported in Appendix E.

**Validity.** The Teacher Commitment Scale is a previously validated instrument (Thien & Razak, 2014) and is sufficient for use in this study.

**Teacher Retention Survey.** Part III contained three short answer questions examining teacher perceptions of factors that contribute to their retention in the teaching profession, a time when s/he considered leaving the teaching profession (if applicable) and the coping strategies that influenced the decision to stay, and an opportunity to add additional comments. All answers were self-reported by the teacher completing the survey. Response data are shown in Table 3.7.

**Table 3.7**

*Number of Teacher Responses for Open Ended Questions*

<table>
<thead>
<tr>
<th>Nature of Question</th>
<th>Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Explain incident that has strongly reinforced decision to continue teaching</td>
<td>152</td>
</tr>
<tr>
<td>Describe incident and coping strategies when considered leaving (if applicable)</td>
<td>72</td>
</tr>
<tr>
<td>Provided additional comments</td>
<td>100</td>
</tr>
</tbody>
</table>

**Items.** One question each asks about positive and negative experiences of teachers that impact their commitment to continue teaching. Critical incidents can act as catalysts (Schlossberg, 1995) and can be useful to understand factors and coping strategies benefiting teacher commitment. Knowing both positive and negative experiences will allow me to develop a rich understanding of teacher commitment by triangulating responses (Patton, 2003). The additional comments question was provided as an opportunity for teachers to provide
information they thought important to understanding mid and late career high school science teacher retention but was not asked about during the survey.

**Demographic Questions.** Part IV contained 13 demographic questions including gender, age, ethnicity, school type, licensure path, education, mobility status, years at current school, course continuity, AP course teacher, school type, school community location, and school SES information.

**Items.** Gender identity included male (coded as 0) and female (coded as 1). Age brackets were 20-29, 30-39, 40-49, 50-59, and 60+. My research focuses on mid and late career teachers and none of these teachers fell into the 20-29 age category. For the analysis, age was coded as 1 (30-39) thru 4 (60+). Length of time teaching science was asked at the beginning of the survey and was also included in the analysis. Those teaching 10-20 years were coded as 1, 21-30 years were coded as 2 and over 30 years were coded as 3. In this study, mid-career teachers have taught 10-20 years, late career teachers have taught 21 or more years. Race/Ethnicity was black or African American, Asian, Hispanic/Latino/Latinx, Native American, American Indian, or Alaska Native, Pacific Islander or Native Hawaiian, or White/Caucasian. Only eleven minorities responded to the survey and therefore race was not included in the analysis since it was impossible to do subgroup analysis with a small number of cases. School type choices were public-traditional, public-magnet, public-charter, or private. For the analysis, school type was recorded into two categories: public traditional (coded as 1) and magnet, charter, and private (coded as 0). School locations were urban (city population of 50,000 residents or more), suburban (development cluster connected to an urban area and less than 50,000 residents), or rural (city population of less than 2,500 residents). Size of the community in which the school was located was recorded so urban communities were coded as 3 and rural schools were coded as
1. Type of licensure referred to the path of how the teacher obtained the license to teach. Lateral entry or another alternative licensure teacher (coded as 1) means that the teacher did not complete a pre-licensing course as a part of college coursework while traditional licensure was coded as 0. Highest level of education choices included bachelor's degree (1), some master’s coursework, master’s degree, some doctoral coursework, or doctoral degree (5). All answers were self-reported by the teacher completing the survey. Of the 187 teachers who began taking the survey, 147 teachers completed the entire survey. Survey demographic information is shown earlier in this chapter in Table 3.1.

**Semi-structured Interviews.** Eight interview questions were developed to clarify survey findings and further explored teacher perceptions of experience, science, value, and resources.

**Items.** Three questions were general to teaching and retention and five questions were specific to science. Questions asked teachers to elaborate on the open-ended survey questions with strategies and resources for incidents that strongly reinforced their decision to continue teaching and incidents that made them consider leaving the teaching profession. Other questions asked about science teacher retention, mid and late career experience, out of field (OOF) teaching, and teaching in the pandemic. Interview protocols and questions are included in Appendix D. Interview demographic information is shown in Tables 3.2 and 3.8.

**Survey and Interview Administration**

Teachers took the one-time online survey during March of 2020. Only one invitation email was sent to the potential participant list. A reminder email was not sent to the potential participant list. However, because the initial responses did not indicate many private school teachers were completing the survey, a follow-up email was sent to private school head
administrations on the generated sample list with a request to ask science teachers at their school to complete the survey.

At the end of the survey, 50 teachers volunteered to participate in a thirty-minute phone interview to be held at a later date. Interviews were conducted to clarify and expound on the quantitative research findings. Teachers who volunteered to be contacted by the researcher for clarity of the survey responses were contacted by email in June 2020 for a semi-structured verbal interview. The interview consent form and questions were emailed. Of the 50 teachers who volunteered to be interviewed at the end of the survey, 25 teachers completed the consent information. Each teacher was sent a Zoom link for an agreed-upon time. Twenty-five interviews were conducted individually through Zoom between June 19 and July 8. Each teacher had the option of having his/her video turned on during the virtual, verbal interview. Written notes were taken during the interview and the interview was audio recorded and transcribed by the researcher.

Data Analysis

After the survey data were collected (N=187), they were downloaded from Qualtrics as a CSV file in order to clean and review. Participants were removed from the sample if they did not give consent (n=11), did not teach science (n=1), had not been teaching at least 10 years (n=22), or where they did not complete the entire survey (n=6). This left 147 observations in the dataset for quantitative analysis. There were 152 collected written responses available for qualitative analysis. The negatively worded STEBI and commitment items were recorded in the proper direction for analysis.
Quantitative Analysis of STEBI and Teacher Commitment Surveys

Means, standard deviations and range of scores are reported for self-efficacy and commitment. Correlational analysis was conducted to examine the strength of the relationship between overall self-efficacy as well as each self-efficacy construct, and overall teacher commitment as well as each commitment construct. Demographic data was analyzed using an analysis of variance (ANOVA) to investigate potential effects of gender, age, ethnicity, school type, school location, school socioeconomic status, type of licensure, and highest level of education on teacher self-efficacy and commitment. Correlations between scales were examined. Data were also analyzed using an analysis of variance (ANOVA) to investigate potential moderating effects of gender, ethnicity, education, licensure path, years of teaching experience, science courses taught, access to resources and school characteristics on teacher commitment. To further investigate commitment prediction, multiple regression was used to examine the relationship between the main effect independent variables of PSTE and STOE and control variables of teacher and school characteristics on Teacher Commitment scale and each of the four commitment subscales. Four teacher variables included in the model were gender, teacher age, teacher education and experience. The three school variables were community size, school type and % free and reduced lunch. Figure 3.1 presents the model for the effects of teacher background school characteristics and teacher self-efficacy on teacher commitment.
Analysis of Teacher Retention Survey by Research Question

Qualitative content analysis methods (Mayring, 2015; Schreier, 2014) were used to identify teacher perceptions of factors that contribute to their intention to stay in the teaching profession and strategies used if s/he considered leaving the teaching profession. Open-ended questions from the survey data revealed patterns identified by teachers. First, a coding frame (Mayring, 2015) was built using a priori codes developed from Bandura’s (1986) Social Cognitive Theory for factors that contributed to teachers’ intention to stay in the teaching profession in order to examine Research Question 2. The complete coding scheme can be found in Appendix H. Categories included personal, environmental, and behavior factors; subcategories included autonomy, relatedness, competency, sociocultural, institutional, and self-efficacy factors. Nineteen sub-subcategory definitions were developed to include a name, a
description with indicators and positive or anchor examples based on an analysis of open-ended response to the question asking teachers to explain an incident that has strongly reinforced their decision to continue teaching (Corbin & Strauss, 1990). The coding frame was tried out on one survey question in a pilot phase (Schreier, 2014). The researcher coded and recoded the material during the trial coding period and evaluated and modified the coding frame with consultation experts (Schreier, 2014). Some survey responses contained multiple parts. Segmentation divided the responses into smaller units based on thematic criterion so that each unit fit into exactly one sub subcategory of the coding frame (Schreier, 2014). For example, one participant responded:

When students reach out to me years after they graduated and say that my teaching and being in my class made a difference. I had a student send me a Facebook post recounting an incident that I did not remember that she said influenced her decision to be a teacher. Another student sent me a postcard announcement of her graduation from medical school 6 years after her graduation, so she had to do some research to find my address.

This response was coded for Relatedness to Students and Effectiveness. The coding frame was evaluated and modified again with consultation experts (Schreier, 2014). All of the responses were then coded in the main analysis phase (Schreier, 2014). Frequency analysis determined the number and percentage of factors and the number and percentage of teachers describing each factor in the coding frame. Factors with high frequencies were identified and patterns of factors that contribute to high school science teachers’ intention to stay in the teaching profession were reported (Corbin & Strauss, 1990). Another education researcher in STEM education independently coded 20% of the survey responses to establish inter-coder agreement. The inter-rater reliability was .90 for the two coders.

Triggers, factors that can stimulate and precipitate a transition, were then analyzed using content analysis of the open-ended survey question exploring Research Question 3, incidents and coping strategies teachers used when they considered leaving. Another coding frame was built
using a priori codes developed from Bandura’s (1986) Social Cognitive Theory. The complete coding scheme can be found in Appendix I. Categories and sub-categories were the same, but sub-subcategory definitions, descriptions and anchor examples were recreated with data from another open-ended question, describing challenges and times when teachers seriously considered leaving the profession. Data were segmented using thematic criterion. Trial coding applied the 19 categories during two rounds with evaluation and modification of the coding frame with consultation experts (Schreier, 2014). Frequency analysis of the number of quotations and the number of teachers who talked about each category were determined. Patterns of triggers that made them consider leaving teaching were reported (Corbin & Strauss, 1990).

To examine the actual coping strategies for Research Question 3, a new coding frame was built using a priori codes developed from Schlossberg’s (1995) Transitional Theory. The complete coding scheme can be found in Appendix J. Categories included Modify Situation, Control Meaning and Manage Stress. Sub-subcategory definitions were developed to include a name, a description with indicators and positive or anchor examples. Segmentation divided the survey question responses into smaller parts. Teacher responses to the open-ended question were analyzed using the coding scheme. Frequency analysis of the number of quotations and the number of teachers who talked about each category were determined. Patterns in coping strategies were reported (Corbin & Strauss, 1990). While coding each open-ended question, reactions and interpretations were recorded in a “memo” (Corbin & Strauss, 1990). This helped identify emerging themes and impacts of critical incidents. Properties and dimensions were recorded and discussed through peer debriefing (Rossman & Rallis, 2016). Data from each open-ended survey question was triangulated to add depth of understanding and increase trustworthiness of this study (Patton, 2003).
**Analysis of Semi-Structured Interviews by Research Question**

Semi-structured interview data clarified and expounded on the patterns (Babchuk, 2016).

For reporting purposes, pseudonyms were assigned to each teacher and are presented in Table 3.8.

**Table 3.8**

*Teachers Interviewed (N=25)*

<table>
<thead>
<tr>
<th>Pseudonym</th>
<th>Ethnicity</th>
<th>Education</th>
<th>Lateral entry</th>
<th>School type</th>
<th>Comm type</th>
<th>Title</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elaine</td>
<td>white</td>
<td>Doctoral</td>
<td>No</td>
<td>Trad</td>
<td>Suburban</td>
<td>No</td>
<td>Mover</td>
</tr>
<tr>
<td>Martha</td>
<td>white</td>
<td>Masters</td>
<td>No</td>
<td>Trad</td>
<td>Urban</td>
<td>--</td>
<td>Mover</td>
</tr>
<tr>
<td>Ruth</td>
<td>white</td>
<td>Masters</td>
<td>No</td>
<td>Trad</td>
<td>Suburban</td>
<td>No</td>
<td>Mover</td>
</tr>
<tr>
<td>John</td>
<td>white</td>
<td>Some Masters</td>
<td>Yes</td>
<td>Magnet</td>
<td>Urban</td>
<td>No</td>
<td>Stayer</td>
</tr>
<tr>
<td>Dick</td>
<td>white</td>
<td>Masters</td>
<td>Yes</td>
<td>Trad</td>
<td>Rural</td>
<td>--</td>
<td>Mover</td>
</tr>
<tr>
<td>Sara</td>
<td>white</td>
<td>Bachelors</td>
<td>Yes</td>
<td>Trad</td>
<td>Urban</td>
<td>No</td>
<td>Mover</td>
</tr>
<tr>
<td>Deanne</td>
<td>white</td>
<td>Masters</td>
<td>No</td>
<td>Trad</td>
<td>Suburban</td>
<td>No</td>
<td>Mover</td>
</tr>
<tr>
<td>Crystal</td>
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<td>Trad</td>
<td>Urban</td>
<td>No</td>
<td>Mover</td>
</tr>
<tr>
<td>Tabatha</td>
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<td>Some Masters</td>
<td>Yes</td>
<td>Trad</td>
<td>Suburban</td>
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<td>Mover</td>
</tr>
<tr>
<td>Edith</td>
<td>white</td>
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<td>No</td>
<td>Charter</td>
<td>Urban</td>
<td>No</td>
<td>Mover</td>
</tr>
<tr>
<td>Robert</td>
<td>black</td>
<td>Some doctoral</td>
<td>Yes</td>
<td>Charter</td>
<td>Urban</td>
<td>No</td>
<td>Mover</td>
</tr>
<tr>
<td>Janice</td>
<td>white</td>
<td>Some Masters</td>
<td>Yes</td>
<td>Trad</td>
<td>Rural</td>
<td>No</td>
<td>Stayer</td>
</tr>
<tr>
<td>Jenny</td>
<td>black</td>
<td>Some doctoral</td>
<td>No</td>
<td>Trad</td>
<td>Suburban</td>
<td>--</td>
<td>Mover</td>
</tr>
<tr>
<td>Charles</td>
<td>white</td>
<td>Masters</td>
<td>Yes</td>
<td>Trad</td>
<td>Suburban</td>
<td>No</td>
<td>Mover</td>
</tr>
<tr>
<td>Jill</td>
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<td>No</td>
<td>Trad</td>
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<tr>
<td>Frances</td>
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<td>Rural</td>
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<td>Mover</td>
</tr>
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<td>Masters</td>
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<td>Trad</td>
<td>Rural</td>
<td>No</td>
<td>Mover</td>
</tr>
<tr>
<td>Elisabeth</td>
<td>white</td>
<td>Masters</td>
<td>No</td>
<td>Trad</td>
<td>Urban</td>
<td>No</td>
<td>Stayer</td>
</tr>
<tr>
<td>Richard</td>
<td>white</td>
<td>Masters</td>
<td>No</td>
<td>Magnet</td>
<td>Urban</td>
<td>No</td>
<td>Mover</td>
</tr>
<tr>
<td>Mary</td>
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<td>Yes</td>
<td>Trad</td>
<td>Urban</td>
<td>Yes</td>
<td>Mover</td>
</tr>
<tr>
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<td>Trad</td>
<td>Rural</td>
<td>No</td>
<td>Mover</td>
</tr>
<tr>
<td>David</td>
<td>white</td>
<td>Bachelors</td>
<td>No</td>
<td>Magnet</td>
<td>Urban</td>
<td>--</td>
<td>Mover</td>
</tr>
<tr>
<td>Jonathan</td>
<td>white</td>
<td>Masters</td>
<td>No</td>
<td>Magnet</td>
<td>Urban</td>
<td>Yes</td>
<td>Mover</td>
</tr>
<tr>
<td>Doris</td>
<td>white</td>
<td>Some doctoral</td>
<td>Yes</td>
<td>Trad</td>
<td>Suburban</td>
<td>No</td>
<td>Stayer</td>
</tr>
<tr>
<td>Joseph</td>
<td>white</td>
<td>Bachelors</td>
<td>No</td>
<td>Trad</td>
<td>Urban</td>
<td>Yes</td>
<td>Mover</td>
</tr>
</tbody>
</table>
Interviews provide rich, thick data as well as allow for further analysis of patterns and themes (Wolcott, 1994) that contribute to mid and late career science teachers’ intention to stay in the teaching profession. Member checking was embedded in each semi-structured interview by asking for elaboration of critical incidents and for feedback on emerging findings (Merriam, 2009). Interviews were recorded through Zoom and transcribed for analysis. Interview responses were analyzed for common patterns and themes using the constant comparative approach (Corbin & Strauss, 1990; Glaser, 1965). Codes were developed using holistic, descriptive strategies (Creswell, 2013), compiled, and organized by topics in the data (Stake, 1995). Naturalistic generalizations (Creswell, 2013) emerged and were confirmed through peer debriefing (Rossman & Rallis, 2016).

**Trustworthiness**

A consultation expert reviewed the findings from the semi-structured interviews and agreed with the coding approach utilized for the analysis of the qualitative portion of the research (Corbin & Strauss, 1990; Lincoln & Guba, 1985). The strategy for building trustworthiness was data triangulation. Four sources of data – survey, interview, member checking, and peer debriefing – were used to triangulate themes and support the integrity of this method of data collection (Rossman & Rallis, 2016; Stake, 1995). Member checking (Lincoln & Guba, 1985) provides an opportunity to validate data collected during the interviews (Merriam, 2009). Peer debriefing (Patton, 2003; Rossman & Rallis, 2016) provides an opportunity to validate coding schemes of open-ended survey questions. Triangulation across different data sources is shown in Table 3.9.
Table 3.9

*Triangulation Across Data Sources*

<table>
<thead>
<tr>
<th>Major Findings</th>
<th>Sources of Data</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Survey</td>
</tr>
<tr>
<td><strong>Finding 1: Student success main motivator for retention.</strong></td>
<td>✓</td>
</tr>
<tr>
<td><strong>Finding 2: Teacher Success motivator for retention.</strong></td>
<td>✓</td>
</tr>
<tr>
<td><strong>Finding 3: Teachers stay by focusing on what they can control.</strong></td>
<td>✓</td>
</tr>
<tr>
<td><strong>Finding 1: Unsuccessful relationships make teachers want to leave.</strong></td>
<td>✓</td>
</tr>
<tr>
<td><strong>Finding 2: Teacher transfer is the most common coping strategy.</strong></td>
<td>✓</td>
</tr>
<tr>
<td><strong>Finding 3: Teachers who stay, focus on their own environment.</strong></td>
<td>✓</td>
</tr>
</tbody>
</table>

**Limitations**

This study is not without limitations. The researcher is a science teacher in North Carolina. Recruitment of survey population is not a true random sample. Participants who completed the online survey might not be representative of all of the secondary science teachers in North Carolina. The number of participants who completed the online survey is small. This study did not have many mid and late career high school science teachers at private schools or public charter schools participate. All of the data in this study is self-reported. Finally, survey data were collected in March of 2020 and teacher interviews were conducted in June 2020.
Teacher responses could have been impacted by the influence of school closures and the move to remote learning due to COVID-19.

**Summary**

This chapter explained the mixed methodology used to answer the research questions of this study. The research design, context, participants, and ethical considerations were described. Data collection of quantitative closed-ended survey questions and qualitative through open-ended survey questions and semi-structured interviews, instruments, data analysis, and limitations were also described in detail. The next chapter, Chapter 4, will provide the results found using these methods.
CHAPTER FOUR

RESULTS

The purpose of this mixed methods descriptive study was to examine factors that contribute to high school science teacher commitment and to explore the relationship between self-efficacy and teacher commitment constructs. This chapter presents the results of the examination of three research questions: (1) How does mid and late career high school science teachers’ self-efficacy relate to their commitment to students, teaching, school, and the profession?, (2) What personal, environmental, and behavioral factors contribute to high school science teachers’ intention to stay in the teaching profession?, and (3) What coping strategies do mid and late career science teachers use to confront challenges and times when they consider leaving the teaching profession?

The results of this study are presented in two sections based on analysis. To answer the first research question, quantitative analyses examined the relationship between self-efficacy and teacher commitment through correlational analysis, analysis of variance (ANOVA), and multiple regression analysis. Results from qualitative analysis revealed emerging patterns and themes regarding factors that strengthen mid and late career science teachers’ desire to stay in the teaching profession, critical incidents to their decisions, and coping strategies that pertain to the second and third research questions.

Relationship Between Self-Efficacy and Teacher Commitment of Mid and Late Career High School Science Teachers

Given the close relationship between teacher efficacy and commitment (Chesnut & Burley, 2015), having a more nuanced understanding of representative constructs, specifically commitment constructs, will help better support and retain teachers. There is a dearth of research
examining the relationship between teacher efficacy and commitment with a focus solely on mid and late career high school science teachers. Since efficacy may be influenced by experience, it is important to focus on efficacy beliefs of teachers who are established in their careers. This study examined the relationship between mid and late career secondary science teachers’ self-efficacy and their overall commitment to teaching, their students, their school, and to the profession. First, correlational analysis was conducted to examine the strength of the relationship between overall self-efficacy as well as each self-efficacy construct, and overall teacher commitment as well as each commitment construct. Next, using t-tests and analysis of variance (ANOVA), I used a bivariate analysis to examine the impact of demographic teacher variables on the relationship between self-efficacy and commitment. Finally, multiple regression analysis was conducted to further explain how control variables impacted the relationship between self-efficacy and commitment. Whole group descriptive statistics for self-efficacy scales and commitment scales are shown in Table 4.1.

**Table 4.1**

*Summary Statistics for each Subscale (N=147)*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>Std Deviation</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall Self-efficacy</td>
<td>94.76</td>
<td>8.57</td>
<td>65</td>
<td>117</td>
</tr>
<tr>
<td>PSTE</td>
<td>54.58</td>
<td>4.45</td>
<td>37</td>
<td>60</td>
</tr>
<tr>
<td>STOE</td>
<td>40.05</td>
<td>5.76</td>
<td>22</td>
<td>58</td>
</tr>
<tr>
<td>Teacher Commitment</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>To Students</td>
<td>19.98</td>
<td>2.97</td>
<td>11</td>
<td>25</td>
</tr>
<tr>
<td>To Teaching</td>
<td>15.47</td>
<td>2.80</td>
<td>7</td>
<td>20</td>
</tr>
<tr>
<td>To School</td>
<td>15.21</td>
<td>3.68</td>
<td>6</td>
<td>20</td>
</tr>
<tr>
<td>To Profession</td>
<td>12.09</td>
<td>2.73</td>
<td>3</td>
<td>15</td>
</tr>
</tbody>
</table>
**Strength of the Relationship Between Self-Efficacy and Commitment**

To explore how overall and constructs of self-efficacy and commitment are correlated with each other, survey scale data were analyzed using SPSS software. The results demonstrate strong, significant correlations between the independent self-efficacy variable and the dependent variable of commitment as shown in Table 4.2. Overall Self-efficacy, Personal Science Efficacy (PSTE), and Science Teaching Outcome Expectancy (STOE) were significantly associated with Teacher Commitment and all of the dependent variable commitment subscales.

**Table 4.2**

*Correlations (2-tailed) between Self-Efficacy and Commitment (N=147)*

<table>
<thead>
<tr>
<th>Self-Efficacy</th>
<th>Commitment to</th>
<th>PSTE</th>
<th>STOE</th>
<th>Overall SE</th>
<th>Student Teaching</th>
<th>School</th>
<th>Profession</th>
</tr>
</thead>
<tbody>
<tr>
<td>PSTE</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>STOE</td>
<td>.348***</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overall SE</td>
<td>.768**</td>
<td>.869**</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Commit to Students</td>
<td>.396***</td>
<td>.348***</td>
<td>.505**</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Commit to Teaching</td>
<td>.328***</td>
<td>.512***</td>
<td>.526**</td>
<td>.548***</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Commit to School</td>
<td>.241**</td>
<td>.332***</td>
<td>.359**</td>
<td>.261***</td>
<td>.462***</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Commit to Profession</td>
<td>.181*</td>
<td>.327***</td>
<td>.321**</td>
<td>.257**</td>
<td>.642***</td>
<td>.430***</td>
<td>1</td>
</tr>
<tr>
<td>Teacher Commit</td>
<td>.379***</td>
<td>.515***</td>
<td>.558**</td>
<td>.631***</td>
<td>.851***</td>
<td>.766***</td>
<td>.762***</td>
</tr>
</tbody>
</table>

*Note.* PSTE=Personal Science Teaching Efficacy STOE=Science Teaching Outcome Expectancy.

*p < .05. **p < .01. ***p < .001.

Pearson’s correlations of self-efficacy and commitment constructs are reported in Table 4.2. R-values in the table are the calculated test statistic of the linear correlation between the two
continuous variables. P-values in the table denote testing a significant deviation in the correlation away from zero with a zero indicative of no relationship between the scales. As shown by the p-values, all correlations are significantly different from zero demonstrating at least weak correlation between variables. A positive correlation indicates that as one variable increases, the other variable also increases. No scales were negatively correlated with one another.

A significant association was found between teachers’ Overall Self-efficacy and Teacher Commitment ($r=0.558$, $p<0.01$). This suggests that a teacher with higher self-efficacy has more Teacher Commitment than those with lower self-efficacy. The highest levels of correlation were found between Teacher Commitment and both self-efficacy constructs. STOE was highly correlated with each commitment construct. PSTE was also highly correlated, although correlations with Commitment to Student and Commitment to Teaching constructs were stronger than correlation with Commitment to School and Commitment to Profession constructs. A full correlation matrix of all variables considered in the analysis is included in Appendix F.

**Impact of Demographic Teacher Variables on the Relationship Between Self-Efficacy and Commitment**

To see if there were any main differences between groups of teachers based on demographic variables on Teacher Commitment, analysis of variance (ANOVA) was conducted. T-test or ANOVA was used to compare mean Teacher Commitment Scale scores for 15 different demographic variables. Demographic variables included Gender, Age, Ethnicity, Licensure Path, Education, Years Teaching, Mid or Late Career Teacher Status, Mobility Status, Years at Current School, Course Continuity, Currently Teach an Advanced Placement (AP) course, School Type, Community Size, School Title 1 Status, and Percent School Free and Reduced Lunch Status. Only two of the 15 demographic variables analyzed in this study revealed a
noteworthy difference in Teacher Commitment – Community Size (Urban, Suburban, Rural) and Title 1 Status (Title 1 or Non-Title 1). There was a significant main effect for Community Size on commitment, \( F(2,144)=4.03, p=.02 \), with suburban school science teachers reporting higher Teacher Commitment as compared to urban and rural schools. The mean Teacher Commitment Scale score for teachers in Title 1 schools (n=48) was 61.04 and for teachers in non-Title 1 schools (n=74) was 64.11. The difference between Title 1 Status schools was almost statistically significant \( (t(120)=-1.85; p=.066) \), with teachers at non-Title 1 schools reporting higher Teacher Commitment. Neither Career Status (Mid or Late Career) nor Mobility Status (Mover or Stayer) demonstrated a significant difference in Teacher Commitment. Results of all 15 demographic variables examined in this study listed in categories with significance noted can be found in Appendix G.

**Contribution of Demographic Variables on the Relationship Between Self-Efficacy and Commitment**

Regression analysis further described how the demographic variables impacted the relationship between self-efficacy and Overall Teacher Commitment and each of the four commitment subscales. Multiple regression examined the relationship between the main effect independent variables of PSTE and STOE and variables of teacher and school characteristics on the dependent variable, Overall Teacher Commitment Scale. These findings are presented in Table 4.3.
Table 4.3

Regression Analysis Results of Predictors of Overall Teacher Commitment (N=147)

<table>
<thead>
<tr>
<th></th>
<th>Model 1</th>
<th></th>
<th></th>
<th>Model 2</th>
<th></th>
<th></th>
<th>Model 3</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>SE</td>
<td>Beta</td>
<td>Sig</td>
<td>B</td>
<td>SE</td>
<td>Beta</td>
<td>Sig</td>
<td>B</td>
</tr>
<tr>
<td>PSTE</td>
<td>0.48</td>
<td>0.15</td>
<td>0.24</td>
<td>**</td>
<td>0.51</td>
<td>0.15</td>
<td>0.25</td>
<td>***</td>
<td>0.53</td>
</tr>
<tr>
<td>STOE</td>
<td>0.68</td>
<td>0.12</td>
<td>0.43</td>
<td>***</td>
<td>0.69</td>
<td>0.12</td>
<td>0.44</td>
<td>***</td>
<td>0.69</td>
</tr>
<tr>
<td>Gender</td>
<td>0.27</td>
<td>1.37</td>
<td>0.01</td>
<td></td>
<td>0.28</td>
<td>1.37</td>
<td>0.14</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TeacherAge</td>
<td>1.49</td>
<td>0.76</td>
<td>0.16</td>
<td></td>
<td>1.50</td>
<td>0.78</td>
<td>0.16</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Experience</td>
<td>-1.14</td>
<td>1.12</td>
<td>-.08</td>
<td></td>
<td>-0.86</td>
<td>1.14</td>
<td>-.06</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Education</td>
<td>-1.08</td>
<td>0.65</td>
<td>-.12</td>
<td></td>
<td>-1.17</td>
<td>0.65</td>
<td>-.13</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CommSize</td>
<td>0.52</td>
<td>0.89</td>
<td>0.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SchoolType</td>
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<td></td>
<td></td>
<td></td>
<td>-2.87</td>
<td>1.43</td>
<td>-.15</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>%freelunch</td>
<td>0.35</td>
<td>0.66</td>
<td>-.52</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>9.99</td>
<td>8.44</td>
<td>10.17</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R²</td>
<td>0.32</td>
<td>0.34</td>
<td>0.36</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note.* PSTE=Personal Science Teaching Efficacy STOE=Science Teaching Outcome Expectancy.

*p < .05. **p < .01. ***p < .001.

Model 1 describes the effect of high school teachers’ Personal Science Efficacy Belief (PSTE) and Science Teaching Outcome Expectancy (STOE) on Teacher Commitment. Model 2 adds teacher characteristic control variables of gender, teacher’s age (TeacherAge), how long they have been teaching science (Experience), and teacher’s highest level of Education (Education). Model 3 adds the school characteristics control variables of community size in which the school is located ranging from a rural area (1) to an urban area (3) (CommSize), traditional or non-traditional school type, and percent of students receiving a free or reduced lunch (%freelunch). The main independent variables of PSTE and STOE were significantly related to Teacher Commitment. As PSTE increased, Teacher Commitment increased (p < .01) and as STOE increased, Teacher Commitment increased (p < .001). The main independent variables continued to be statistically significant when the teacher and school characteristics were added to the analysis in Models 2 and 3. The only control variable that was statistically
significant was school type (p < .05), although teacher education was nearly significant at p = .09. Teacher Commitment was lower for science teachers in traditional public schools and higher for science teachers in non-traditional schools. Non-traditional schools include public magnet, public charter, and private schools. Teachers with higher degrees had moderately lower levels of commitment as compared to teachers with fewer degrees. About 32% of the dependent variable of Teacher Commitment was explained by Model 1. Teacher characteristics, Model 2, accounted for an additional two percent and the full model accounted for 36% of Teacher Commitment.

Subscale analysis investigated the effects of PSTE, STOE, and the individual and school characteristic control variables on teacher Commitment to the School where they teach, Commitment to Students, Commitment to Teaching, and Commitment to the Profession. Multiple regression was used to examine the relationship between the main effect independent variables of PSTE and STOE and control variables of teacher and school characteristics on School Commitment Scale and are presented in Table 4.4 to Table 4.7.

Table 4.4
Regression Analysis Results of Predictors of Commitment to School (N=147)

<table>
<thead>
<tr>
<th></th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>SE</td>
<td>Beta</td>
</tr>
<tr>
<td>PSTE</td>
<td>0.12</td>
<td>0.07</td>
<td>0.15</td>
</tr>
<tr>
<td>STOE</td>
<td>0.18</td>
<td>0.05</td>
<td>0.28</td>
</tr>
<tr>
<td>Gender</td>
<td>0.43</td>
<td>0.63</td>
<td>0.04</td>
</tr>
<tr>
<td>TeacherAge</td>
<td>0.65</td>
<td>0.35</td>
<td>0.15</td>
</tr>
<tr>
<td>Experience</td>
<td>-0.20</td>
<td>0.52</td>
<td>0.03</td>
</tr>
<tr>
<td>Education</td>
<td>-0.32</td>
<td>0.30</td>
<td>-0.11</td>
</tr>
<tr>
<td>CommSize</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SchoolType</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% freelunch</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>1.22</td>
<td>0.42</td>
<td></td>
</tr>
<tr>
<td>R²</td>
<td>0.13</td>
<td>0.16</td>
<td></td>
</tr>
</tbody>
</table>

Note. PSTE=Personal Science Teaching Efficacy STOE=Science Teaching Outcome Expectancy. *p < .05. **p < .01. ***p < .001.
In Model 1, Science Teaching Outcome Expectancy (STOE) is significant at the .001 level and Personal Science Efficacy Belief (PSTE) was moderately significant \((p < .071)\). Thirteen percent of Commitment to School was explained by this Model. In Model 2, STOE and PTSE continue to be significant at the same level as in Model 1. In addition, teacher age was moderately significant \((p < .09)\). As teachers age increases, Commitment to School increases. Sixteen percent of Commitment to School was explained by this Model 2. The main independent variables and teacher age continue to be statistically significant in Model 3 when school characteristics were added to the analysis. Teachers in non-traditional schools were significantly more committed to their school as compared to students in traditional public schools \((p = .011)\). Also, teachers in schools with a lower percentage of free and reduced lunch students were somewhat more committed to their school as compared to those teachers in schools where a higher percentage of students receive a free or reduced cost lunch \((p = .06)\). Twenty-two percent of Commitment to School was explained in Model 3.

Subscale analysis also investigated each model’s contribution on commitment to the act of teaching of high school science teachers. The analysis for the dependent variable of Commitment to Teaching is shown in Table 4.5.

The main independent variables of PTSE and STOE were significantly related to Teacher Commitment. As PTSE increased, Commitment to Teaching increased \((p < .05)\) and as STOE increased, Commitment to Teaching increased \((p < .001)\). The main independent variables continued to be statistically significant when the teacher and school characteristics were added to the analysis in Models 2 and 3. The only control variable moderately significant \((p < .05)\) for both models was the age of the teacher. As teachers age increased, Commitment to Teaching also increases. \(R^2\) values increase from .29 in Model 1, to .32 in both Model 2 and in Model 3.
Table 4.5

Regression Analysis Results of Predictors of Commitment to Teaching (N=147)

<table>
<thead>
<tr>
<th></th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>SE</td>
<td>Beta</td>
</tr>
<tr>
<td>PSTE</td>
<td>0.11</td>
<td>0.05</td>
<td>0.18</td>
</tr>
<tr>
<td>STOE</td>
<td>0.22</td>
<td>0.04</td>
<td>0.45</td>
</tr>
<tr>
<td>Gender</td>
<td>-0.02</td>
<td>0.43</td>
<td>-0.00</td>
</tr>
<tr>
<td>TeacherAge</td>
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<td>0.24</td>
<td>0.169</td>
</tr>
<tr>
<td>Experience</td>
<td>-0.42</td>
<td>0.35</td>
<td>-0.09</td>
</tr>
<tr>
<td>Education</td>
<td>-0.34</td>
<td>0.21</td>
<td>-0.12</td>
</tr>
<tr>
<td>CommSize</td>
<td>-0.03</td>
<td>0.29</td>
<td>-0.01</td>
</tr>
<tr>
<td>SchoolType</td>
<td>-0.27</td>
<td>0.46</td>
<td>-0.04</td>
</tr>
<tr>
<td>%freelunch</td>
<td>0.15</td>
<td>0.21</td>
<td>0.05</td>
</tr>
<tr>
<td>Constant</td>
<td>0.68</td>
<td>0.13</td>
<td>-0.06</td>
</tr>
</tbody>
</table>

Note. PSTE=Personal Science Teaching Efficacy STOE=Science Teaching Outcome Expectancy.

*p < .05. **p < .01. ***p < .001.

I next analyzed the relationship between the main effect of independent variables and control variables on high school science teachers’ Commitment to Students. In each of the three models, the combined effect of high school teachers’ PSTE and STOE was found to be significant at the highest level (p < .001). No other demographic factors found in the models impacted teacher Commitment to Students. The analysis for the dependent variable of Commitment to Students is shown in Table 4.6. The R² for Model 1 is .26. Teacher and school characteristics each added about 1 percent to the explanation of Commitment to Students.
Table 4.6

Regression Analysis Results of Predictors of Commitment to Students (N=147)

<table>
<thead>
<tr>
<th>predictor</th>
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<th></th>
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<tbody>
<tr>
<td></td>
<td>B</td>
<td>SE</td>
<td>Beta</td>
<td>Sig</td>
<td>B</td>
<td>SE</td>
<td>Beta</td>
<td>Sig</td>
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<tr>
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<td>0.29</td>
<td>***</td>
<td>0.20</td>
<td>0.05</td>
<td>0.30</td>
<td>***</td>
<td>0.20</td>
<td>0.05</td>
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<tr>
<td>STOE</td>
<td>0.17</td>
<td>0.04</td>
<td>0.32</td>
<td>***</td>
<td>0.17</td>
<td>0.04</td>
<td>0.33</td>
<td>***</td>
<td>0.17</td>
<td>0.04</td>
<td>0.33</td>
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<tr>
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<td>-0.04</td>
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<td>-0.03</td>
<td></td>
<td>-0.12</td>
<td>0.27</td>
<td>-0.04</td>
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<tr>
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<td>0.23</td>
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<tr>
<td>R²</td>
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<td>0.27</td>
<td>0.28</td>
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</tr>
</tbody>
</table>

Note. PSTE=Personal Science Teaching Efficacy STOE=Science Teaching Outcome Expectancy.

*p < .05. **p < .01. ***p < .001.

Finally, subscale analysis investigated each model’s contribution on high school science teachers’ Commitment to the Profession. Multiple regression was used to examine the relationship between the main effect independent variables of PSTE and STOE and control variables of teacher and school characteristics on Commitment to the Profession Scale and is presented in Table 4.7.
Table 4.7

_Regression Analysis Results of Predictors of Commitment to the Profession (N=147)_

<table>
<thead>
<tr>
<th></th>
<th>Model 1</th>
<th></th>
<th></th>
<th></th>
<th>Model 2</th>
<th></th>
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<th>Model 3</th>
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<tbody>
<tr>
<td></td>
<td>B</td>
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<td>Beta</td>
<td>Sig</td>
<td>B</td>
<td>SE</td>
<td>Beta</td>
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<td>SE</td>
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<tr>
<td>STOE</td>
<td>0.14</td>
<td>0.04</td>
<td>0.30 ***</td>
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<td>0.04</td>
<td>0.31 ***</td>
<td></td>
<td>0.14</td>
<td>0.04</td>
<td>0.30 ***</td>
<td></td>
</tr>
<tr>
<td>Gender</td>
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<td>0.47</td>
<td>0.04</td>
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<td>0.25</td>
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<td>0.04</td>
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<tr>
<td>TeacherAge</td>
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<td>-0.05</td>
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<td>-0.17</td>
<td>0.39</td>
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<tr>
<td>%freelunch</td>
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</tr>
<tr>
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<td>$R^2$</td>
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</tr>
</tbody>
</table>

_Note._ PSTE=Personal Science Teaching Efficacy STOE=Science Teaching Outcome Expectancy.

*p < .05. **p < .01. ***p < .001.

The main independent variable of STOE was significantly related to teacher Commitment to the Profession although unlike the previous subscales, PTSE was not significantly related to Commitment to the Profession. As Science Teaching Outcome Expectancy increased, teacher Commitment to the Profession increased ($p < .001$). More than 11% of the dependent variable of teacher Commitment to the Profession was explained by Model 1. Teacher characteristics, Model 2, accounted for an additional three percent and the full model accounted for 18 percent of the variance. Teacher age and type of school made moderately significant contributions to this model. As teachers age increased, Commitment to the Profession increased ($p = .06$). Teachers in non-traditional public schools were somewhat more committed to the profession as compared to teachers in traditional public schools ($p = .06$). Eighteen percent of Teacher Commitment to the Profession was explained by the full Model 3.
Factors that Contribute to Mid and Late Career High School Science Teacher Retention through Qualitative Analysis

The regression analysis builds on the correlational analysis which found a strong correlation between teacher efficacy and commitment ($r=.558, p<.001$). Teacher perceptions of critical incidents, both positive and negative, help develop a rich understanding of factors that contribute to teacher retention. In order to further examine the relationships identified in the quantitative analysis, a coding frame using a priori codes was developed. Open-ended questions from the survey data (N=152) revealed patterns identified by teachers. Next, frequency analysis revealed patterns in the responses. Finally, semi-structured interview data analysis (n=25) allowed for further analysis of the themes describing factors that strengthens mid and late career science teachers’ desire to stay in the teaching profession, triggers or factors that made them consider leaving the teaching profession, and coping strategies used to confront challenges and times when they consider leaving. The rest of this chapter presents those findings.

Factors that Strengthen Teachers’ Desire to Stay in the Teaching Profession

To explore personal, environmental, and behavioral factors that strengthened high school science teachers’ intention to stay in the teaching profession, open-ended survey data were analyzed using constant comparative methods. Frequency analysis examined the number and percentage of factors and the number and percentage of teachers describing each factor. Personal Relatedness is the most prevalent factor as shown in Table 4.8. The complete coding scheme and frequency of individual factors can be found in Appendix H.
Table 4.8

*Frequency Analysis of Factors that Teachers Gave for Staying (N=152)*

<table>
<thead>
<tr>
<th>Bandura’s Factors</th>
<th># quotations</th>
<th>% quotations</th>
<th># teachers reported</th>
<th>% teachers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Personal</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Autonomy</td>
<td>6</td>
<td>3.0%</td>
<td>6</td>
<td>3.9%</td>
</tr>
<tr>
<td>Relatedness</td>
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<td>61.7%</td>
<td>123</td>
<td>80.9%</td>
</tr>
<tr>
<td>Competency</td>
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<td>14.4%</td>
<td>29</td>
<td>19.1%</td>
</tr>
<tr>
<td><strong>Personal Total</strong></td>
<td><strong>159</strong></td>
<td><strong>79.1%</strong></td>
<td><strong>123</strong></td>
<td><strong>80.9%</strong></td>
</tr>
<tr>
<td>Environmental</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Institutional</td>
<td>9</td>
<td>4.5%</td>
<td>9</td>
<td>5.9%</td>
</tr>
<tr>
<td>Sociocultural</td>
<td>6</td>
<td>3.0%</td>
<td>6</td>
<td>3.9%</td>
</tr>
<tr>
<td><strong>Environmental Total</strong></td>
<td><strong>15</strong></td>
<td><strong>7.5%</strong></td>
<td><strong>9</strong></td>
<td><strong>5.9%</strong></td>
</tr>
<tr>
<td>Behavioral</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Self-efficacy</td>
<td>27</td>
<td>13.4%</td>
<td>27</td>
<td>17.8%</td>
</tr>
<tr>
<td><strong>Behavioral Total</strong></td>
<td><strong>27</strong></td>
<td><strong>13.4%</strong></td>
<td><strong>27</strong></td>
<td><strong>17.8%</strong></td>
</tr>
<tr>
<td><strong>Total factors</strong></td>
<td><strong>201</strong></td>
<td><strong>100%</strong></td>
<td></td>
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</tr>
</tbody>
</table>

Survey results from this study revealed three distinct levels of responses. The factor described most often is Personal Relatedness (61.7%). Personal Competency and Behavioral Self-efficacy (combined 27.8%) comprise a second level of response. In a third level, Personal Autonomy (3.0%) and five environmental factors (combined 7.5%) were mentioned.

As seen in Table 4.8, the overwhelming majority of the quotes given in the survey described Personal factors for staying in the teaching profession. More specifically, Personal Relatedness was described in 62% of the quotes. In other words, of the 201 quotations reported in the survey, 159 were in the Personal category with 124 describing Personal Relatedness.

Relatedness refers to the interdependence, cooperation, collaboration, and collegiality with other teachers, students, parents, members of the community, and to the teaching profession itself.

Eighty-eight (43%) of the quotations in the survey describe Personal Relatedness to Students (Appendix H).

Teachers, who spend the majority of their workday with students, are likely to include discussions about their students as the reason they stay as compared to other factors contributing
to staying in the profession. Science teachers, who rely on constructivist methods of teaching, described connections with their students the most. Connections took many forms - tutoring a homebound student until he had enough credits to graduate (T-33), being surprised by a thoughtful gift from a student at the end of a semester who had never seemed interested in the course (T-127), making a difference for English Language Learner (ELL) students who were placed in her class because she happened to speak the same language (T-10), watching the “lightbulb” come on when a student finally gets a concept (T-28), and the look of gratitude and confidence (T-140). Many teachers described the impact of students expressing gratitude. T-67 wrote “For me, when a student simply says “thank you” it makes it all worthwhile” (Survey response from T-67). Some teachers explicitly pointed out that the gratitude is slow to come.

The incidents generally occur long after my contact with students. Years after leaving my classroom, seeing and hearing about student success in the field of Science is what keeps me in the profession. I sometimes receive a letter from a past student thanking me for the encouragement and dedication to their science experience in my classroom. Sometimes what I do today is not recognized until years later by students (Survey response from T-89).

Teachers reported that expressions of gratitude and recognitions are not expected but are reasons that keep them in the classroom. The data for this study were gathered during the beginning of the pandemic, and some teachers described the excitement of being able to discuss the coronavirus with their students. One teacher said, “during this pandemic, current and former students reach out to me for help with science and their own children or to tell me how much they miss class” (Survey response from T-141).

Other instances of relatedness were with colleagues, parents, and the community. Colleagues included both teachers and administrators who were cooperative. Said one teacher, “I work within a great department with other teachers that have great ideas and are very supportive” (Survey response from T-121). Administrators who expressed collegiality with
teachers by working with them on projects or relaying positive comments such as “my new principal said that a parent had told her that her child was in medical school today because of me” (T-6) contributed to the Personal factors teachers’ used to describe their persistence. Parent and guardian cooperation with teachers took the form of supporting teacher expectations for students, offering encouraging comments, and providing monetary resources such as requests for grocery store items to be used in science labs. Teachers described community stakeholders such as local businesses, government agencies, civic organizations, and faith-based groups who collaborated to support student learning. Examples included grants, awards, donations of resources, and serving for school events when asked. Teachers also described a connection to the teaching profession itself. “Growing up as the offspring of educator parents” (T-42) described one teacher’s personal relatedness to the teaching profession. Science teachers explained interdependence with students, colleagues, parents, and the community as contributing to their intention to stay in the teaching profession.

Personal Competency and Behavioral Self-efficacy composed a second level of descriptions. Competency (14.4%) describes teachers’ understanding, knowledge, and effectiveness in teaching science. Self-efficacy (13.4%) describes the strength of teachers’ belief in their own ability and in their students’ outcomes. Taken together, the frequency of these factor responses was half of the number of Personal Relatedness factor responses.

Mid and late career science teachers, established in their fields, described equally the affirmation of knowing their content and knowing how to teach it. Fifty-six of the teachers in the survey recounted their abilities in teaching as other people learn a subject I know well (T-50), students get turned on to science due to labs (T-100), and their experience in my class pushes them forward in science-based careers that they thought were not obtainable (T-48). One
teacher, T-116, described a specific moment when she was able to utilize professional understandings during a lesson:

As I was answering a question posed by a student, I could sense confusion, not only in the student, but also in his classmates. Using informally gathered information, I was able to recast the lesson in a manner that the students could grasp the concept, using their interests to help them understand. I could almost see the light flashing behind their eyes (Survey response from T-116).

This experience solidified her decision to remain in teaching. Another teacher, T-102, reflected on his ability to teach science in this way:

I see myself getting excited about a new lesson or teaching strategy, even if it takes extra time. I've noticed that if I come up with a good idea for a lesson, I can't drop it; I'll spend too much time the day before finalizing the new idea to implement the next day. There are several specific times (incidents) when this has clearly happened (Survey response from T-102).

In the third and final tier of survey responses, mid and late career science teachers in this study mentioned Autonomy and five different Institutional or Sociocultural categories as contributors to their intention to stay in the teaching profession. Six teachers in the study talked about Autonomy, having a measure of control over their actions and input into the decisions that affect their jobs. For example, T-96 described *having freedom in the pacing and pedagogy that I use to teach science* (Survey response from T-96). Eight teachers described Institutional Job Benefits such as *being on the same schedule as his family* (T-43) or *job security during a pandemic* (T-146). Institutional Out of Field teaching (OOF) is of interest to this study. Only one teacher in the survey commented on this topic as *increasing intellectual demands by teaching new courses every couple of years* (Survey response from T-84). Six teachers described Sociocultural factors that contribute to their intention to stay in the teaching profession. Three teachers described Administrative Support. One teacher, T-41, recounted an incident from at least 10 years earlier.
During my first semester of teaching, I had a class that was very difficult behaviorally. There were two groups of female students that greatly disliked each other and were constantly threatening the other. There was also a group of male students that liked to do everything they could to antagonize the female groups and also try to get a rise out of me. One day, one of my assistant principal's came into my room while my students were doing independent work and told me to go take a walk. I was a little stunned. She told me she thought I needed a break from these students, that she would address their behaviors, that she did not want to lose me, and to come back in about 20 minutes. After the visit, the student behavior improved, albeit temporarily. I had not asked for her help. She had seen a need (perhaps due to my mentor teacher's intervention) and sought me out to help me. That support and the knowledge that I would be backed up made me decide to stay at the end of the year. (Survey response from T-41)

Two teachers described professional development (PD) opportunities such as a Biology Modeling course (T-75) and one teacher described their school climate, or moving to a school with a “successful” school climate (T-144), as contributing to their decisions to continue teaching. Missing from teacher descriptions and receiving no representation in the frequency analysis were Institutional categories of Facilities, Resources, Workload, and Sociocultural category of Enforced Instructional Practices.

Relationships between Factors Contributing to Teacher Retention

Once the major factors (Bandura, 1986) contributing to the teachers’ decisions to remain in the teaching profession were determined, relationships between the identified factors were examined through the analysis of interviews conducted with a subset of teachers who participated in the survey. The qualitative data analysis revealed three themes as to how Relatedness, Competency and Autonomy factors play into teacher retention: (1) Student success main motivator for retention, (2) Teacher success is a motivator for retention, and (3) Teachers who have control over the instances that cause success are more likely to stay.

Theme 1: Student Success Main Motivator for Retention. During teacher interviews, most teachers started by talking about their students. Primarily, teachers described personal
events, pedagogies, achievements, and curricula where students were successful. Teachers explained Relatedness with Students as a factor that affirmed their intention to stay in the teaching profession when their students were successful in learning the science content in their class or were successful in subsequent science experiences because of their class. Teachers also talked about times and ways that students’ comments validated their own personal learning experiences in the teacher’s classroom. John, a lateral entry teacher who has never transferred, recounted being nominated by a student for a teacher award two years after the student graduated from the public high school. *It validated what I’m doing as a teacher because he (the student) was being successful at college and gave me credit* (Interview response from John). Teachers want their students to be successful in their classes. These instances where students related to teachers in a personal way about their success have contributed to teachers’ intention to remain in the classroom.

**Theme 2: Teacher Success is a Motivator for Retention.** It was clear that teachers enjoyed talking about times when their students were successful in learning science content in their class or were successful in subsequent science experiences because of their class. Teachers described student success as achieving science subject understanding both in their class and in later college-level classes, earning high test scores, and choosing STEM careers. Teachers are motivated to continue teaching when they see themselves as contributing to the success of their students. Mid and late career science teachers have developed skills and amassed resources to do their job well. They want to be successful in performing their job, which explains the large number of Personal Competency and Behavioral Self-efficacy statements teachers gave in the survey and supports the quantitative findings of high correlation between science teaching outcome expectancy (STOE) and Commitment to Students.
Besides gaining competency through experience, professional educators in the study had sought to improve their craft through education. Eighty-eight percent had taken at least one master’s level class with four percent having earned a PhD in science education. Sixteen percent of the teachers were credentialed to be an administrator even though teachers interviewed stated that they did not want to leave the classroom. Elaine stated that the reason she sought the administrative credential was *I just want to know how they (administrators) think* (Interview response from Elaine). David, who now teaches at an early college, described writing several successful grants to fund science teaching resources and later rented a storage unit over the summer to keep his equipment when he transferred. Teacher interviewees recounted professional organizations such as the National Science Teachers Association, North Carolina Science Teachers Association, American Association of Physics Teachers, North Carolina Science Leadership Association, and the National Educators Association as contributing to their success.

It is important to note that teachers described their success as being able to ensure their students’ success in doing science, not necessarily as success in performance on a standardized test. Data from the test could be useful up to a point, but it only told part of the story and was never more important than what happened day to day in the classroom. For example, Edith, a non-certified teacher in a public charter school, described feeling inadequate until the first Education Value-Added Assessment System (EVASS) scores were released with confirmation that her students had done very well. EVASS scores are created for each NC teacher based on student test performance in his/her class. Edith quickly learned to trust her own teaching instincts and no longer needs the EVASS metrics. She is now an Advanced Placement (AP) reader and uses that experience each year to see what students all over the country are writing to inform her teaching for the next year.
Science teachers felt confident in their ability to recognize how to structure their classrooms, how to scaffold student learning, and how to give meaningful feedback to students. Some science teachers stated that their students did well on their relative version of a standardized test – North Carolina Final Exam (NCFE), End of Course (EOC) exams, or Advanced Placement (AP) exams – but most bemoaned the impact of being required to teach to the test or having to interact with administrators whose ideas were not always congruent with their own. For example, Doris, a lateral entry teacher who never transferred, says her test scores have always been high but her administration puts “needless stress” on her every year and has created a “toxic environment” because her benchmark scores are not as high as other schools. She understands that her choice to teach scientific writing in her Honors Biology classes results in lower benchmark scores during the first part of the course because she is not on pace with other schools in the county, but she makes up the ground later in the course when she condenses other content. Doris says her students’ scores are always the highest in the county on the final exam, yet every year she says that she is called in and “raked over the coals” by the administration for the low benchmark scores at the beginning of the course and then mildly praised at the end for the high EOC scores. This has resulted in feelings of animosity on her part, a strained relationship with those who are supposed to support her teaching, and she worries for the new biology teachers at her school who are not developing the autonomy skills to do what is best for students. David, a 31-year veteran who has transferred only once, described the negative impact of standardized tests on standard level students. *I don’t have time to add in the extra stuff for kids who need relevance the most. The tests just reinforce those kids’ negative feelings about science* (Interview response from David). Another teacher described it this way,

The NC public school system pushes for great test scores and even though they tell you not to, they want you to teach to the test (EOC, NCFE, VOCAT). They want you to push
for that graduation rate to increase. They want the test scores to look amazing so that NC looks like we know what we are doing in education on a national level. NC Public schools do not care if students retain or enjoy learning (Survey response from T-99).

With a mistrust of how data has been interpreted in the school to support student learning, teachers also report a misuse of data intended to support their growth in teaching. When cited, teachers in the study described teacher evaluations largely as unhelpful.

I love teaching. I love learning. And I love my students. That said, year after year, we are taught in professional development one thing and are evaluated on another thing. My test scores show I am a "highly effective teacher." I have received district and national awards for teaching. However, every time we get a new assistant principal over science, all teachers in our department - including other district/state/nationally recognized teachers- our evaluations drop to "proficient" or 2 on the state's 4 point grading rubric. The yo-yo of distinguished back to proficient or even developing for some teachers in our department is demoralizing (Interview response from Jonathan).

During the interview, Crystal described what she loves the most about teaching as “the sound of students learning.” Teachers understand how to connect students to science content, and what it looks like and even sounds like. Several of the teachers during the interviews revealed that they were married to a teacher or guidance counselor. They described the benefits of talking about strategies and the encouragement to try new pedagogies. Crystal and her husband self-published an activity book and science game. Teachers’ success in science teaching reinforced their decisions to persist.

**Theme 3: Teachers Stay by Focusing on What They Can Control.** When teachers described events that have reinforced their decisions to teach, they focused on situations and experiences that they can control. The factors teachers talked about having the most control over were in the Personal category. Personal Relatedness was described in Theme 1, Teachers want their students to be successful. Teachers included less detail about Personal Autonomy factors as compared to other categories, reporting a smaller number of quotes. For example, charter school
teachers described the control they had over school culture (Personal Autonomy). One charter school teacher, Edith, described how the culture of the school encourages positive Teacher-Student relationships. *When you prepare citizens of the world, academics follow* (Interview response from Edith). Edith described and complimented her administrative team, her colleagues, and her students for all the ways they were successful in working together, especially those who enjoyed her “corny” jokes. Philip, who teaches at a rural public high school in NC, has had only one principal during his tenure there. *The continuity means I know what to expect. Teaching is a good profession with community affirmation* (Interview response from Philip).

Teachers in this study described staying relevant and challenged. They personally invested their time and financial resources in professional development to learn skills and pedagogies. Over 77% of the mid and late career science teachers in this study had taken at least one graduate course. Many had National Board Certification. They talked about the benefits of education and genuinely wanted to help others. At the end of the survey teachers were given an opportunity to provide information they thought important to understanding mid and late career high school science teacher retention but was not asked about during the survey. Sixty-eight percent of the teachers chose to provide more information, with comments emphasizing already-made points and expressing concern for new teachers entering the profession.

Teachers do not have much control over Environmental factors and did not generally describe them as factors contributing to their retention. One Environmental Institutional factor of interest to this study is Out of Field Teaching (OOF). Teachers were split in how being asked to teach a new course impacted their decision to remain in the profession. Some teachers described learning to teach a new course as a welcome challenge while others described the angst of having to start a new course. Sara, a lateral entry teacher with a General Science Education license,
could be asked to teach any science subject without technically being OOF. She left one school system when a co-worker with a business degree was given the AP Biology class. *I was the wild card. I did well at it. But you become a pawn in the game. That is one of the reasons I left* (Interview response from Sara). Sara, a biology major in college, wanted to teach the AP Biology class but was not given the class because her license allowed the administration to give her any science class without technically being OOF. Charles, also a lateral entry teacher, reflected that it took him a *decade to get his AP Chemistry right* and he was not interested in starting from scratch to perfect new content. Martha, another lateral entry teacher, echoed Charles’ comments about teaching OOF. She had a degree in Environmental Science and a Master’s in Science Education, so her license allowed her to teach any subject. Martha has transferred once and would transfer again if she had to teach a science subject she did not want to teach. Edith echoed Charles’ comments about the subject. *I know how to teach chemistry. I understand where they are coming from. I do not want to [teach something else and] be mediocre* (Interview response from Edith). Jill received a Teaching Fellows Scholarship to pay for her college. She has transferred schools to work closer to home and would leave her current school if she were not teaching the subjects she wants. Richard said he would quit if he was told he had to teach Biology. *I don’t have the content knowledge and it is not in the best interest of the students* (Interview response from Richard). Elaine, with two advanced degrees and National Board certification, emphasized the importance of *keeping yourself challenged*. She wants to be challenged, but only on her terms. Elaine remarked that *everything was out of field in my first job. It is not the only reason I left, but it did contribute* (Interview response from Elaine).

Tabatha, a Teach-for-America teacher who has stayed in the profession after transferring twice, does not mind teaching OOF if the course is an upper-level class. *Freshmen have different
management tools and require different skills (Interview response from Tabatha). Tabatha enjoys teaching science and sees teaching upperclassmen a new course as sustainable but does not think teaching freshmen a new course would be sustainable because of having to deal with student motivation issues. OOF was seen as a factor that could appeal to some teachers and be a trigger to leave for others. A distinction to the appeal was how much control they felt in the decision to teach a new course.

Mid and late career high school science teachers in this study described mainly Personal factors that strengthened their desire to stay in the teaching profession. According SCT (Bandura, 1986), personal factors can have an individual impact on teacher persistence to remain in the profession. Most of the teacher responses in this study described personal factors of relatedness, competency, and autonomy which are consistent with the strong correlations between self-efficacy and Commitment to Students and Commitment to Teaching described earlier. While personal, environmental, and behavioral factors can be interrelated and work together to impact teacher persistence (Bandura, 1986), environmental factors were largely absent from teacher descriptions. When describing critical incidents that reinforced their decision to continue teaching, more than half of the teachers described being supported in some way. Sixty-eight percent used a form of the word “support” or “encourage” to relate how the incident contributed to their intention to stay in the teaching profession. Transition Theory (Schlossberg, 1995) further explains support as a resource a teacher can utilize during and after a critical event. The support described by teachers in this survey helped them access strategies to confront challenges and times when they might consider leaving.
Triggers and Coping Strategies Described by Mid and Late Career High School Science Teachers Who Have Considered Leaving

Almost fifty percent of the teachers who participated in the survey (n=72) said that they have seriously thought about leaving teaching. To identify triggers that cause mid and late career high school science teachers to consider leaving the teaching profession, survey data were analyzed using content analysis methods. Survey data analysis revealed patterns and semi-structured interview data analysis further explained themes that contribute to mid and late career science teachers’ intention to stay in the teaching profession. Survey and semi-structured interview data were then analyzed to describe coping strategies used to confront challenges and times when teachers considered leaving the teaching profession.

Triggers that Make Teachers Want to Leave the Teaching Profession

To explore trigger events that make teachers want to leave the teaching profession, open-ended survey data were analyzed using constant comparative methods. A priori codes were again taken from Bandura (1986). Frequency analysis examined the number and percentage of factors and the number and percentage of teachers describing each factor. Environmental Sociocultural and Personal Relatedness are the most prevalent factors as shown in Table 4.9. The complete coding scheme and frequency of individual factors can be found in Appendix I.
Table 4.9

*Frequency Analysis of Triggers Teachers Gave for Making them Want to Leave (n=72)*

<table>
<thead>
<tr>
<th>Bandura’s Factors</th>
<th># quotations</th>
<th>% of all quotations</th>
<th>#teachers reported</th>
<th>% teachers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Personal</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Autonomy</td>
<td>19</td>
<td>13.1%</td>
<td>19</td>
<td>26.4%</td>
</tr>
<tr>
<td>Relatedness</td>
<td>41</td>
<td>28.3%</td>
<td>41</td>
<td>56.9%</td>
</tr>
<tr>
<td>Competency</td>
<td>7</td>
<td>4.8%</td>
<td>7</td>
<td>9.7%</td>
</tr>
<tr>
<td><strong>Personal Total</strong></td>
<td><strong>67</strong></td>
<td><strong>46.2%</strong></td>
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<td></td>
</tr>
<tr>
<td>Environmental</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Institutional</td>
<td>31</td>
<td>21.4%</td>
<td>31</td>
<td>43.1%</td>
</tr>
<tr>
<td>Sociocultural</td>
<td>43</td>
<td>29.7%</td>
<td>43</td>
<td>59.7%</td>
</tr>
<tr>
<td><strong>Environmental Total</strong></td>
<td><strong>74</strong></td>
<td><strong>51.0%</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Behavioral</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Self-efficacy</td>
<td>4</td>
<td>2.8%</td>
<td>4</td>
<td>5.6%</td>
</tr>
<tr>
<td><strong>Behavioral Total</strong></td>
<td><strong>4</strong></td>
<td><strong>2.8%</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total all factors</strong></td>
<td></td>
<td><strong>100%</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Survey results from this study reveal that mid and late career high school science teachers describe experiencing triggers resulting in the desire to leave teaching in four of the six subcategories and do not describe experiencing triggers in two of the six subcategories. Triggers were notably abundant in Environmental Sociocultural (29.7%), Personal Relatedness (28.3.6%), Environmental Institutional (21.4%), and Personal Autonomy (13.1%). Triggers were notably low in Personal Competency (4.8%) and Behavioral Self-efficacy (2.8%).

In the previous qualitative section, Relatedness to Students was the number one factor cited by teachers in this study contributing to their retention. In this qualitative section, Relatedness to Students was cited as the number two factor cited as a trigger in leaving (16.6%). The same teachers who described student success as the reason that they stay, described student apathy and misbehavior as reasons they want to leave. When students are apathetic and uncooperative, teachers cannot do their job of teaching and want to leave. *It is hard to help students when they just do not care* (Interview response from Philip). One teacher at the end of the survey stated it like this,
I love what I do, but I no longer want to continue teaching in the US. The number of new directives, new initiatives, new programs is overwhelming. The hours that I put into my job are not yielding the same level of satisfaction. Instead of seeing more engagement among students with the addition of new practices, I see less motivation for learning. I want to go back to Africa, where resources might be lacking, but students are motivated to learn. There, I can truly make a difference (Survey response from T-124).

The only trigger teachers in this study described more than Relatedness to Students was in the Environmental subcategory Sociocultural Administrative Leadership and Support (24.1%). While student behavior could make teachers want to leave, administrative behavior was of a greater concern to teachers. When describing critical incidents in which they seriously considered leaving the profession, almost half of the teachers described a lack of support in some way. Forty-five percent used the word “support” as they described incidents that made them seriously consider leaving the teaching profession. Teachers described principals that are not supportive (T-61), overreacts, micromanages, and throws you under the bus (T-65), poor evaluations (T-86), being bullied (T-35), and doing what is easiest rather than what is best for the students and the school (T-115). They also described the instability of having multiple principals’ cycle through the school. Charles stated in his interview, the principal makes the school. When a parent calls with a complaint, a supportive principal should ask if they have talked with the teacher yet (Interview response from Charles). In contrast, Philip, a third-generation educator, reported a strong sense of knowing what to expect and always feeling supported by the administration (Interview response from Philip). Philip has had only one principal during his entire high school teaching tenure.

Science teachers also described the Institutional factor of Salary/Job Benefits as a trigger to make them consider leaving. Responses included not received a raise in compensation for more than 10 year while my costs for health insurance and taxes have risen (T-96), took away master's pay and mentor pay and club pay and have added more and more responsibilities
without compensation (T-97), did away with longevity (T-23), and I will no longer get a raise (T-115). Of interest to this study, only 43.5% of the mid and late career teachers in this study taught an AP course and were even eligible for the supplemental funds paid for their students’ scores on AP exams. Quantitative data analysis however did not reveal a significant contribution of this characteristic on teacher commitment. Survey data did not describe the supplemental funds available to AP teachers as a factor that impacted their mobility decisions. Neither did teacher interviews. Jill, an AP Chemistry teacher, was against the program even though she personally benefited. It is a horrible program. ABC money should be for everybody. Bonuses for scores is just wrong. Especially when teaching AP is easier than teaching standard level (Interview response from Jill). Teachers wanted legitimate compensation for their work and thought educators should be compensated for higher levels of education.

Finally, mid and late career high school science teachers described the Personal Autonomy factor of Policy Decisions as a trigger. Personal Autonomy describes both the policy decisions that are made for the school without the teachers’ input (such as curriculum, course change, loss of rigor, blind focus on standardized tests or graduation rates) as well as the lack of opportunity for teachers to advance in leadership roles. One teacher described how the administration did not disagree with his policy decision, they just did not allow him to make decisions that were (obviously) the best for teaching his subject.

I had developed a vast set of interesting and enjoyable presentations to deliver my content to the students. These presentations included self-made animations unavailable via internet and many, many years of hard work. The school was moving to another computer type that did not support my software. I assured the admin that I would not require students to use anything other than the school sanctioned software and that I would use my own computer for my presentations. I even offered to purchase (at my expense) a computer matching the one they had chosen, and to purchase (again at my expense) the software to run my presentations. My scores had been excellent throughout my career. My students had always done well. The admin ordered me to either change
to another software. I quit. One year later, after I was teaching at another school, I found that the teacher who took my place was pirating my work from my new school's website (Survey response from T-149).

Personal Autonomy also describes classroom decisions made to micromanage teachers or appease parents. Pacing guides, schoolwide grading and homework policies were cited as examples where teachers were not allowed to independently make instructional decisions in their own classrooms concerning curriculum, behaviors, or teaching and learning expectations.

Personal Competency and Behavioral Self-efficacy triggers were notably low in this study. One teacher explained her belief that students would not perform well on state exams as a consequence of the system focused on test scores rather than on students. Students know that they have not learned anything and will be passed on anyway, so they do not learn, do not want to learn and the administrators are really just making it worse by continuing to pass them on and blaming the teachers and the school. It is a terrible cycle (Survey response from T-32).

According to this teacher, the reason for expected low outcomes for students was systemic rather than personal.

In addition to the incidents described in the survey, teachers who were interviewed described additional critical events that they had not described when they completed the survey. These included family events of marriage, birth of a child, spouse’s job moved, parent died, and a child entered high school. The events did not fit in the coding frame of school stresses. However, they were times of transition and times the teachers reflected and considered leaving. It is natural for mid and later career teachers to experience these normal life events. Transition Theory (Schlossberg, 1995) frames these situations as times of transition, times when teachers considered leaving the profession.
Coping Strategies Teachers Use When They Consider Leaving

To explore coping strategies contributing to teacher retention, open-ended survey and interview data were analyzed using constant comparative methods. A priori codes were taken from Schlossberg Transition Theory (Schlossberg, N. K., Waters, & Goodman, 1995). Frequency analysis examined the number and percentage of factors and the number and percentage of teachers describing each factor. The most prevalent strategy teachers described was Managing Stress after it occurred as shown in Table 4.10. The complete coding scheme and frequency of individual factors can be found in Appendix J.

Table 4.10

Frequency Analysis of Coping Strategies Teachers Use When They Consider Leaving

<table>
<thead>
<tr>
<th>Schlossberg’s Strategies</th>
<th># quotations</th>
<th>% of all quotations</th>
<th>#teachers reported</th>
<th>% teachers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Modify Situation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Negotiation</td>
<td>5</td>
<td>5.2%</td>
<td>5</td>
<td>6.9%</td>
</tr>
<tr>
<td>Personal Discipline</td>
<td>11</td>
<td>11.3%</td>
<td>11</td>
<td>15.3%</td>
</tr>
<tr>
<td>Optimism</td>
<td>5</td>
<td>5.2%</td>
<td>5</td>
<td>6.9%</td>
</tr>
<tr>
<td>Seek Advice</td>
<td>5</td>
<td>5.2%</td>
<td>5</td>
<td>6.9%</td>
</tr>
<tr>
<td><strong>Modify Situation Total</strong></td>
<td><strong>26</strong></td>
<td><strong>26.9%</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control Meaning</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Neutralize</td>
<td>7</td>
<td>7.2%</td>
<td>7</td>
<td>9.7%</td>
</tr>
<tr>
<td>Positive comparison</td>
<td>3</td>
<td>3.1%</td>
<td>3</td>
<td>4.2%</td>
</tr>
<tr>
<td>Selective Ignoring</td>
<td>11</td>
<td>11.3%</td>
<td>11</td>
<td>15.3%</td>
</tr>
<tr>
<td>Substitute rewards</td>
<td>12</td>
<td>12.4%</td>
<td>12</td>
<td>16.7%</td>
</tr>
<tr>
<td><strong>Control Meaning Total</strong></td>
<td><strong>33</strong></td>
<td><strong>34.0%</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manage Stress</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Withdrawal</td>
<td>21</td>
<td>21.6%</td>
<td>21</td>
<td>29.2%</td>
</tr>
<tr>
<td>Hope</td>
<td>1</td>
<td>1.0%</td>
<td>1</td>
<td>1.4%</td>
</tr>
<tr>
<td>Relaxation</td>
<td>3</td>
<td>3.1%</td>
<td>3</td>
<td>4.2%</td>
</tr>
<tr>
<td>Passive acceptance</td>
<td>13</td>
<td>13.4%</td>
<td>13</td>
<td>18.1%</td>
</tr>
<tr>
<td><strong>Manage Stress Total</strong></td>
<td><strong>38</strong></td>
<td><strong>39.1%</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total all factors</td>
<td><strong>97</strong></td>
<td><strong>100%</strong></td>
<td><strong>72</strong></td>
<td></td>
</tr>
</tbody>
</table>

According to Schlossberg (1995) teachers utilize three main categories of coping strategies – modify, control meaning, and manage afterward. The coping strategy used depends on the situation, the teacher’s perceived support systems and the teacher’s personal...
characteristics. Effective copers have flexibility and several strategies to draw upon (Schlossberg, Waters & Goodman, 1995). Survey results from this study revealed that mid and late career high school science teachers described coping strategies almost evenly between the three categories.

Science teachers, problem solvers by trade, describe coping strategies in the Manage Stress category (38.0%), the Control Meaning category (34.0%), and Modify the Situation category (26.9%). Manage Stress, strategies aimed at accommodating the existing stress of the event without being overwhelmed by it, is cited most often by teachers in this study. The coping strategy that most often moderates the teacher’s decision to persist in the profession is to withdraw or leave the school in which s/he is currently teaching. Control Meaning strategies are aimed at cognitively neutralizing the event and Modify Situation strategies seek to alter the source of the event.

While only 72 teachers (47.4%) responded that they had seriously considered leaving the profession, only 21 teachers of that group (29.2%) listed transferring to a new school as a coping strategy. Other strategies given in the study include Help Manage Stress through Passive Acceptance (13.4%), Control Meaning through Substitute Rewards (12.4%), Selective Ignoring (11.3%), and Modify Situation through Personal Discipline (11.3%).

**Relationship Between Factors Contributing to Teacher Attrition**

Negative Critical Incidents, those prompting teachers’ consideration of leaving the profession, were examined through the analysis of semi-structured interviews. The data analysis revealed three themes as to how the identified Triggers and Coping Strategies play into teacher attrition, leaving the profession before retirement: (1) Unsuccessful relationships make teachers
want to leave, (2). Teacher transfer is the most common coping strategy, and (3). Teachers who stay, focus on their own environment.

**Theme 1: Unsuccessful Relationships Make Teachers Want to Leave.** Teachers describing triggers that caused them to consider leaving the profession most often cited deficits in Administrative leadership or Student responsibility. Teachers did not describe an inability to do their job. Rather, they described being unsuccessful in their job of teaching students due to lack of student cooperation with the job of learning or lack of administrative leadership in helping to facilitate students’ focus on the job of learning. Teachers described incidents when students would complain about me asking them to do work.... criticized my teaching style (T-26), students more interested in their cell phones than their assignments (T-61), students think that education is all about grades. They don’t think that it is necessary to understand a concept and that a grade is the point of all activities (T-69), and Children no longer being held accountable. It is the teacher’s fault if a child who does nothing fails (T-74). Teachers also described leadership issues where the district that I work for does not do enough to support administrators (or teachers) that do the right thing (T-76), I was bullied by a principal for whistleblowing on their extremely poor human relation practices, lying and broken verbal contracts (T-35), a student had broken a rule several times and told the principal the rule was never broken. The principal chose to believe the student over me (T-77), and graduation rates became the end all, be all to evaluate teachers (T-95). Another teacher wove the students’ and administrative relationships into one response:

Classroom behavior and lack of interest by students. Lack of support by administration. Wavering of academic standards. Having students passed when they have not met standards. At previous schools, students have graduated with a 30% average. I get frustrated when we have to provide so many remediation options and they are not used by students. I understand different social and cultural backgrounds, but the lack of interest or
concern in meeting criteria is disturbing. Blaming the teacher for student failure is debilitating and kills morale (Survey response from T-108).

Support is a potential resource used during critical incidents (Schlossberg, 1995) when people are experiencing transitions. More than half of the mid and late career teachers in this study described a sense of support when asked to describe an incident that reinforced their decision to continue teaching. Almost 30% of the teachers in this study cited lack of administrative support as the trigger that made them seriously consider leaving the profession. Teachers in this study believe they have the self-efficacy and competency to do their job, but when they are unsuccessful, and do not have the relationships to support what they need, they leave.

**Theme 2: Teacher Transfer is the Most Common Coping Strategy.** The most frequent coping strategy was Transfer to another school or leave the profession: 21.6% of the teachers cited this strategy. The second most frequent coping strategy was given by 13.4% of the teachers, Passive Acceptance. Teachers saw their options during a transition as doing nothing or completely leaving. Teachers explained *I sought counseling and was advised to leave public education and try private* (Survey response from T-140), and *I transferred schools. My self-esteem took a blow, but at the new school I was valued and treated like a member of the team. A greater percentage of the students were nice, so I was glad to make the move. I feel sorry for the teachers who are stuck and start thinking that the problem is with them.* (Survey response from T-32).

Teachers were asked in the interviews why they thought science teachers had such high rates of teacher attrition. It was suggested that *science and math teachers are more likely to be introverts, would naturally move to a higher-paying lab bench job after spending a few years in the classroom* (Interview response from Robert), *science teachers have more options and can do*
more things with their degree other than teach (Interview response from Elaine), or that science teachers are logical by nature and the chaos of bad policies would make them want to leave the classroom (Interview response from Emily). Most teachers acknowledged there were a lot of triggers any teacher might experience, and that science teachers were uniquely qualified to be problem solvers. Unfortunately, the most common solution was to leave the school or quit the profession.

To understand why leaving the school was given as the most frequent coping strategy (21.6%), interviewed teachers talked about administrative leadership and support, which was described as the most frequent trigger causing teachers to consider leaving the profession (24.1%). Teachers described the administration's role in running the school and providing the leadership needed to deal with issues.

They (administration) can set you up for success or failure by what classes you are assigned, how many students and which students you get and if they will deal with or acknowledge the discipline issues. The administration just wants to look good so they can go to the next level and teachers are pawns in the game. I had a principal say don’t take it personal, it's just data. But it is personal. I work hard. And it is my data. (Interview response from Mary).

Most teachers who chose to leave relate that they could not agree with the current school practices impacting them and their students. Teachers talked about AVID (Advancement Via Individual Determination) programs, technology, problem-based learning (PBL), and freshmen academies as school wide initiatives with which they resonated. These programs were run in ways that the teachers could support. The teachers did not need to have the program to successfully teach science but having the program at the school was seen as a benefit for students. Some teachers talked about principals who throw teachers under the bus (Interview response from Charles), be underhanded and vengeful (Interview response from Doris), think test
scores and graduation rates were signs of a good leader, and not understand how science works (Interview response from Jonathan). Transition Theory (Schlossberg, 1995) describes potential resources teachers use during the transition process. Having multiple strategies has been seen as effective (Pearlin & Schooler, 1978). Frances described her coping strategies as talking to colleagues and taking mental health days. She has withdrawn twice in her career. The first time she left a school, after working on a project and not receiving credit, she transferred to another school in the same district. The second time she left she took a $10,000 pay cut to work at a public charter school where she loves her environment and is “totally fulfilled.”

Unique to teaching science, science teachers tend to collect a lot of resources in order to teach the concepts. Teachers were asked in the interviews if they thought moving schools was seen as less of an option for science teachers. Not a single teacher saw the amount of stuff a science teacher would have to move as a detriment to moving. At one time you were given some latitude in school because it would be a pain to move but that doesn’t seem to matter with new principals. Sure it is more effort, but so is teaching where you are not wanted (Interview response from Jenny). One teacher told of renting a storage unit during the summer to hold all of the personal equipment he had acquired over two decades of teaching before he could move it into his new school.

It is important to note that 83.7% of the teachers in this study had transferred at least once, but only 47.4% of the teachers in this study indicated that they had seriously considered leaving the profession. This implies that transferring is a successful coping strategy that prevents teachers from leaving the profession. Interview data revealed that some teachers transferred as many as 15 times in 30 years (Interview Response from Ruth). While most teachers did not transfer that much, science teachers in this study did transfer much higher than the national
teacher average of 8%. Supporting teachers in their current school is the preferable goal to support student achievement and school stability.

**Theme 3: Teachers who Stay, Focus on Their Own Environment.** Teachers focus on the factors that they can control when coping with stress that might cause them to leave the profession. In each of the categories of coping strategies, high numbers of quotes were given to strategies that teachers have absolute control over and low numbers of quotes were given to strategies that described teachers depending on something external. For example, Passive Acceptance and Personal Discipline were high while Seek Advice and Relaxation were low. When coping with stress, teachers look for ways to create new growth opportunities. Teachers focused on improving an aspect of themselves or acquiring Professional Development to bring about a resolution. It is important to note that the times when mid and late career high school science teachers considered leaving the profession were not connected to feelings of incompetence or lack of self-efficacy. Mary summed it up well when she said, *I am confident in my ability as a teacher, I can teach any subject you want me to teach* (Interview response from Mary). As an additional comment to the survey, seven teachers described some connection to professional development or pedagogy, one teacher stating *I recommend science teachers to look for opportunities to work in a lab, during the summer, possibly at a university or local government/private research facility. It would help them appreciate what scientists do and maybe excite them about the field of science* (T-5). For these career educators, they turned to education as a way to confront a challenge or cope with an unwanted issue.

Mid and late career high school science teachers in this study described Environmental and Personal factors that triggered times when they considered leaving the teaching profession. This finding is consistent with the correlations described earlier. High correlations were found
between self-efficacy constructs and teacher commitment. Behavioral self-efficacy factors were not described by teachers in this study as triggers for time when they considered leaving. SCT describes how personal and environmental factors can be interrelated and can individually impact teacher commitment (Bandura, 1986).

Potential resources available during the transition include support, strategies, situation, and self (Schlossberg, 1985). Mid and late career high school science teachers in this study highlighted the importance of support. Coping strategies described by teachers were strategies they could control with the most common being transferring to a different school. This would explain why teacher commitment to their school and to their profession was not as high as commitment to students and to teaching. Because the teachers in this study have been teaching for a longer period of time, they should have more strategies from which to draw. Effective coping is being able to access a range of strategies, even if they continue to rely on the same strategy (Pearlin & Schooler, 1978).

**Summary**

Survey data found strong, significant correlations between high school science teachers’ self-efficacy and commitment. Higher levels of correlation were found between Teacher Commitment and the PSTE and STOE constructs than between Teacher Commitment and Overall Self-efficacy. STOE was found to be highly correlated to each of the four commitment subscales – Commitment to Students, Commitment to Teaching, Commitment to School, and Commitment to the Profession. PSTE was also found to be highly correlated with each of the four commitment subscales, although correlations with Students and Teaching subscales were stronger than correlation with School and Profession subscales. Mid and late career North Carolina Science teachers who took this survey were not as committed to their profession and
their schools as they were to their students and their practice of teaching. T-tests and analysis of variance (ANOVA) examined the impact of demographic teacher variables on the relationship between self-efficacy and commitment. Science teachers teaching in Suburban communities reported higher Overall Commitment compared to their Urban and Rural counterparts. Science teachers at Non-Title 1 schools reported higher Overall Commitment compared to their Title 1 counterparts. Multiple regression analysis examined the contribution of demographic variables on the relationship between self-efficacy and Teacher Commitment and the four commitment subscales after controlling for four teacher characteristics (gender, age, experience and education) and three school characteristics (size of community in which the school is located, whether the school is a conventional public school as compared to a private, charter or magnet school, and the percentage of the students receiving a free or reduced lunch). The findings demonstrate that PTSE and STOE were consistent predictors of Teacher Commitment and three of the four subscales. As PTSE and STOE increased, so did commitment. The exception is that PTSE was not found to have a significant effect on Commitment to the Profession.

Qualitative findings were used to inform the quantitative results. Survey data found three levels of factors that contribute to mid and late high school science teachers’ intention to stay in the teaching profession. Personal Relatedness (Students) was described twice as much as Personal Competency and Behavioral Self-efficacy combined. Positive critical incidents described themes of student success being the main motivator for retention, teacher success is a motivator for retention, and teachers who have control over the instances that cause success are more likely to stay. Survey data further revealed Personal and Environmental triggers to leave the profession impacting mid and late career science teachers are Environmental Sociocultural (Administrative leadership/support), Personal Relatedness (Students), Environmental
Institutional (Teacher Salary), and Personal Autonomy (lack of input into school policy). While there are a variety of triggers, the behavioral factor of self-efficacy is largely missing. Teachers use a variety of coping strategies to confront challenges and times when they consider leaving the profession. Modify the Situation, a strategy that would deal with the stress without incurring teacher mobility, is not a commonly used strategy; leave or transfer is the most common strategy. Negative critical incidents described themes of unsuccessful relationships making teachers want to leave, teacher transfer is the most common coping strategy, and teachers who stay cope by focusing on their own environment.

This chapter explained the quantitative and qualitative findings of this study. The next chapter, Chapter 5, will discuss these findings.
CHAPTER FIVE
DISCUSSION

The purpose of this study is to examine the relationship between self-efficacy and teacher commitment constructs of mid and late career high school science teachers in North Carolina. This study also explores factors that contribute to teachers’ intention to remain in the profession and coping strategies used to confront challenges that lead them to consider leaving the teaching profession. Understanding the relationship between self-efficacy and experience on science teachers’ commitment can improve science teacher retention and result in high-quality teaching and learning. A detailed examination of factors contributing to experienced teachers’ intention to stay in the profession and coping strategies used when they consider leaving the profession can support science teacher retention, prevent teacher shortages, and close opportunity gaps for students.

In this chapter, I discuss both the quantitative and qualitative findings of this study in the context of my research questions, focusing on three aspects: strongest relationship between self-efficacy and commitment to students, personal factors contributing to mid and late career teacher commitment, and teachers’ focus on what they can control. Implications for policy, practice and future research are addressed.

**Strongest Relationship Between Self-Efficacy and Commitment to Students**

Quantitative results from this research showed strong, significant correlations between self-efficacy and commitment, with high levels of correlation between both Personal Science Efficacy (PSTE) and Science Teaching Outcome Expectancy (STOE) in a sample of mid and late career science teachers’ Commitment. The strongest relationship was between PSTE, STOE and the Commitment to Students construct. Mid and late career North Carolina high school science
teachers who took this survey were specifically committed to their students. Qualitative data further explained this finding. Teachers described their students’ academic successes and their ability to help their students achieve academic success as motivators for staying in the profession. This finding is not surprising. Park (2005), for example, found that teachers’ commitment to their students plays an important role in student achievement. Pil and Leana (2009), focusing on human capital of teachers, found that students whose teachers had greater human capital including education and experience, had greater educational benefits as compared to their counterparts (Pil & Leana, 2009). Science teachers have also been found to have higher levels of education and attended harder to get in schools (Ingersoll, 2001) which can also benefit their students. Quantitative findings from my research demonstrated that self-efficacy had a direct and significant impact on Commitment to Students while qualitative findings showed that these teachers are both motivated by and interested in the success of their students. The investment by teachers in their own self-efficacy, education, and experience results in greater Commitment to Students. Findings from my research which focuses only on mid and late career teachers are consistent with those of Freeman and Fields (2020) who report that late career teachers have slightly but meaningfully higher commitment scores than early career teachers. Across their career trajectory, teachers’ self-efficacy develops along with their commitment to their students and their perception of their ability to teach their students. The strength of the relationship between self-efficacy and Commitment to Students can further be explained by how teachers care about their students’ success and the predictors of Teacher Commitment.
**Teachers Care About Student Success**

The strongest correlation in this study was found between the self-efficacy constructs and teachers’ Commitment to Students. An explanation for this is teacher investment in student success. Previous research has shown the importance of quality teachers on student learning (Alliance for Excellent Education, 2008; Darling-Hammond, 2000; Stronge, Ward, & Grant, 2011). Researchers have also identified significant relationships between teacher self-efficacy and teacher commitment (Chan, Lau, Nie, Lim & Hogan, 2008; Chesnut & Cullen, 2014; Coladarci, 1992; Klasen & Chiu, 2011). Teachers with strong self-efficacy beliefs tend to think they can make a difference in their environment and are more likely to be committed.

Quantitative data from my study showed Science Teaching Outcome Expectancy (STOE) significantly associated with Teacher Commitment and all of the commitment constructs. Success is focused on the student’s learning and achievements. Experienced science teachers care about their students’ achievements and experiences in the classroom. Comments teachers made during the qualitative open-ended questions and interviews described student success through students’ papers published, STEM careers advanced, additional science courses taken, degrees earned, and gratitude expressed. Experienced science teachers know how to successfully teach their students and are invested in the best outcomes for their students as evidenced in the high levels of correlation between self-efficacy subconstructs, PSTE and STOE, as well as the absence of self-efficacy as a trigger to make teachers consider leaving.

Science teachers in this study also complained about principals who wanted to shortchange students in order to manipulate data about school indexes. These school level practices that undermine rigorous learning environments for students can be sources of stress, prompting critical incidents whereby teachers are more likely to leave the school. Practices that
promote test taking strategies such as teaching to the test could meet school accountability goals but are not appropriate pedagogies for prolonged learning and can result in teacher’s being disenfranchised from their schools. Previous research has identified a link between school leaders who focus on school improvement goals which do not foster an environment leading to greater teacher commitment to students (Freeman and Fields, 2020). In this way, underserved schools with high teacher turnover rates do more to undermine teacher retention by adopting “grade fixing” practices that do not hold high expectations for students (Firestone & Rosenblum, 1988; Freeman & Fields, 2020).

**School Types are a Critical Predictor of Teacher Commitments**

Findings from this research show a relationship between teacher age and education and commitment. As age increases, Commitment to Teaching increases and as education increases Overall Teacher Commitment decreases. This finding is consistent with previous research (Malinen & Savolainen, 2016). Since my research focuses only on mid and late career teachers, it is possible that those teachers with lower levels of self-efficacy and commitment exited the teaching profession leaving only those teachers who are highly invested and committed. This empirical finding is given context from comments teachers made during the qualitative open-ended questions and interviews. Mid and late career teachers revealed high levels of self-efficacy and competency. Several teachers indicated that the many years of teaching solidified their career choice as they did not think they had the skills to be able to start a new career at the level of pay they were currently earning. Before 2013, in North Carolina, teachers were compensated for earning advanced degrees. Teachers earning higher degrees may have lower levels of commitment because of the lack of compensation for more investment in their education and ability to serve their students. Some teachers described earning another degree to acquire new
skills and move out of the classroom. Although many teachers in this study had advanced degrees and credentials, teachers being interviewed indicated that currently, the only reason to get an advanced degree was to help you find another job. No other teacher level variables showed a relationship with teacher commitment. This included the teacher assignment variable of teaching an advanced placement (AP) course. Bonus pay to teachers whose students score at a certain level on Advanced Placement (AP) exams has been implemented in North Carolina for the stated purpose of increasing teacher retention. Usually, more experienced teachers teach the higher-level courses and would benefit from additional pay. But AP course teacher assignments are not uniform across schools. Not all schools offer AP courses and principals in NC can choose to reallocate school resources by having students take AP-level courses at the community college. About 43 percent of the teachers in the current study were teaching an AP course at the time the data were collected with teachers in traditional public schools and those in other types of schools about equally likely to teach an AP course. There was no significant effect however of teaching an AP course on commitment which could mean that teaching an AP course, or receiving money for student AP exam scores, does not matter to teacher commitment.

School characteristics contributing to the full model included School Type and Percent Free Lunch. Teaching Commitment, School Commitment, and Professional Commitment was lower for science teachers in traditional public schools and higher for science teachers in non-traditional public schools (public magnet, public charter, and private schools). One explanation for this is that most non-traditional public schools are not bound by the high stakes testing and accountability mandates. Science teachers in these non-traditional schools might feel more empowered to teach their subject outside the constraints of standardized test material, including ways that may be more creative and interactive. Teachers in private and public charter schools
described in open-ended questions how respect, value, and trust “filled” them emotionally. Furthermore, School Commitment was lower for high school science teachers in schools with a higher percentage of free and reduced lunch students as compared to those teachers in schools where a lower percentage of students receive a free or reduced cost lunch. An explanation for this is schools with high percentages of free and reduced lunch costs are harder places to teach because of inherent problems associated with student poverty and higher amounts of teacher turnover (Carver-Thomas & Darling-Hammond, 2019; Ingersoll, 2001). Another explanation for this is that schools with high percentages of free and reduced lunch costs have more pressure to graduate students without having met minimal academic expectations, disenfranchising science teachers (Freeman & Fields, 2020; Johnson, Susan Moore & Birkeland, 2003; Ryan et al., 2017).

Only two of the demographic variables analyzed in this study revealed a noteworthy difference in Teacher Commitment – Community Size (Urban, Suburban, Rural) and Title 1 Status (Title 1 or Non-Title 1). Science teachers teaching in Suburban communities reported higher Teacher Commitment compared to their Urban and Rural counterparts and science teachers at Non-Title 1 schools reported higher Teacher Commitment compared to their Title 1 counterparts. This finding is consistent with previous studies (Ingersoll, R., 2001; Schaefer, Long, & Clandinin, 2012). Ingersoll (2001) described teacher movement to majority and affluent schools because they are closer to home and have better working conditions which can result in higher levels of commitment. An alternative explanation is that teachers who care about their students move because they do not believe their students are getting the high-quality education they deserve. Teachers who start their careers in underserved schools might choose to leave them because school-level practices circumvent teacher-level decisions. Practices in place to improve graduation rates include graduating students who have not actually met the requirements, letting
students turn in assignments at any time without consequence, and practices intended to improve standardized test grades include “drill and kill” pedagogies (Battle & Looney, 2014; Ryan et al., 2017) may result in teacher disenfranchisement as these practices can result in fewer educational opportunities for students. Teachers who care about their students and care about providing quality lessons—would not be able to teach in an environment that is not structured, in their understanding, to promote students’ rigorous learning.

**Personal Factors Contributing the Most to Mid and Late Career Teacher Commitment**

Teachers’ relatedness was the most important factor contributing to mid and late career high school science teacher retention. Relationship with students and their desire for student success were the most important factors identified in the qualitative portion of this research. Other analyses revealed interesting patterns. Personal factors of Autonomy and Relatedness to Colleagues increased teacher commitment, Sociocultural factor of Out of Field (OOF) teaching can be a positive or negative trigger, and Environmental Institutional factors did not impact commitment as much as previously suggested (Ingersoll, 2001; Simon & Johnson, 2015; Skaalvik & Skaalvik; 2014; Wong & Luft, 2015).

One interesting pattern was identified when examining the Personal factors of Autonomy. Mid and late career high school science teachers described their own success in teaching as seen in their students’ achievements as a motivator for retention, and they stay when they have control over what and how they teach. Skaalvik and Skaalvik (2014) found that both teacher autonomy and self-efficacy were independent predictors of commitment. Teachers reveal that they take their jobs seriously and for them, it is personal.

The next noteworthy pattern was the results from the Personal factor of Relatedness to Students and Relatedness to Colleagues analysis. When asked to explain an incident that has
strongly reinforced their decision to continue teaching, teachers in this study overwhelmingly described Personal Relatedness factors, specifically incidents connected to students. Teachers are committed to their students’ success and are motivated by student cooperation and acknowledgement. Teachers also described the importance of colleague collaboration and community support. Positive colleague interactions build instructional capital and contribute to teacher satisfaction (Simon & Johnson, 2015). Amrein-Beardsley (2007) found that the attitude of other teachers impacted the decision of expert teachers to move to a hard to staff school. Teachers need to know that other teachers in the building are dedicated to their work, especially when the work will be challenging (Amrein-Beardsley, 2007). Mid and late career teachers who are continuing to develop teaching strategies rely on peers and community partners (Wong & Luft, 2015).

Skaalvik and Skaalvik (2011) examined teachers’ feeling of belonging as a motivation for commitment and found that relationships with colleagues, administrators, and parents were independent predictors to a feeling of belonging. Other factors that create teacher commitment are community organizations who partner with local schools to award teacher grants, donate resources, and serve at school events thus demonstrating an investment in the school by the larger community in which the school is located (Skaalvik & Skaalvik, 2011). Teachers in my study described an emotional connection to the teaching profession, some using the word “calling” or justice issues as reasons that encourage them to stay. For example, teachers who talked about other family members who were teachers described teaching as being a part of their DNA.

I also examined Institutional factor Out of Field (OOF) teaching, which has been criticized as a trigger for teacher turnover (Ingersoll, 2001). Previous studies found OOF
teaching to negatively influence student achievement (Ingersoll, 2001; Nixon, Luft & Ross, 2017). Ingersoll (2001) suggested principals misassign teachers as short-term solutions that save schools money by not investing in additional training required for a fully qualified teacher. As expected, the prevalence of OOF teaching assignments has been linked to teacher attrition (Nixon, Luft & Ross, 2017; Soares, Lock & Foster, 2008). While some of the mid and late career science teachers in this study saw a new course as a significant stress, not wanting to invest in learning a new course and being mediocre on the learning curve, others described enjoying the challenge of teaching a new course. It is possible that experienced teachers with high levels of science self-efficacy might see a new course as an asset and as an opportunity to expand their own knowledge base.

Interestingly, findings from this study showed that Personal Autonomy and Environmental Institutional factors did not impact teacher retention as much as previous studies suggest. Research has suggested implementing advanced teaching roles or strengthening the role of teacher-leader as a way to encourage teachers to stay in the profession (Freeman & Fields, 2020; Wenner & Campbell, 2016). While a stated goal of these strategies is to keep teachers in the classroom, leadership roles can actually move teachers away from direct contact with students and towards more contact with other teachers or administrators. Advanced teaching roles are more aligned with encouraging Autonomy factors rather than Relatedness factors, and my study found that Relatedness with students was more likely to keep teachers in the classroom.

**Teachers’ Focus on What They Can Control**

To answer the third research question, what coping strategies do mid and late career science teachers use to confront challenges and times when they consider leaving the teaching profession, qualitative analysis of open-ended responses to the survey questions and responses
from the interviews revealed patterns and themes pertaining to triggers, critical incidents, and coping strategies. Quantitative findings supported the qualitative results.

While this study seeks to add to the asset-based perspective of teacher retention, critical incidents can be both positive and negative. Exploring negative incidents, triggers that made teachers consider leaving the teaching profession, and coping strategies provides an opportunity to triangulate responses with positive incidents and develop a richer understanding of teacher retention.

Many of the teachers in this study listed a range of triggers that made them consider leaving the profession. Triggers included student misbehavior, lack of administrative support, and low salary without additional compensation when asked to do even more. Teachers used several different strategies to manage these potential problems, including acquiring more skills, ignoring the situation, passive acceptance, and withdrawal (transferring to a new school). While teachers in this study described a range of triggers that prompted a stress or possible transition, it is noteworthy that teachers did not describe a range of coping strategies to deal with the challenge that made them consider leaving the profession.

**Range of Triggers related to NC Policies**

Personal and Environmental triggers that cause mid and late career high school science teachers to consider leaving the profession include Environmental Sociocultural (Administrative leadership/ support), Personal Relatedness (Students), Environmental Institutional (Teacher Salary), and Personal Autonomy (lack of input into school policy). While there are a variety of triggers, the Behavioral Self-efficacy factor is largely missing as a trigger to attrition. This supports the quantitative results from this study. Teachers in this study had high values of self-efficacy.
Frequency analysis of triggers teachers described when they considered leaving the profession were evenly distributed between the Environmental and the Personal category. In the quantitative analysis, teachers’ Personal Science Efficacy (PSTE) was highly correlated with Commitment to School and Commitment to Profession, but not as highly correlated as Commitment to Students and Commitment to Teaching. In other words, there is an opportunity to improve Commitment to School and to possibly reduce the number of teacher movers and improve Commitment to Profession and reduce the likelihood of teachers leaving the profession.

Eliminating teacher tenure effectively changed the terms of commitment as described by Brown (1986). I did not directly ask teachers in this study how they feel about the role of the State in their teaching, but teachers talked about how things have changed for them in their career. Many teachers indicated in both the survey and interviews about legislative actions freezing teacher pay and decreasing teachers’ benefits. They were upset with the salary schedule, they were expected to do more with less, and to volunteer for jobs that they had once been paid to do such as mentoring and advising students in clubs. Teachers expressed a lack of support from the NC General Assembly to do the job of teaching. Research is needed to better understand how school and professional commitment might be increased as a way to support teacher decisions to stay in the profession.

Over 83% of the teachers in this study had moved schools at least one time. Organizational research suggests there might be differences by gender in how triggers impact teachers’ mobility decisions. Toprak, Karakus, and Chen (2019) found that gender is a moderator in relationships among tenure, commitment to manager and intent to leave in an educational context. Findings from the quantitative portion of my research found no significant difference in the percent of male and female teachers indicating they had changed schools (Toprak, Karakus,
& Chen, 2019). However, it is beyond the scope of this study whether or not gender impacted mobility decisions. The salient feature in their coping strategy is that they focus on what they can control and moving to a new school was something they could control.

**Problem with Teacher Transfer as a Coping Strategy**

As was reinforced in the coping strategies given by teachers for challenges, teachers focus on what they can control. This study explored how teachers described critical incidents including times they considered leaving the teaching profession. Teachers new to teaching have lower levels of self-efficacy (Chesnut & Burley, 2015) than those who have remained in the profession longer. Teachers later in their career have survived many of the beginning teacher issues of competency and classroom management. Findings from this study showed significant correlations between teacher self-efficacy and commitment constructs. Since stronger teacher commitment was to students and to the act of teaching, leaving the school was a viable option during a critical incident. Only 16.3% of the mid and late career high school science teachers in this study were considered Stayers, teachers who had never chosen to leave a school. Compared to the national average of eight percent movers (Provasnik & Dorfman; 2005), 83.7% of the science teachers in this study were movers.

Three themes explaining triggers and coping strategies describe how unsuccessful relationships make teachers want to leave. Of the coping strategies, teacher transfer was cited most often. Teachers who stayed coped by focusing on their own environment and things that they were able to control. Previous research has suggested improving teacher working conditions as a way to prevent teacher attrition (New Teacher Center, 2016; Tray & Margarita, 2018). Working conditions generally include Environmental Institutional factors of salary, facilities, resources, and workload. Teachers in this study, when asked why they stay, did not mention
Environmental Institutional factors of facilities, resources, or workload at all. Almost a quarter of the teachers in this study, when asked why they consider leaving, mentioned the Environmental Institutional factor of salary.

Research has shown that one motivation of teachers entering the profession is the intrinsic sense of mission in making a difference in the lives of students (Nieto, 2003). But most of the studies were done with beginning preservice teachers (Chesnut & Cullen, 2014; Klassen & Chiu, 2011) or beginning teachers (Evans & Tribble, 1986). Findings from my study show that mid and late career teachers are highly committed to their students and this factor may explain why they have chosen to remain in the teaching profession even though the State of North Carolina has developed policies that do not reward teachers for longevity or for investing in themselves.

Many of the coping factors teachers in this study described were coping factors creating new growth opportunities. Strategies such as transferring to a new school, professional development, and personal discipline worked in the transition but did little to confront and eliminate the stress. Moving to a new school would not directly yield higher pay since all NC public school teachers are paid on the same pay scale. Moving to a new school with less workload or less discipline problems could result in more time for a second job or more job intrinsic job enjoyment. In order to accomplish the goal of reducing teacher turnover, it is important to help teachers develop a range of coping strategies so that transfer school is not the best or most viable option.
Implications for Policy, Practice and Future Research

This study explored perceptions of mid and late career high school science teachers. Previous studies have focused on Environmental factors to improve Teacher Working Conditions and leadership development for in-service teachers (Freeman & Fields, 2020; New Teacher Center, 2016) and competency, induction, and mentoring programs for pre-service/beginning teachers (Patterson, Roehrig, & Luft, 2003; Redding & Henry, 2019). The current study found that Personal Relatedness factors were stated the most as contributing to mid and late career teachers’ intentions to stay in the teaching profession. Future research should examine how teacher education programs focusing on collaboration and constructivist teaching practices socialize future teachers into the profession and whether these practices result in teachers remaining in the profession over their life course.

The study has highlighted the disconnect between teacher perceptions of skills that benefit student learning and skills that benefit school accountability measures as being a trigger to teacher attrition. Previous studies have reported that high stakes accountability measures increase teacher attrition (Dworkin, 2009; Ryan et al., 2017). Building on Ingersoll (2016) and Colleagues’ findings that schools can be managed and organized in ways that undermine teachers’ abilities to help students learn, is it important for teachers to have buy-in to school policies or practices addressing accountability measures (Ingersoll, Richard, Merrill, & May, 2016). Further research exploring ways to address accountability measures at the school level in ways that teachers perceive also promote student learning is warranted.

In North Carolina, teacher retention is a part of every school administrators’ yearly evaluation (NC GS 115C-288). Empirical research however is lacking on how teacher retention data is used in administrative evaluation processes. Consistent with Olsen and Huang (2018), the
most frequent trigger for teacher attrition in this study was inadequate administrative leadership and support. While correlational relationships between teacher working condition surveys and teacher attrition levels have been examined, aggregate student achievement data is reported but aggregate teacher and principal evaluation data is not. Furthermore, principal mobility patterns have the potential to exacerbate Personal Relatedness efforts. For example, principal decisions for accountability data will have short term impacts and long-term ramifications. Schools are impacted in negative ways when teachers leave, but principals leave or are reassigned frequently, avoiding the long-term ramification issues. Future studies should explore accountability data for administrators as well as for schools with high levels teacher attrition or low teacher working conditions as this could lead to higher teacher commitment and retention.

Findings from my study show student success as a factor contributing to teacher intention to stay in the profession. Policies that focus on student success to contribute to teacher retention at the school level should be developed. Creating positive feedback loops whereby students have established norms for recognizing their teachers for the teacher’s role in student achievement will encourage teachers to remain at the school which will lead to increased student achievement.

Many studies have described the tenuous dynamic between teacher retention and administrative support (Olsen & Huang, 2018). Given the high correlation between self-efficacy and commitment of mid and late career science teachers found in this study, policies exploring fostering administrative partnership and support should be explored. For example, the purpose of teacher evaluation instruments is to inform and improve teacher competency. Mid and late career science teachers in this study were found to have high levels of competency. Future practices could include eliminating the evaluation instrument of mid and late career science teachers because they have such high self-efficacy it is not necessary, or moving from a traditional
evaluation to a “what can the school do for you” type evaluation targeting ways to improve
teacher retention, or having mid and late career science teachers evaluate their administrators.

Findings from my research also show that mid and late career high school science
teachers in non-traditional public schools were somewhat more committed to the profession as
compared to teachers in traditional public schools. This is inconsistent with findings reporting
higher rates of teacher turnover in charter schools than in traditional public schools (Newton,
Rivero, Fuller, & Dauter, 2018). Given that public monies are spent in public charter and school
voucher programs, research should focus on why these science teachers are more committed and
whether these conditions can be replicated in traditional public-school settings. It would be
interesting to know if teachers in non-traditional schools had taught in traditional public schools
and the pathway whereby teachers potentially move back and forth between these types of
schools with the goal of strengthening traditional public schools.

National surveys have found that eight percent of the teacher workforce each year are
considered movers (Provasnik & Dorfman, 2005), with science teachers being harder to staff
(Borman & Dowling, 2008). Eighty four percent of the science teachers in this study were
movers at some point in their career. Future research should investigate how mid and late career
high school science teacher mobility patterns compare to other subjects, other states, and other
career stages.

This study sought to support teacher retention as a way to increase stability, prevent
teacher shortages, and close opportunity gaps for students. While teachers in this study described
a range of triggers and a range of strategies, the overwhelming coping strategy was transfer (84%
of the teachers in the study). Future research should focus on teacher transfer. Helping mid and
late career high school science teachers have access to a wider range of strategies will help them
be more effective copers and possibly develop higher levels of commitment to their school and to the profession (Pearlin & Schooler, 1978).

Conclusions

When mid and late career high school science teachers leave the school in which they are teaching, students are impacted in negative ways. This study elicited the perspectives of mid and late career high school science teachers to examine the relationship between self-efficacy and teacher commitment constructs and explored influences and coping strategies of critical incidents. Teachers in this study showed strong, significant relationships between self-efficacy and commitment with the highest levels of correlation between self-efficacy and Commitment to Students. Teachers describe Personal factors – Personal Relatedness, Personal Competency, and Personal Autonomy- as reasons they stay in the classroom. Supporting teachers’ personal relatedness with their students, their colleagues and their community has the potential to increase commitment and teacher retention. Promoting teachers’ personal autonomy to make decisions that impact their classrooms also has the potential to strengthen teacher commitment. Interviews from teachers in this study revealed that teachers focus on what they can control. Many teachers chose to leave or transfer school because this is what they can control. Policy implications to increase teacher retention include increasing environmental factors to strengthen the interplay of personal, environmental, and behavioral factors on teacher commitment, strengthening teachers’ commitment to the profession, and giving teachers more control in conflict situations so that withdrawal or transfer is not the only or the best option.

Summary

Teacher turnover hurts school stability and costs school systems valuable resources. Quantitative and qualitative findings of this study describe the strongest relationship for mid and
late career science teachers is between self-efficacy and commitment to students. Teachers care about student success and tend to leave when they do not believe they are being successful at teaching their students. Teachers in this study suggest that teachers move from schools lacking high academic standards for students and move to schools where they believe they will be successful in teaching students. In that regard, school type is a critical predictor for teacher commitment. Teachers in this study focused on what they can control. Implications for policy, practice and future research include improving personal factors to have more Relatedness or provide coping strategies, with transfer being a last resort, for mid and late career high school science teachers.
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Veteran Secondary Science Teacher Survey

Title of Study: Veteran Science Teacher Retention in North Carolina (eIRB # 20436)
Principal Investigator: Dorothy Holley, dholley@ncsu.edu, 919-515-3591
Funding Source: College of Education, NCSU
Faculty Point of Contact: Soonhye Park, spark26@ncsu.edu, 919.515.3591

What are some general things you should know about research studies?

You are invited to take part in a research study. Your participation in this study is voluntary. You have the right to be a part of this study, to choose not to participate, and to stop participating at any time without penalty. The purpose of this research study is to gain a better understanding of factors that impact veteran secondary science teachers’ decisions to stay and teach in North Carolina classrooms. We will do this through soliciting perspectives and experiences of veteran (those who have been teaching at least 10 years) secondary science teachers, the survey is linked to this email.

For those who do not know me, I am also a veteran science teacher in NC. I first taught at Hillside High School in Durham and have also taught in schools in Wake, Johnson, and Franklin County. I am passionate about helping teachers stay and thrive in the classroom. This research aims to give a voice to teachers’ perspectives. I hope you will consider participating in this research.

You are not guaranteed any personal benefits from being in this study. Research studies also may pose risks to those who participate. You may want to participate in this research because it will give you an opportunity to add your voices to issues that impact your decision to remain in the teaching profession. You may not want to participate in this research because it takes time and effort to complete the survey.

Specific details about the research in which you are invited to participate are contained below. If you do not understand something in this form, please ask the researcher for clarification or more information. This consent form is available to you to download. If, at any time, you have questions about your participation in this research, do not hesitate to contact the researcher(s) named above or the NC State IRB office. The IRB office’s contact information is listed in the What if you have questions about your rights as a research participant? section of this form.

What is the purpose of this study?

The purpose of the study is to better understand factors that impact veteran science teachers’ decisions to stay and teach in North Carolina classrooms.

Am I eligible to be a participant in this study?
There will be approximately 100 participants in this study.

In order to be a participant in this study, you must agree to be in the study and answer all of the questions to the best of your ability about your experience as a classroom science teacher.

You cannot participate in this study if you do not want to be in the study or if you have not taught a science subject in a secondary (9-12) school for at least 10 years.

**What will happen if you take part in the study?**

If you agree to participate in this study, you will be asked to do all of the following:

- Complete the consent form. Answer all of the online Qualtrics survey questions to the best of your ability.

The total amount of time that you will be participating in this study is approximately 30 minutes.

**Risks and benefits** There are minimal risks associated with participation in this research.

There are no direct benefits to your participation in the research. The indirect benefits could include better working conditions and a strengthened educational workforce.

**Right to withdraw your participation** You can stop participating in this study at any time for any reason. In order to stop your participation, please stop taking the survey. If you choose to withdraw your consent and to stop participating in this research, you can expect that your data will be deleted from the study.

**Confidentiality, personal privacy, and data management** Trust is the foundation of the participant/researcher relationship. Much of that principle of trust is tied to keeping your information private and in the manner that we have described to you in this form. The information that you share with us will be held in confidence to the fullest extent allowed by law. Protecting your privacy as related to this research is of utmost importance to us. However, there are very rare circumstances related to confidentiality where we may have to share information about you. These are limited to instances in which imminent harm could come to you or others.

How we manage, protect, and share your data are the principal ways that we protect your personal privacy. Data generated about you in this study will be re-identifiable.

**Re-identifiable**. Re-identifiable data is information or that we can identify you indirectly because of our access to information, role, skills, and/or use of technology. This may also mean that in published reports others could identify you from what is reported, for example, if a story you tell us is very specific. If your data is re-identifiable, we will report it in such a way that you are not directly identified in reports. Based on how we need to share the data, we cannot remove details from the report that would protect your identity from ever being figured out. This means that others may be able to re-identify from the information reported from this research.

**Compensation**

For completing all research activities, you will be compensated with a $20 gift card. This gift card will be emailed to you. Your name and email will never be paired with your survey.
responses. Your name and email will not be shared with anyone other than the researcher and only with the researcher for compensation purposes.

If you do not complete all research activities, you will not be compensated. If you do not provide your name and email after submitting the survey, you will not be compensated.

**What if you are an NCSU student?**

Your participation in this study is not a course requirement and your participation or lack thereof, will not affect your class standing or grades at NCSU.

**What if you are an NCSU employee?**

Your participation in this study is not a requirement of your employment at NCSU, and your participation or lack thereof, will not affect your job.

**Sponsorship and Funding** This research compensation is funded by the College of Education at NCSU. This means that the faculty member is using allocated funds to pay the compensation amounts. The researchers do not, however, have a direct financial interest with the sponsor or in the final results of the study. If you would like more information, please ask the researcher(s) listed in the first page of this form about the funding and sponsorship.

**What if you have questions about this study?** If you have questions at any time about the study itself or the procedures implemented in this study, you may contact the researcher, Dorothy Holley, dholley@ncsu.edu, 919-515-3591, or the Faculty Point of Contact Soonhye Park, spark26@ncsu.edu, 919.515.3591.

**What if you have questions about your rights as a research participant?**

If you feel you have not been treated according to the descriptions in this form, or your rights as a participant in research have been violated during the course of this project, you may contact the NC State IRB (Institutional Review Board) Office. An IRB office helps participants if they have any issues regarding research activities. You can contact the NC State IRB Office via email at irb-director@ncsu.edu or via phone at (919) 515-8754. **Consent To Participate** By clicking the “I consent to research” button, I am affirming that I have read and understand the above information. All of the questions that I had about this research have been answered. I have chosen to participate in this study with the understanding that I may stop participating at any time without penalty or loss of benefits to which I am otherwise entitled. I am aware that I may revoke my consent at any time.

- [ ] I consent to research
- [ ] I do not consent to research
This form asks you to make an important choice about the use of your re-identifiable information that you are sharing in this research. It asks you to decide if you are willing to give your consent to the use of your re-identifiable information for future research.

If you agree, researchers in the future may use re-identifiable information in many different research studies over an indefinite period of time without asking your permission again for any specific research study. This could possibly help other people or contribute to science. If you do not agree to allow researchers to use your re-identifiable information for future research, your information will not be kept for future use by anyone.

This form explains in more detail what saying “yes” or “no” to this use of your biospecimens and/or information will mean to you.

**If you say “Yes” on this form**

The researcher will store, use, and share your re-identifiable information for the purpose of medical, scientific, and other research, now and into the future, for as long as they are needed. This may include sharing your re-identifiable information with other research, academic, and medical institutions, as well as other researchers, drug and device companies, biotechnology companies, and others.

If you say “yes”, there are no plans to tell you about any of the specific research that will be done with your re-identifiable information.

By saying “yes,” your re-identifiable information may be used to create products or to deliver services, including some that may be sold and/or make money for others. If this happens, there are no plans to tell you, pay you, or give any compensation to you or your family.

The main risk in saying “yes” is that your confidentiality could be breached. Through managing who has access to your re-identifiable information and through regularly updated data security plans, I will do our best to protect your re-identifiable information from going to people who should not have it.

Another risk is that if you say “yes,” your re-identifiable information could be used in a research project to which you might not agree to if you were asked specifically about it.

You will not personally benefit from saying “yes” in this form. Saying “yes” in this form is not a condition of participating in the Veteran Science Teacher Retention in North Carolina study, nor of your enrollment or employment.

**If you say “no” or do not complete this form**

The researchers and institutions identified above will not store, use, or share your re-identifiable information beyond the purposes stated in the previous consent form that you agreed to and signed for the study Veteran Science Teacher Retention in North Carolina.

**If you want to withdraw your consent**
To revoke your broad consent, please contact the researcher, Dorothy Holley, at dtholley@ncsu.edu or 919-515-3591, or the faculty contact for this protocol, Dr. Soonhye Park, at spark26@ncsu.edu or 919-515-3591. You can expect that if you revoke your consent, your re-identifiable information will be removed from the existing data set and destroyed. This is possible in some, but not all, cases.

**If you have questions**

Please ask the research team to explain anything in this form that you do not clearly understand. Please think about this broad consent and/or discuss it with family or friends before making the decision to say “Yes” or “No.”

If you have any questions about this broad consent, please contact the researcher, Dorothy Holley, at dtholley@ncsu.edu or 919-515-3591, or the faculty contact for this protocol, Dr. Soonhye Park, at spark26@ncsu.edu or 919-515-3591.

If you want to discuss your rights as a person who has agreed to, refused, or declined to respond to an offer of broad consent or believe that your rights were violated as a result of your agreeing to this broad consent, please contact the NC State IRB Director, at irb-director@ncsu.edu or via phone at (919) 515-8754.

**Please choose one statement**

- **Statement of agreement: I say yes.** The future use of my information and this broad consent has been explained to me, and I agree to give my consent to the future research uses of my identifiable information. My participation is voluntary, and I may withdraw my consent at any time without any penalty or loss of benefits to which I am entitled.

- **Statement of refusal: I say no.** My data collected for this study will not be stored for future research.
Appendix B

Survey Questions

1. Are you currently a high school science teacher?
   - Yes
   - No

2. How long have you been teaching science?
   - 1-9 years
   - 10-20 years
   - 21-30 years
   - 31 or more years

Part 1 - STEBI (25 questions) (Riggs & Enochs, 1990)

Thinking about your current school setting, to what extent do you agree or disagree with each of the following statements?

Strongly Agree, Somewhat Agree, Neither agree nor disagree, Somewhat Disagree, Strongly Disagree

1. When a student does better than usual in science, it is often because the teacher exerted a little extra effort
2. I am continually finding better ways to teach science
3. Even when I try very hard, I don’t teach science as well as I do other things
4. When the science grades of students improve, it is most often due to their teacher having found a more effective teaching approach
5. I know the steps necessary to teach science concepts effectively
6. I am not very effective in monitoring science experiments
7. If students are underachieving in science, it is most likely due to ineffective science teaching
8. I generally teach science effectively
9. The inadequacy of a student’s science background can be overcome by good teaching
10. The low science achievement of some students cannot generally be blamed on their teachers
11. When a low achieving child progresses in science, it is usually due to extra attention given by the teacher
12. I understand science concepts well enough to be effective in teaching science
13. Increased effort in science teaching produces little change in some students’ science achievement

14. The teacher is generally responsible for the achievement of students in science

15. Students’ achievement in science is directly related to their teacher’s effectiveness in science teaching

16. If parents comment that child is showing more interest in science at school, it is probably due to the performance of the child’s teacher

17. I find it difficult to explain to students why science experiments work

18. I am typically able to answer students’ science questions

19. I wonder if I have the necessary skills to teach science

20. Effectiveness in science teaching has little influence on the achievement of students with low motivation

21. Given a choice, I would not invite the principal to evaluate my science teaching

22. When a student has difficulty understanding a science concept, I am usually at a loss as to how to help the student understand it better

23. When teaching science, I usually welcome student questions

24. I don’t know what to do to turn students on to science

25. Even teachers with good science teaching abilities cannot help some kids learn science

Part 2 – Teacher Commitment (17 questions) (Thien & Razak, 2014)

1. Often, I find it is difficult to agree with school policies on important matters relating to teachers

2. I talk to my friends about this school as a great place to work

3. I find that my values and the values of the school are very similar

4. There is not much to be gained by sticking with this school indefinitely

5. I used to be more ambitious about my work than I am now

6. For me, this school is the best one to work for

7. I have been known to be so engrossed in or excited about an upcoming lesson that I lie awake at night thinking about it
8. All students can succeed, and it is my mission to ensure their success

9. I enjoy teaching

10. Working as a teacher is the best decision I ever made

11. It is my responsibility to ensure good social relations among my students

12. I feel obligated to mediate conflicts among student groups

13. If I could get a job different from being a teacher and paying the same amount, I would take it

14. If I could do it all over again, I would not choose to work in the teaching profession

15. I cannot face my students if I do not put all my effort into increasing their knowledge and skills

16. I am disappointed that I ever entered the teaching profession

17. I try to do my best to help unsuccessful students

Part 3 – Open ended questions

1. Please explain an incident that has strongly reinforced your decision to continue teaching.

2. In what ways do you think the incident you just described has influenced your work in the profession?

3. Please describe an incident that made you seriously consider leaving the teaching profession

4. What strategies did you use to resolve the problem involved in the incident you described?

5. Are there any comments on mid and late career high school science teacher retention that you’d like to share?

Part 4 – Demographic questions

1. Which option best describes your current school?
   - Public Traditional,
   - Public Magnet,
   - Public Charter,
   - Private

2. Which of the following best describes your current school?
   - Urban - city population 50,000 or more residents
   - Suburban - development cluster connected to an urban area with less than 50,000 residents
   - Rural - city population of less than 2,500 residents
3. Which of the following describes your current school?
   Title 1
   Non title 1
   I do not know

4. What percentage of your school qualifies for Free and Reduced Lunch? (If you are unsure, use your best judgement.)
   0-25%
   26-50%
   51-75%
   76-100%

5. In terms of your teaching career, have you always taught at the school where you are currently teaching?
   Yes,
   No

6. How long have you been teaching in your current school?
   Less than 5 years,
   5-10 years,
   11-20 years,
   21-30 years,
   31 or more years

7. Have you always taught the science subjects you are currently teaching?
   Yes,
   No

8. Are you currently teaching an Advanced Placement (AP) course?
   Yes,
   No

9. How do you identify in terms of your gender? (Mark all that apply)
   Male,
   Female,
   Trans,
   Non-binary,
   I prefer not to say

10. What is your ethnicity?
    Black or African American,
    Asian,
    White / Caucasian,
    Hispanic / Latino / Latinx,
    Pacific Islander or Native Hawaiian
    Native American, American Indian, or Alaska Native,
Other (please specify),
I prefer not to say

11. What is the highest level of education you have obtained?
   Bachelor's degree,
   Some Master's coursework,
   Master's Degree,
   Some Doctoral Coursework,
   Doctoral Degree

12. Were you a lateral entry or another alternative licensure teacher?
   Yes,
   No

13. What is your current age?
   20-29,
   30-39,
   40-49,
   50-59,
   60+
Appendix C

Interview Consent

This will look similar to the survey consent form. The difference is that now I know your contact information even though I will not use it or publish it.

Veteran Secondary Science Teacher Survey

**Title of Study:** Veteran Science Teacher Retention in North Carolina (eIRB # 20436)  
**Principal Investigator:** Dorothy Holley, dholley@ncsu.edu, 919-515-3591  
**Funding Source:** College of Education, NCSU  
**Faculty Point of Contact:** Soonhye Park, spark26@ncsu.edu, 919.515.3591

**What are some general things you should know about research studies?**

You are invited to take part in a research study. Your participation in this study is voluntary. You have the right to be a part of this study, to choose not to participate, and to stop participating at any time without penalty. The purpose of this research study is to gain a better understanding of factors that impact veteran secondary science teachers’ decisions to stay and teach in North Carolina classrooms. We will do this through soliciting perspectives and experiences of veteran (those who have been teaching at least 10 years) secondary science teachers. You have taken the survey. The interview is to gain clarity and depth.

You are not guaranteed any personal benefits from being in this study. Research studies also may pose risks to those who participate. You may want to participate in this research because it will give you an opportunity to add your voices to issues that impact your decision to remain in the teaching profession. You may not want to participate in this research because it takes time and effort to speak with me.

Specific details about the research in which you are invited to participate are contained below. If you do not understand something in this form, please ask the researcher for clarification or more information. This consent form is available to you to download. If, at any time, you have questions about your participation in this research, do not hesitate to contact the researcher(s) named above or the NC State IRB office. The IRB office’s contact information is listed in the **What if you have questions about your rights as a research participant?** section of this form.

**What is the purpose of this study?**

The purpose of the study is to better understand factors that impact veteran science teachers’ decisions to stay and teach in North Carolina classrooms.

**Am I eligible to be a participant in this study?**

There will be approximately 100 participants in the larger study. I am hoping to interview 10 teachers.
In order to be a participant in this study, you must agree to be in the study and answer all of the questions to the best of your ability about your experience as a classroom science teacher.

You cannot participate in this study if you do not want to be in the study or if you have not taught a science subject in a secondary (9-12) school for at least 10 years.

**What will happen if you take part in the study?**

If you agree to participate in this study, you will be asked to do all of the following:
- Complete the consent form.
- Speak with Dorothy Holley about your responses.

**Recording and images**

If you want to participate in this research, you must agree to be audio recorded. If you do not agree to be audio recorded, you cannot participate in this research.

The total amount of time that you will be participating in this study is approximately 30 minutes.

**Risks and benefits**

There are minimal risks associated with participation in this research.

There are no direct benefits to your participation in the research. The indirect benefits could include better working conditions and a strengthened educational workforce.

**Right to withdraw your participation**

You do not have to answer any question in the interview. If you do not want to answer a question, please say skip and I will ask the next question. You can stop participating in this study at any time for any reason. In order to stop your participation, please let me know and we will hang up. If you choose to withdraw your consent and to stop participating in this research, you can expect that your data will be deleted from the study.

**Confidentiality, personal privacy, and data management**

Trust is the foundation of the participant/researcher relationship. Much of that principle of trust is tied to keeping your information private and in the manner that we have described to you in this form. The information that you share with us will be held in confidence to the fullest extent allowed by law. Protecting your privacy as related to this research is of utmost importance to us. However, there are very rare circumstances related to confidentiality where we may have to share information about you. These are limited to instances in which imminent harm could come to you or others.

How we manage, protect, and share your data are the principal ways that we protect your personal privacy. Data generated about you in this study will be identifiable.

**Identifiable.** Identifiable data is information about you. This includes your name, e-mail, or other details that makes you easily recognizable to me and others. Identifiable data has your real identity directly on the information that are shared with me and other people. This means that though your identity is directly on the data that I have access to, your identity will not be reported publicly in a manner that can identify you to others.

**What if you are an NCSU student?**
Your participation in this study is not a course requirement and your participation or lack thereof, will not affect your class standing or grades at NCSU.

**What if you are an NCSU employee?**

Your participation in this study is not a requirement of your employment at NCSU, and your participation or lack thereof, will not affect your job.

**What if you have questions about this study?** If you have questions at any time about the study itself or the procedures implemented in this study, you may contact the researcher, Dorothy Holley, dholley@ncsu.edu, 919-515-3591, or the Faculty Point of Contact Soonhye Park, spark26@ncsu.edu, 919.515.3591.

**What if you have questions about your rights as a research participant?**

If you feel you have not been treated according to the descriptions in this form, or your rights as a participant in research have been violated during the course of this project, you may contact the NC State IRB (Institutional Review Board) Office. An IRB office helps participants if they have any issues regarding research activities. You can contact the NC State IRB Office via email at irb-director@ncsu.edu or via phone at (919) 515-8754.  Consent To Participate By clicking the “I consent to research” button, I am affirming that I have read and understand the above information. All of the questions that I had about this research have been answered. I have chosen to participate in this study with the understanding that I may stop participating at any time without penalty or loss of benefits to which I am otherwise entitled. I am aware that I may revoke my consent at any time.

- [ ] I consent to research (4)
- [ ] I do not consent to research (5)

This form asks you to make an important choice about the use of your re-identifiable information that you are sharing in this research. It asks you to decide if you are willing to give your consent to the use of your re-identifiable information for future research.

If you agree, researchers in the future may use re-identifiable information in many different research studies over an indefinite period of time without asking your permission again for any specific research study. This could possibly help other people or contribute to science. If you do not agree to allow researchers to use your re-identifiable information for future research, your information will not be kept for future use by anyone.

This form explains in more detail what saying “yes” or “no” to this use of your biospecimens and/or information will mean to you.

**If you say “Yes” on this form**
The researcher will store, use, and share your re-identifiable information for the purpose of medical, scientific, and other research, now and into the future, for as long as they are needed. This may include sharing your re-identifiable information with other research, academic, and medical institutions, as well as other researchers, drug and device companies, biotechnology companies, and others.

If you say “yes”, there are no plans to tell you about any of the specific research that will be done with your re-identifiable information.

By saying “yes,” your re-identifiable information may be used to create products or to deliver services, including some that may be sold and/or make money for others. If this happens, there are no plans to tell you, pay you, or give any compensation to you or your family.

The main risk in saying “yes” is that your confidentiality could be breached. Through managing who has access to your re-identifiable information and through regularly updated data security plans, I will do our best to protect your re-identifiable information from going to people who should not have it.

Another risk is that if you say “yes,” your re-identifiable information could be used in a research project to which you might not agree to if you were asked specifically about it.

You will not personally benefit from saying “yes” in this form. Saying “yes” in this form is not a condition of participating in the Veteran Science Teacher Retention in North Carolina study, nor of your enrollment or employment.

If you say “no” or do not complete this form

The researchers and institutions identified above will not store, use, or share your re-identifiable information beyond the purposes stated in the previous consent form that you agreed to and signed for the study Veteran Science Teacher Retention in North Carolina.

If you want to withdraw your consent

To revoke your broad consent, please contact the researcher, Dorothy Holley, at dtholley@ncsu.edu or 919-515-3591, or the faculty contact for this protocol, Dr. Soonhye Park, at spark26@ncsu.edu or 919-515-3591. You can expect that if you revoke your consent, your re-identifiable information will be removed from the existing data set and destroyed. This is possible in some, but not all, cases.

If you have questions

Please ask the research team to explain anything in this form that you do not clearly understand. Please think about this broad consent and/or discuss it with family or friends before making the decision to say “Yes” or “No.”

If you have any questions about this broad consent, please contact the researcher, Dorothy Holley, at dtholley@ncsu.edu or 919-515-3591, or the faculty contact for this protocol, Dr. Soonhye Park, at spark26@ncsu.edu or 919-515-3591.
If you want to discuss your rights as a person who has agreed to, refused, or declined to respond to an offer of broad consent or believe that your rights were violated as a result of your agreeing to this broad consent, please contact the NC State IRB Director, at irb-director@ncsu.edu or via phone at (919) 515-8754.

Please choose one statement

- **Statement of agreement: I say yes.** The future use of my information and this broad consent has been explained to me, and I agree to give my consent to the future research uses of my identifiable information. My participation is voluntary, and I may withdraw my consent at any time without any penalty or loss of benefits to which I am entitled.

- **Statement of refusal: I say no.** My data collected for this study will not be stored for future research.
Appendix D

Semi-structured Interview Questions

Mailed to teachers with consent, prior to scheduled interview.

**General questions about retention**

1. Tell me something that makes teaching special to you.

2. When you took the online survey, you were asked to explain an incident that strongly reinforced your decision to continue teaching. Please tell me more about that incident or another incident you have experienced as a teacher. (Incidents may be events or nonevents, positive or negative.) I want to gain a deeper understanding of your experience, and if there were strategies or resources that you developed or utilized. Might you elaborate a little bit on the incident itself (perhaps the timing or how you experienced it) and how you were supported (colleagues, family, professional organization, district, professional learning)?

3. Teacher turnover is a problem in education. Some research has shown that nearly fifty percent of teachers leave the profession in the first 5 years. Schools have implemented mentoring and induction programs and to help retain early career teachers. This study focuses on mid and late career teachers. You have survived the early challenges. How do you think you have survived past the first 5 years?

**Science specific questions**

4. One question in the online survey asked if you have ever transferred schools. Of the teachers who responded, 84% said that they had transferred at least once. I would like to know more about your individual decision and thoughts. Are you one of the 84%? How were you impacted? Did your decision impact your science teaching? Do you think transferring is a successful strategy for science teachers to remain in teaching? Why or why not?

5. Some research studies have found that science and math teachers are more likely to leave than teachers of other subject areas. This study focuses on science teachers. Based on your own experience, why do you think that happens?

6. “Out of field” teaching is a term used to describe teaching science courses when the teacher has not majored in, student taught, received certification, or any formal training in the subject matter. For example, a teacher who is certified to teach Biology is asked to teach Physics due to staffing issues would be teaching “Out of Field.” Almost half (47%) of the teachers who took the survey said they have not always taught the science courses they are currently teaching and might possibly be considered an “Out of Field” teacher. Have you had an experience teaching out of field? How did that experience impact your perception of yourself as a science teacher? Have you changed your perceptions of the teaching profession through course changes?

7. When you took the online survey, you were asked if you had seriously considered leaving the teaching profession and then you were asked to describe an incident that made you consider
doing so. (Incidents may be events or nonevents, positive or negative.) Again, I would like to
gain a deeper understanding of your experience, particularly the strategies or resources that you
were able to utilize. Would you elaborate a little bit on the incident itself (perhaps the timing or
how you experienced it) and how you were supported (colleagues, family, professional
organization, district, professional learning)?

You may talk about a different incident than the one you gave in the survey. If you have not
seriously considered leaving the profession, and did not describe an incident in the survey, you
may describe your perception of “a friend.” Again, I want to gain a deeper understanding of your
perceptions, particularly the strategies or resources that you believe should be strengthened in
order to help teachers remain in the profession.

8. How has the pandemic influenced your decision to stay in the profession?


## Appendix E

### Analysis of Exploratory Factor Analysis Commitment Scale

<table>
<thead>
<tr>
<th>Survey</th>
<th>Item description</th>
<th>Subscale</th>
<th>Loading</th>
<th>Alpha</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Often, I find it is difficult to agree with school policies on important matters relating to teachers</td>
<td>school</td>
<td>.72</td>
<td>.89</td>
</tr>
<tr>
<td>2</td>
<td>I talk to my friends about this school as a great place to work</td>
<td>school</td>
<td>.72</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>I find that my values and the values of the school are very similar</td>
<td>school</td>
<td>.71</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>There is not much to be gained by sticking with this school indefinitely</td>
<td>school</td>
<td>.70</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>I used to be more ambitious about my work than I am now</td>
<td>teaching</td>
<td>.63</td>
<td>.73</td>
</tr>
<tr>
<td>6</td>
<td>For me, this school is the best one to work for</td>
<td>school</td>
<td>.53</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>I have been known to be so engrossed in or excited about an upcoming lesson that I lie awake at night thinking about it</td>
<td>teaching</td>
<td>.61</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>All students can succeed, and it is my mission to ensure their success</td>
<td>students</td>
<td>.76</td>
<td>.82</td>
</tr>
<tr>
<td>9</td>
<td>I enjoy teaching</td>
<td>Teaching</td>
<td>.52</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Working as a teacher is the best decision I ever made</td>
<td>Teaching</td>
<td>.58</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>It is my responsibility to ensure good social relations among my students</td>
<td>Students</td>
<td>.74</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>I feel obligated to mediate conflicts among student groups</td>
<td>Students</td>
<td>.68</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>If I could get a job different from being a teacher and paying the same amount, I would take it</td>
<td>profession</td>
<td>.77</td>
<td>.50</td>
</tr>
<tr>
<td>14</td>
<td>If I could do it all over again, I would not choose to work in the teaching profession</td>
<td>profession</td>
<td>.75</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>I cannot face my students if I do not put all my effort into increasing their knowledge and skills</td>
<td>students</td>
<td>.60</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>I am disappointed that I ever entered the teaching profession</td>
<td>profession</td>
<td>.72</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>I try to do my best to help unsuccessful students</td>
<td>students</td>
<td>.50</td>
<td></td>
</tr>
</tbody>
</table>

### Analysis of Exploratory Factor Analysis Self-Efficacy Scale

<table>
<thead>
<tr>
<th>Item &amp; Description</th>
<th>+/- word</th>
<th>Subscale</th>
<th>Loading</th>
<th>Alpha</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. When a student does better than usual in science, it is often because the teacher exerted a little extra effort</td>
<td>+</td>
<td>STOE</td>
<td>.37</td>
<td>.77</td>
</tr>
<tr>
<td>2. I am continually finding better ways to teach science</td>
<td>+</td>
<td>PSTE</td>
<td>.53</td>
<td>.92</td>
</tr>
<tr>
<td>3. Even when I try very hard, I don’t teach science as well as I do other things</td>
<td>neg</td>
<td>PSTE</td>
<td>.64</td>
<td></td>
</tr>
<tr>
<td>4. When the science grades of students improve, it is most often due to their teacher having found a more effective teaching approach</td>
<td>+</td>
<td>STOE</td>
<td>.44</td>
<td></td>
</tr>
<tr>
<td>5. I know the steps necessary to teach science concepts effectively</td>
<td>+</td>
<td>PSTE</td>
<td>.66</td>
<td></td>
</tr>
<tr>
<td>6. I am not very effective in monitoring science experiments</td>
<td>Neg</td>
<td>PSTE</td>
<td>.62</td>
<td></td>
</tr>
<tr>
<td>7. If students are underachieving in science, it is most likely due to ineffective science teaching</td>
<td>+</td>
<td>STOE</td>
<td>.49</td>
<td></td>
</tr>
<tr>
<td>8. I generally teach science effectively</td>
<td>Neg</td>
<td>PSTE</td>
<td>.65</td>
<td></td>
</tr>
<tr>
<td>9. The inadequacy of a student’s science background can be overcome by good teaching</td>
<td>+</td>
<td>STOE</td>
<td>.31</td>
<td></td>
</tr>
<tr>
<td>10. The low science achievement of some students cannot generally be blamed on their teachers</td>
<td>Neg</td>
<td>STOE</td>
<td>.36</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>11. When a low achieving child progresses in science, it is usually due to extra attention given by the teacher</td>
<td>+</td>
<td>STOE</td>
<td>.36</td>
<td></td>
</tr>
<tr>
<td>12. I understand science concepts well enough to be effective in teaching science</td>
<td>+</td>
<td>PSTE</td>
<td>.71</td>
<td></td>
</tr>
<tr>
<td>13. Increased effort in science teaching produces little change in some students’ science achievement</td>
<td>Neg</td>
<td>STOE</td>
<td>.40</td>
<td></td>
</tr>
<tr>
<td>14. The teacher is generally responsible for the achievement of students in science</td>
<td>+</td>
<td>STOE</td>
<td>.49</td>
<td></td>
</tr>
<tr>
<td>15. Students’ achievement in science is directly related to their teacher’s effectiveness in science teaching</td>
<td>+</td>
<td>STOE</td>
<td>.58</td>
<td></td>
</tr>
<tr>
<td>16. If parents comment that child is showing more interest in science at school, it is probably due to the performance of the child’s teacher</td>
<td>+</td>
<td>STOE</td>
<td>.44</td>
<td></td>
</tr>
<tr>
<td>17. I find it difficult to explain to students why science experiments work</td>
<td>Neg</td>
<td>PSTE</td>
<td>.72</td>
<td></td>
</tr>
<tr>
<td>18. I am typically able to answer students’ science questions</td>
<td>+</td>
<td>PSTE</td>
<td>.62</td>
<td></td>
</tr>
<tr>
<td>19. I wonder if I have the necessary skills to teach science</td>
<td>Neg</td>
<td>PSTE</td>
<td>.70</td>
<td></td>
</tr>
<tr>
<td>20. Effectiveness in science teaching has little influence on the achievement of students with low motivation</td>
<td>Neg</td>
<td>STOE</td>
<td>.36</td>
<td></td>
</tr>
<tr>
<td>21. Given a choice, I would not invite the principal to evaluate my science teaching</td>
<td>Neg</td>
<td>PSTE</td>
<td>.65</td>
<td></td>
</tr>
<tr>
<td>22. When a student has difficulty understanding a science concept, I am usually at a loss as to how to help the student understand it better</td>
<td>Neg</td>
<td>PSTE</td>
<td>.68</td>
<td></td>
</tr>
<tr>
<td>23. When teaching science, I usually welcome student questions</td>
<td>+</td>
<td>PSTE</td>
<td>.60</td>
<td></td>
</tr>
<tr>
<td>24. I don’t know what to do to turn students on to science</td>
<td>Neg</td>
<td>PSTE</td>
<td>.67</td>
<td></td>
</tr>
<tr>
<td>25. Even teachers with good science teaching abilities cannot help some kids learn science</td>
<td>Neg</td>
<td>STOE</td>
<td>.35</td>
<td></td>
</tr>
</tbody>
</table>
Appendix F

Full Correlation Matrix of All Variables Considered in the Analysis

<table>
<thead>
<tr>
<th>Correlation Matrix of Dependent, Independent, and Control Variables Examined in the Analysis, N=248</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) Overall teaching commitment</td>
</tr>
<tr>
<td>(2) Commitment to students</td>
</tr>
<tr>
<td>(3) Commitment to teaching</td>
</tr>
<tr>
<td>(4) Commitment to school</td>
</tr>
<tr>
<td>(5) Commitment to profession</td>
</tr>
<tr>
<td>(6) PTTE</td>
</tr>
<tr>
<td>(7) STTE</td>
</tr>
<tr>
<td>(8) Gender</td>
</tr>
<tr>
<td>(9) Teacher age</td>
</tr>
<tr>
<td>(10) Experience</td>
</tr>
<tr>
<td>(11) Education</td>
</tr>
<tr>
<td>(12) Teacher Consider Loading</td>
</tr>
<tr>
<td>(13) Lateral Entry?</td>
</tr>
<tr>
<td>(14) Committee?</td>
</tr>
<tr>
<td>(15) School Type</td>
</tr>
<tr>
<td>(16) % Free Lunch</td>
</tr>
</tbody>
</table>

*Correlation is significant at the 0.01 level (2-tailed).

*Correlation is significant at the 0.05 level (2-tailed).
Appendix G

Results from the Correlation Analysis for All 15 Demographic Variables Examined in This Study

Listed by category with significance noted

**Teacher Characteristics.** Demographic variables describing the teacher included Gender, Age, Ethnicity, Licensure Path, Education, Years Teaching, Mid or Late Career Teacher Status, and Mobility Status. The mean Teacher Commitment Scale score for male teachers (n=47) was 62.36 and for female teachers (n=99) was 63.76. The difference between male and female teachers did not yield statistically significant results ($t(144)=.873; p<.38$). There was no significant effect of Teachers’ Age on commitment, $F(3,143)=.208, p=.89$. The mean Teacher Commitment Scale score for White teachers (n=132) was 63.27 and for Non-white teachers (n=15) was 63.20. The difference in Ethnicity categories did not yield statistically significant results ($t(145)=.026; p<.98$). The mean Teacher Commitment Scale score for teachers licensed through lateral entry or another alternative licensure (n=57) program was 63.25 and for teachers licensed through traditional science education licensing programs (n=90) was 63.27. The difference in licensure groups did not yield statistically significant results ($t(145)=-.014; p=989$). There was no significant effect of Teachers’ Education Level, $F(4,142)=.514, p=.73$ or the Number of Years the teacher has been Teaching Science, $F(2,145)=.624, p=.54$. The mean Teacher Commitment Scale score for Mid-Career teachers, teachers teaching 10-20 years, (n=80) was 63.37 and for Late-Career teachers, those teaching 21 years or more, (n=68) was 63.10. The difference between Mid and Later Career teachers did not yield statistically significant results ($t(146)=-.183; p>.86$). In terms of Mobility, the mean Teacher Commitment Scale score for Stayers, teachers who have always taught at the same school, (n=24) was 62.33 and for Movers, teachers who have chosen to transfer at least once, (n=123) was 63.44. The difference between Stayers and Movers did not yield statistically significant results ($t(145)=-.549; p=.584$). None of the surveyed demographic teacher characteristics reported significant differences in Teacher Commitment for this study.

**Teaching Assignment Characteristics.** Demographic variables describing the teaching assignment included Years at Current School, Course Continuity, and Currently Teach an Advanced Placement (AP) course. There was no significant effect of Years taught at Current School on commitment, $F(3,143)=.1.51, p=.215$. The mean Teacher Commitment Scale score for science teachers continuing to teach the same Courses (n=78) was 63.77 and for science teachers teaching different Courses (n=69) was 62.68. The difference in Course Continuity did not yield statistically significant results ($t(145)=.729; p=.467$). The mean Teacher Commitment Scale score for Current AP teachers (n=64) was 62.5 and for not-current AP teachers (n=83) was 63.8. The difference between Current AP teacher groups did not yield statistically significant results ($t(145)=-.896; p=.372$). None of the surveyed demographic teaching assignment characteristics reported significant differences in Teacher Commitment for this study.

**School Characteristics.** Demographic variables describing the school included School Type, Community Size, School Title 1 Status, and Percent School Free and Reduced Lunch Status. The mean Teacher Commitment Scale score for science teachers teaching in a traditional public school (n=103) was 62.55 and for science teachers teaching in a non-traditional school,
public charter, public magnet or private, (n=44) was 64.91. The difference between groups according to School Type did not yield statistically significant results ($t(145)=-1.46; p=.147$).

There was a significant main effect for Community Size on commitment, $F(2,144)=4.03, p=.02$, with suburban school science teachers reporting higher Teacher Commitment. The mean Teacher Commitment Scale score for teachers in Title 1 schools (n=48) was 61.04 and for teachers in non-Title 1 schools (n=74) was 64.11. The difference between Title 1 Status schools was almost statistically significant ($t(120)=-1.85; p=.066$), with teachers at non-Title 1 schools reporting higher Teacher Commitment. There was no significant effect of Percent Free and Reduced Lunch Status on Teacher Commitment, $F(3,143)=1.24, p=.298$. Of the surveyed demographic school characteristics, a significant difference in Teacher Commitment was found in Community Size and a marginally significant difference in Teacher Commitment was found in School Title 1 Status.
# Appendix H

## Coding Scheme

Coding Scheme of Why Teachers Stay  
Based on Bandura (1986) Social Cognitive Theory (N=152)  
201 total quotations/ instances

<table>
<thead>
<tr>
<th>Category</th>
<th>Sub-Category</th>
<th>Definition (inclusion/exclusion criteria)</th>
<th>Example</th>
<th>Frequency quotations</th>
<th>Frequency teachers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Personal</td>
<td>Autonomy: having a measure of control over their actions and input into decisions that affect their jobs</td>
<td>Classroom decisions – teachers are permitted to independently make instructional decisions in their own classrooms concerning curriculum, behaviors, teaching and learning expectations.</td>
<td>T-96 I currently have some freedom in the pacing and pedagogy that I use to teach science that I would not have at another school.</td>
<td>5 (2.4%)</td>
<td>5 (3.3%)</td>
</tr>
<tr>
<td></td>
<td>Policy decisions – teachers are permitted and encouraged to make policy decisions that impact how the school runs. Examples might include determining the content of inservice professional development programs, hiring new teachers, and deciding how the school budget will be allocated.</td>
<td>T-99 At my public charter school, we get to actually teach the curriculum without the stress of test scores</td>
<td>1 (0.5%)</td>
<td>1 (0.7%)</td>
<td></td>
</tr>
<tr>
<td>Relatedness: teacher interdependence, cooperation, collaboration, and collegiality</td>
<td>Collegiality – interdependence with teacher colleagues and administrators; ease of cooperation and coordination</td>
<td>T-12 I work within a great department with other teachers that have great ideas and are very supportive.</td>
<td>6 (3.0%)</td>
<td>6 (3.9%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Students – student cooperation with teachers aids in teaching efforts, behavioral expectations are met. Examples include student enthusiasm, connections with students outside of the normal role of teaching, and expressions of gratitude.</td>
<td>T-4 On a SEL level, I have had many students over the years tell me that they connect with me where they can’t connect with their parents or guardians at home, and being that I am very passionate about helping teenagers realize and grow into their full potential, if I am able to grow and foster these relationships with these students, then I am exactly where I need to be. T-71 a student who earned her PhD in telomere research. She sent me her paper and had named me in it as being a reason for her success.</td>
<td>88 (43.8%)</td>
<td>87 (57.2%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Parents/Guardians – parent cooperation with teachers aids in teaching efforts, parents support teacher expectations for student, offer encouraging comments, and provide monetary resources when asked (such as household requests for lab supplies)</td>
<td>T-115 a parent come to me in tears, her son's life had completely changed as a result of having me as a teacher.</td>
<td>4 (2.0%)</td>
<td>4 (2.6%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Community (of practice) – community stakeholders such as local businesses, government agencies, and civic organizations partner with teachers to support student learning. Also, connection to the teaching profession itself. Examples include grants, awards, donations of resources, and serving for school events when asked.</td>
<td>T-15 Recipient of a grant for a community-based project that was extremely rewarding and a great learning experience for myself as well as my students T-42 Growing up as the offspring of educator parents</td>
<td>26 (12.9%)</td>
<td>26 (17.1%)</td>
<td></td>
</tr>
<tr>
<td>Competency: Teacher’s ability to teach</td>
<td>Knowledge for teaching science – Refers to the teachers’ professional understandings and knowledge necessary to teach science</td>
<td>T-116 As I was answering a question posed by a student, I could sense confusion, not only in the student, but also in his classmates. Using</td>
<td>12 (6.0%)</td>
<td>12 (7.9%)</td>
<td></td>
</tr>
</tbody>
</table>
Informally gathered information, I was able to recast the lesson in a manner that the students could grasp the concept, using their interests to help them understand.

**Effectiveness**  - student attitude towards science and pursuit of future science study/career

- T-98 female students tell me they have become better problem solvers and that they have gained the confidence from my physics class that they were lacking so they are ready and enthusiastic to study engineering in college

<table>
<thead>
<tr>
<th>Environment: structures in the education system including rules, norms and behaviors that guide schools in which teachers work</th>
<th>Institutional: structures determined mainly at the district or higher level</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Salary/Job benefits</strong> – compensation for the job of teaching. This includes pay and benefits as well as the larger picture of how raises and bonuses are distributed (tiered, steps, longevity, tenure) and benefits to the teachers’ family such as having longer breaks during the summer.</td>
<td><strong>Facilities</strong> – the physical space accessible for teaching to happen. Classroom, laboratory, safety, as well as space students utilize such as cafeteria, auditorium, and outside areas.</td>
</tr>
<tr>
<td>T-43 Teaching has allowed me to have the same schedule as my children which has given me opportunities to travel with my children over the summer. Knowing the inner workings of the school system has allowed me to help my children be more successful in school.</td>
<td><em>Nothing coded in survey question 5.1</em></td>
</tr>
<tr>
<td><strong>Resources</strong> – items that are freely available to teachers for use or consumption in order to fulfill their job of teaching science. Examples include money (budget), technology, textbooks, curriculum, consumables, office supplies, copy machines</td>
<td>0 0</td>
</tr>
<tr>
<td>(indirectly referenced when talking about challenge as being intellectually stimulating) T-84 increasing intellectual demands by teaching new courses every couple of years</td>
<td><strong>OOF teaching</strong> – subjects the teacher has had no formal training (academic major/minor or student teaching) as preparation to teach</td>
</tr>
<tr>
<td>1 (0.5%) 1 (0.7%)</td>
<td><em>Nothing coded in survey question 5.1</em></td>
</tr>
<tr>
<td><strong>Workload/Time</strong> – duties, obligations and time required throughout the day; includes routine paperwork, time to plan, provide student feedback, collaborate, engage in PD</td>
<td>0 0</td>
</tr>
<tr>
<td>(indirectly referred with team – coded with colleagues) T-144 opportunity to work in a “successful” school presented itself after years of supporting “failing” schools. I did not want to go out with the defeated feeling those schools left in me.</td>
<td><strong>School climate</strong> – the environment of the school beyond the physical space, encapsulates the culture of accountability, how school is run, and what is acceptable behavior</td>
</tr>
<tr>
<td>1 (0.5%) 1 (0.7%)</td>
<td><em>Nothing coded in survey question 5.1</em></td>
</tr>
<tr>
<td><strong>Admin support/leadership</strong> – how the school leadership interfaces with the faculty, includes communication, trust and encouragement</td>
<td><strong>PD</strong> – the growth mechanism for teachers to learn new pedagogy and content knowledge, often focused by school level, departmental, or subject specific.</td>
</tr>
<tr>
<td>T-41 During my first semester of teaching…That support and the knowledge that I would be backed up made me decide to stay at the end of the year.</td>
<td>T-75 Taking the Biology Modeling course at the Science House at NC State and witnessing the power of inquiry-based teaching methods.</td>
</tr>
<tr>
<td>3 (1.5%) 3 (2.0%)</td>
<td>2 (1.0%) 2 (1.3%)</td>
</tr>
<tr>
<td>Behavior</td>
<td>Self-efficacy:</td>
</tr>
<tr>
<td>----------</td>
<td>---------------</td>
</tr>
<tr>
<td>Enforced instructional practices: school wide initiatives promote learning science (for example: STEM school, standards-based grading, project-based learning)</td>
<td>(interviews – spoke of rural school initiatives, early college, etc.)</td>
</tr>
<tr>
<td>Personal Science Teaching (PSTE) strength of teachers’ belief in their ability to teach science. Examples include student success in science courses</td>
<td>T-102 I see myself getting excited about a new lesson or teaching strategy, even if it takes extra time. I've noticed that if I come up with a good idea for a lesson, I can't drop it; I'll spend too much time the day before finalizing the new idea to implement the next day. There are several specific times (incidents) when this has clearly happened.</td>
</tr>
<tr>
<td>T-128 I also look forward to the results of my students' results on the standardized state exam (EOC).</td>
<td>19 (9.5%)</td>
</tr>
</tbody>
</table>
### Appendix I

**Coding Scheme**

Triggers Coding Scheme of Incidents where Teachers Consider Leaving the Profession Based on Bandura (1986) Social Cognitive Theory (n=72)

145 total quotations/instances

<table>
<thead>
<tr>
<th>Category</th>
<th>Sub-Category</th>
<th>Definition (inclusion/exclusion criteria)</th>
<th>Example</th>
<th>Frequency quotations</th>
<th>Frequency teachers</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Personal</strong></td>
<td>Autonomy:</td>
<td>Classroom decisions – Teachers not allowed to independently make instructional decisions in their own classrooms concerning curriculum, behaviors, teaching and learning expectations. Examples include being micromanaged or being forced to use Pacing guides or specific pedagogies.</td>
<td>T-87 I am not being given the autonomy to explore different methods of teaching because of administrators being focused entirely on test scores. When given freedom and time to instruct, I have been very successful. The next year these freedoms are taken away, but I am expected to exceed achievement from the past year and threatened with action plans</td>
<td>3 (2.1%)</td>
<td>3 (4.2%)</td>
</tr>
<tr>
<td></td>
<td>Policy decisions – Teachers do not make (or support) policies driving school decisions. Examples include policies to manipulate Graduation rates data (by passing students who have not done the work), focusing on test scores, and getting rid of classes without consulting teachers. Also includes Opportunities for Leadership or advancement</td>
<td>T-149 The school was moving to another computer type that did not support my software…. I even offered to purchase (at my expense) a computer ….and to purchase (again at my expense) the software to run my presentations. …. The admin ordered me to change to another software. T-25 After having taught Physics AP for 25 years, administration informed me the day before registration was to begin that…. T-120 lack of leadership opportunities</td>
<td>16 (11.0%)</td>
<td>16 (22.2%)</td>
<td></td>
</tr>
<tr>
<td><strong>Relatedness:</strong></td>
<td></td>
<td>Collegiality – Perception that administrators or other teachers are uncooperative, difficulty in coordination, feeling of a toxic environment, lack of respect for colleagues (often feel others are not pulling their weight). Also, the change in dynamics due to instability – when teachers leave.</td>
<td>T-131 I realized my department chair had created a toxic environment. He spread rumors….. He constantly spread a culture of fear and backstabbing among the teachers in my department. T-98 new teacher that came in does not believe in working with others or sharing planning. He also doesn’t believe in doing labs and activities because he can’t control his class.</td>
<td>7 (4.8%)</td>
<td>7 (9.7%)</td>
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<td></td>
<td>Students:</td>
<td>Lack of student discipline, lack of student support for teacher rules, student apathy, includes teacher percepts that students not getting the help they need from the school community.</td>
<td>T-61 Students more interested in their cell phones than their assignments. T-145 a student explained that a friend of hers was raped by several boys. I went to the officer for the school. The officer did nothing and told me not to have any contact with anyone involved. I had my keys in my hand and almost threw them at him.</td>
<td>24 (16.6%)</td>
<td>24 (33.3%)</td>
</tr>
<tr>
<td>Category</td>
<td>Description</td>
<td>Responses</td>
<td>Percentages</td>
<td></td>
<td></td>
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<td>-----------------------------------------------</td>
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<tr>
<td>Parents/Guardians</td>
<td>Lack of parent participation, general lack of cooperation or criticism of the teacher; feeling of being undermined in teaching efforts</td>
<td>T-88 the lack of respect for teachers from parents</td>
<td>8 (5.5%)</td>
<td></td>
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</tr>
<tr>
<td>Community (of practice)</td>
<td>Lack of cooperation by community stakeholders such as local businesses, government agencies, and civic organizations to support student learning. Also, disconnection to the teaching profession itself or inability to affect change. Examples include lack of value, respect, or support from community for school events when asked</td>
<td>T-27 We are governed by people that have little background in the actual classroom.</td>
<td>2 (1.4%)</td>
<td></td>
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</tr>
<tr>
<td>Competency: Teacher’s ability to teach</td>
<td>Knowledge for teaching science - Refers to the teachers’ insecurity or lack of professional understandings/ knowledge necessary to teach science</td>
<td>Nothing coded in survey question 5.5</td>
<td>-</td>
<td></td>
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</tr>
<tr>
<td>Effectiveness</td>
<td>Refers to student attitude towards science and administrators’ evaluation for the job of teaching.</td>
<td>T-102 I had far more potential than was being realized in my work as a teacher.</td>
<td>7 (4.8%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Environmental:</td>
<td>Structures in the education system including rules, norms and behaviors that guide schools in which teachers work</td>
<td>Nothing coded in survey question 5.5</td>
<td>-</td>
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<tr>
<td>Institutional:</td>
<td>Structures determined mainly at the district or higher level</td>
<td>-</td>
<td>-</td>
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<tr>
<td>Salary/job benefits</td>
<td>Compensation for the job of teaching. This includes pay and benefits as well as the larger picture of how raises and bonuses are distributed (tiered, steps, longevity, tenure) and impact on the teachers’ family. NCGA, legislature decisions. Teachers describe frozen steps, no raise, lack of compensation for all of the extra duties that are added, especially with more experience.</td>
<td>T-96 As a veteran teacher in NC, I have not received a raise in compensation for more than 10 year while my costs for health insurance and taxes have risen T-97 they took away master’s pay and mentor pay and club pay and have added more and more responsibilities without compensation</td>
<td>17 (11.7%)</td>
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<tr>
<td>Facilities</td>
<td>Refers to the physical space accessible for teaching to happen. Classroom, laboratory, safety, as well as space students utilize such as cafeteria, auditorium, and outside areas.</td>
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<tr>
<td>Resources</td>
<td>Refers to items that are freely available to teachers for use or consumption in order to fulfill their job of teaching. Examples include money (budget), technology, textbooks, curriculum, consumables, office supplies, copy machines</td>
<td>T-44 The reoccurring theme of not having the resources needed.</td>
<td>4 (2.8%)</td>
<td></td>
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<tr>
<td>OOF teaching</td>
<td>Subjects the teacher has had no formal training (academic major/ minor or student teaching) as preparation</td>
<td>Coded with workload (multiple preps, did not distinguish if OOF)</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Workload/Time</td>
<td>Duties, obligations and time required throughout the day; includes routine paperwork, time to plan, provide student feedback,</td>
<td>T-162 I have been assigned classes for an entire year that are crowded, with the lowest performing students, a large number of ESL students, and a</td>
<td>10 (6.9%)</td>
<td></td>
<td></td>
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</tbody>
</table>
collaborate, engage in PD. Examples include preps, double duty, lack of planning time

large number of behavioral issues. This requires a lot of time outside of class to keep up with all of the requirements such as paperwork and parent phone calls placed on me by the district and administration.

<table>
<thead>
<tr>
<th>Socio-Cultural</th>
<th>School climate – the environment of the school beyond the physical space, encapsulates the culture of accountability, how school is run, and what is acceptable behavior. Examples include “Dysfunctional”, no mutual trust, value or respect; “unstable”</th>
</tr>
</thead>
<tbody>
<tr>
<td>Admin support/leadership – how the school leadership interfaces with the faculty, responds to parental inquiries, includes communication, trust and encouragement. Examples include teacher evaluation is destructive rather than constructive.</td>
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<tr>
<td>PD – the growth mechanism for teachers to learn new pedagogy, content knowledge or address areas deemed deficient by evaluation</td>
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<tr>
<td>Enforced instructional practices; school wide initiatives promote learning science (for example: STEM school, standards-based grading, project-based learning)</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Behavioral</th>
<th>Self-efficacy: teachers’ judgement of ability to effect positive change in student learning</th>
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</thead>
<tbody>
<tr>
<td>Personal Science Teaching (PSTE) Undermined belief in teachers’ ability to teach science. Examples include</td>
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<tr>
<td>Outcome expectancy (STOE) – Breakdown in learning environment such that teacher does not expects students to learn, includes low expectation in test scores, achievement, and future achievement</td>
<td></td>
</tr>
</tbody>
</table>

| | T-71 During that three-year time period, I also had 2 principal changes. There was much movement and lack of consistency that it made my day to day very difficult. |
| | T-21 Change in administration to poor leadership, low morale in the school. |
| | T-64 I had a principal who constantly targeted different teachers she wanted to get rid of. She would bully them …The LEA never responded to incidents …I felt I had no power or chain of command…. |
| | Nothing coded in survey question 5.5 |
| | Nothing coded in survey question 5.5 |

| | 8 (5.5%) |
| | 8 (11.1%) |
| | 35 (24.1%) |
| | 35 (48.6%) |
| | 1 (0.7%) |
| | 1 (1.4%) |
| | 3 (2.1%) |
| | 3 (4.2%) |
Appendix J

Coding Scheme (Schlossberg)

Coping strategies of Critical Incidents where Teachers Consider Leaving the Profession
Based on Schlossberg (1995) Transition Theory (n=72)
97 total quotations/instances

<table>
<thead>
<tr>
<th>Category</th>
<th>Definition (inclusion/exclusion criteria)</th>
<th>Example</th>
<th>Frequency quotations</th>
<th>Frequency teachers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Modify situation:</td>
<td></td>
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<td></td>
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<tr>
<td>Modify situation: strategies aimed at altering the source of the event</td>
<td>Negotiation – Focus on trying to find a fair compromise, would include communication with parties involved</td>
<td>T-84 I have advocated for myself T-115 I have tried over the course of the current principal's tenure to work with my and my fellow staff members to improve student performance as well as teacher moral</td>
<td>5.2%</td>
<td>6.9%</td>
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<tr>
<td></td>
<td>Personal Discipline- Focus on improving some aspect in order to bring about a resolution, focus on the part of that you can control (include PD, personal improvement, personal challenge)</td>
<td>T-86 Take more PD on differentiation and making sure I can describe other examples of it to him.</td>
<td>11.3%</td>
<td>15.3%</td>
</tr>
<tr>
<td></td>
<td>Optimism- Focus on taking action to getting rid of the stress or finding a solution; focus on external (include political action,</td>
<td>T-29 Got very involved in NCAE - was there when Roy Cooper announced candidacy.</td>
<td>5.2%</td>
<td>6.9%</td>
</tr>
<tr>
<td></td>
<td>Seek Advice- Asking for help or advice of administration, other colleagues, friends, relatives, or professionals (include therapy)</td>
<td>T-116 I brought my concerns to the Principal, who expressed her support of me and my teaching. She also wrote a letter to all parties concerned, expressing her support.</td>
<td>5.2%</td>
<td>6.9%</td>
</tr>
<tr>
<td>Control meaning of problem:</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Control meaning of problem: strategies aimed at cognitively neutralizing the event (Pearlin &amp; Schooler, 1978)</td>
<td>Neutralize response - Focus on getting through the event without making a change or adjustment and later deciding to teach another year or try again; this added space give a more balanced perspective (strategies include counting to 10 or putting one foot in front of the other to get through)</td>
<td>T-72 I have just found that if I take it a day at a time and keep my eyes focused on my goal, I will make it T-102 The incident happened in the spring, so the school year ended, then summer served as a break, and then a new year started in the fall. The year following the incident was good - I felt like my work was effective, I wasn't overwhelmed, and I enjoyed teaching. So, I continued teaching after that.</td>
<td>7.2%</td>
<td>9.7%</td>
</tr>
<tr>
<td></td>
<td>Positive comparison- reframing the situation in a more acceptable way, often captured in idioms such as “count your blessings”</td>
<td>T-98 I reminded myself that I was making a difference--and that students were learning and succeeding and becoming better overall learners because of my class.</td>
<td>3.1%</td>
<td>4.2%</td>
</tr>
<tr>
<td></td>
<td>Selective ignoring- Focusing on the job, or certain aspects of teaching and overlooking</td>
<td>T-113 My strategy to deal with that is to remember that administrations come and go, coworkers come and</td>
<td>11.3%</td>
<td>15.3%</td>
</tr>
</tbody>
</table>
the difficulty (seeing the event as a small incident or not as important as other parts of the job) | go and that I should just focus on my classroom and make it as functional as I can: Engaging, rigorous, dynamic and hands on. T-123 Creating new growth opportunities for myself such as standards-based grading and mastery-based grading. Taking informal leadership role among similar minded staff.

Substitute rewards – Focusing on other aspects of life and downplaying the difficulty (seeing the event as not as important or valuable as other parts of life – such as family or mental health) | T-66 I have a daughter; I will keep teaching until she is grown. T-72 the hope that I will be able to help one or two of these hurting kids it what keeps me motivated.

Help manage stress after is has occurred: strategies aimed at accommodating the existing stress of the event without being overwhelmed by it (Pearlin & Schooler, 1978) | Substitute rewards – Focusing on other aspects of life and downplaying the difficulty (seeing the event as not as important or valuable as other parts of life – such as family or mental health) | T-66 I have a daughter; I will keep teaching until she is grown. T-72 the hope that I will be able to help one or two of these hurting kids it what keeps me motivated.

Withdrawal-leave the situation (transfer, quit) | T-39 I did not stay in the situation, but I was able to find a school where I felt respected. T-91 I left the school and found a job elsewhere. Science teachers are always in demand.

Hope – focus on religious faith | T-30 Prayer-lots of it!

Relaxation- Finding ways to release the stress through activity or community support (include hobbies and activities such as sports, yoga, and communities such as friend groups) | T-16 Great relationships with colleagues, family atmosphere, and great students! T-135 I have found other passions to pursue.

Passive acceptance/forbearance-avoiding the situation or people involved, keeping out of the way (includes doing nothing or waiting until retirement) | T-96 I am 7 years from retirement. It is not economically feasible for me to change professions at this stage of my career. The NCGA understands this and has trapped veteran teachers in a cycle of poverty and disrespect unseen in our state before now.

Emotional discharge- Yelling, shouting, or another physical response to release emotions caused by event | No comments made in survey

Denial – Thinking that the situation doesn’t exist | No comments made in survey

Magical thinking – Thinking that the situation will magically disappear or take care of itself | No comments made in survey