SCIENCE TEACHING IN TEXAS:

INVESTIGATING RELATIONSHIPS AMONG TEXAS HIGH SCHOOL SCIENCE TEACHERS' WORKING CONDITIONS, JOB SATISFACTION, AND RETENTION

A Dissertation

by

VICTORIA MARLENE HOLLAS

Submitted to the Office of Graduate Studies of
Texas A&M University
in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

December 2011

Major Subject: Curriculum and Instruction

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ABSTRACT

Science Teaching in Texas: Investigating Relationships

among Texas High School Science Teachers' Working Conditions,

Job Satisfaction, and Retention. (December 2011)

Victoria Marlene Hollas, B.A., Houston Baptist University

Chair of Advisory Committee: Dr. Carol L. Stuessy

In many critical subject areas our schools are facing a need for teachers, particularly in the "high-need" areas of mathematics, science, and bilingual education. Educators and researchers alike have identified teacher turnover as a major contributor to the challenge of finding and keeping highly-qualified teachers in American classrooms. The purpose of the three studies in this dissertation was to investigate the potential role of working conditions in explaining the turnover rates of high school science teachers.

I used data collected by the Policy Research Initiative in Science Education (PRISE) Research Group during the 2007-2008 and 2008-2009 academic years, from their random, stratified sample of 50 Texas high schools and their 385 science teachers. The first study focuses on the development of a rubric assessing individual science teachers' working conditions, which involved the examination of multiple data sources, including school master schedules and AEIS reports to determine the working conditions of 385 science teachers. Analyses from this study suggested that (a) science teachers

from small schools experience tougher working conditions than science teachers from both medium and large schools; (b) veteran science teachers experience tougher working conditions than both induction and mid-career teachers; and (c) science teachers from lower minority schools experience tougher working conditions than science teachers from schools with higher MSEPs.

The second study focuses on the relationship between high school science teachers' working conditions and their levels of job satisfaction. Findings included that (1) science teachers from small schools experienced tougher working conditions, even though they were more satisfied with their jobs; (2) veteran science teachers experienced tougher working conditions and were more satisfied with their jobs; and (3) science teachers from lower minority schools experienced tougher working conditions and were more satisfied with their jobs.

The final study focuses on the relationship between high school science teachers' school size, MSEP, teacher type, working condition scores, job satisfaction scores, and retention status. Results of independent samples T-test revealed no significant difference in working condition scores for "stayers" versus "non-stayers." Pearson's correlation revealed school size and the experience level of the science teacher as significant predictors of working condition and job satisfaction scores. Results of the discriminant analysis revealed (a) working condition scores and job satisfaction scores as not significantly predicting science teacher retention; and (b) teacher type (beginning, mid-career, and veteran) as the only significant predictor of teacher retention.

DEDICATION

I would like to dedicate this work to my husband, Randy, and my children, Aubrey, Brady, and Blake. Their support, from the beginning of this journey, has made the completion of this process possible. I will not ever be able to express the love and gratitude I feel towards these most important people in my life. Further, I would like to thank my parents for constantly pushing and asking questions about my progress. Their expectations, as well as the rest of my family's expectations, have encouraged me to keep progressing even when the journey became filled with obstacles. Looking back, I cannot imagine my life any other way and would not change this experience for the world.

ACKNOWLEDGEMENTS

I would like to thank my committee chair, Dr. Carol Stuessy. Thank you for being a mentor, role model, teacher, and friend. Your encouragement and mentorship has changed my life forever. Your guidance through this process has opened the doors to the rest of my life. I will never be able to thank you enough for this gift you have given me.

Additionally, I would like to extend my gratitude to my committee members, Dr. Loving, Dr. Scott, and Dr. Yalvac, for their support and guidance throughout the course of this research. These outstanding individuals have been a part of this graduate process in some way or another throughout my graduate career. I cherish their support and input and admire and respect them immensely. Thank you for your contribution to this work.

I feel most grateful for not having to go through this experience alone. I would like to extend my gratitude to the PRISE Research Group. Over the last several years, I was fortunate enough to have a group of colleagues in the trenches with me during this journey. Although different faces made their way through our office doors, the support and encouragement of my peers never wavered. I am so glad we completed this journey together.

Finally, I would like to extend my gratitude to the National Science Foundation, whose funding made this research possible. In part, the research reported in this paper was supported by a National Science Foundation grant (Grant ESI-0455679) and the Department of Teaching, Learning, and Culture at Texas A&M University. Any opinions, findings, or conclusions expressed in this paper are those of the author and do not necessarily reflect the views of the funding agencies or Texas A&M University.

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CHAPTER I

INTRODUCTION

While the turnover of any teacher negatively impacts our schools, the turnover of science teachers, in particular, is of mounting concern. Science teacher retention is important to preserve the prosperity upon which this nation was founded. Essentially, what we have as a nation is strongly related to the past investments we have made in science and technology (National Academy of Sciences, 2007). Much of what you see in your everyday life today in the U.S. (health, education, defense, transportation, agriculture, communication, and jobs) is the product of investments made in the education of engineers and scientists. Science teachers should be the best and the brightest, and we should fight to keep them in the profession. Without science teachers preparing the next generation of science-literate students to learn, live, and work in the 21st century, we not only lose the competitive edge in Science, Technology, Engineering, and Mathematics (STEM) markets but also risk the democratic process itself, as our country is founded on informed decision-making. Understanding issues related to science is particularly difficult without an adequate science background, and that puts our nation at risk on many different levels (National Academy of Sciences, 2007).

Today, few would argue about the impact of teachers on the quality of education. Numerous education reforms echo in agreement. Specifically, the *No Child Left*

This dissertation follows the style of *Education Administration Quarterly*.

Behind Act (NCLB, 2001) requires that every classroom in the U.S. be led by a teacher who has met the requirements to be classified as highly qualified by demonstrating a strong proficiency of content mastery and pedagogy in the field (Grissmer & Kirby, 1997; Ingersoll, 2003a).

However, the nation faces an extreme teacher shortage in our core subject areas, and a significant gap still exists between the demand and actual supply of teachers' qualified and willing to work in today's schools (Henke, Chen, Geis, & Knepper, 2000). The increasing deficit of qualified teachers in today's classroom is not merely a result of increases in teacher retirements and student enrollments, class size reductions, and a lack of production from teacher preparation programs. A key factor lies in high rates of teacher turnover in general (Darling-Hammond, 1999; Sanders & Rivers, 1996). Based on Ingersoll's research (2001), teacher turnover is defined by the number of "movers" (those that move from one school to another), "leavers" (those that leave the profession entirely) and "stayers" (those that make no change in their position or school) within a school.

Across the country, teachers leave the profession at alarmingly high rates (Ingersoll, 2001). One study estimates the teacher turnover rate as almost 16% annually (Ingersoll, 2003a). When beginning teachers are examined alone, their rates are much higher. Twenty-five percent of new teachers leave the profession within the first five years of teaching, and 40% of those teachers who leave say they have no intention of teaching again (Darling-Hammond, 1999; Weiss, 1999). A 2003 report recently revealed approximately one third of all beginning teachers leaving within their first three years of teaching, while evaluating after five years reveals a 50% attrition rate (National Commission on Teaching and America's Future [NCTAF], 2003).

Teacher turnover is not always a negative process. An occasional positive outcome of teacher turnover is the loss of incompetent teachers (Courig, 2001); however, teacher turnover makes our classrooms prone to an imbalance in the quality of education in several critical areas such as science and mathematics. Furthermore, teacher turnover is expensive. It produces costs associated with recruiting and hiring as well as disruption to the educational process with new induction efforts and general content mastery of a teacher replacement (Cooperman, 2000; Ingersoll, 2003a; Murnane & Steele, 2007; Rothstein, 2002).

Teacher turnover is not a new problem. Many school districts along with states have tried, through policy interventions, recruiting, training, and retaining qualified teachers (Frankenberg, 2006; Ingersoll, 2002). Some of those interventions have included programs to improve working conditions, induction and mentoring programs, financial incentives, professional development programs, among many others (Frankenberg, 2006; Johnson, 2006; Olson, 2003). Research has produced a number of strategies to address teacher turnover, and additional research related to the retention of teachers has examined the effects of some of these interventions (Haenn, 2002; McAndrews & Anderson, 2002).

Understanding the complicated factors related to teacher attrition and retention is difficult. This study aims to better understand the process by assessing the relative weights of a variety of working conditions on science teachers' job satisfaction and ultimately, science teacher retention. Furthermore, this study will examine the roles that individual teacher characteristics and school characteristics play in those relationships.

Background of the Study

In reality, the problem of teacher turnover is not new. Teachers have always quit the profession and switched schools and districts (Lortie, 1975; Metz & Fleishman, 1974). When examining the history of teacher retention in K-12 public school systems over the twentieth century, we see fairly stable trends. In 1924, annual turnover of teacher topped 16% (National Education Association, 2004). Metz & Fleischman (1974) reported a 19% turnover rate in 1969, while a 16% turnover rate was reported in 2000 (Kelley, 2004; Ingersoll & Smith, 2003b). One researcher concluded that high turnover rates plague the teaching profession in general (Lortie, 1975).

The difference today is markedly higher public awareness and concern. The concerns about teacher turnover have likely increased due to several reasons: a demand for smaller class sizes in most schools at the elementary and secondary level, a realization that an overwhelming percentage of baby-boomer teachers have accumulated experience in excess of 20 years and are nearing retirement within the next ten years, and newer requirements that create more hurdles for individuals wanting to be teachers (NCTAF, 2003). According to the National Center for Education Statistics (2007), the push toward smaller class sizes comes in conjunction with an all-time high enrollment of approximately 48.7 million K-12 public school students in 2004, projected at 10% growth through 2016. This, coupled with potential teacher retirements and increasing requirements, could create the need for over two million teachers nationwide in the next decade (NCES, 2007).

In addition, the NCLB Act of 2001 has drawn the general public into the teacher shortage crisis (Ingersoll, 2002; NCTAF, 2003). The NCLB Act requires schools to hire highly qualified teachers for every classroom in America, thus assuring a quality education for each student regardless of income, background, or ethnicity (Haberman, 2005). By 2006, the NCLB Act dictated that all public school teachers teaching in K-12 public schools must have a minimum of a bachelor's degree, show competency in the subject(s) taught, and meet the licensing/certification requirements for their resident states (Hess & Petrilli, 2006; National Academy of Sciences, 2007). With these more rigid requirements, a real fear has been that potential teacher candidates may abandon the profession altogether.

With growing demands for teachers in our classrooms, pressure has mounted for colleges and other teacher preparation programs (Loeb, Darling-Hammond, & Luczak, 2005). The demand is to provide expanded programs in teacher education and develop additional alternative routes for any professional with an interest in education who may have the desire to become a teacher (Darling-Hammond, 1999; Feistritzer & Chester, 2001; Loeb, Darling-Hammond, & Luczak, 2005). However, millions of individuals have already earned their teaching certificates and never stepped foot into a classroom (Ingersoll & Perda, 2006). The effectiveness of these types of policies to resolve our teacher shortage problem is questionable.

Some researchers have turned their attention away from recruitment and instead have focused on teacher retention. They claim that the nationwide average shows the profession of teaching losing teachers new to the profession at a rate of approximately 50% within the first five years. As a result, many conclude that our focus as a nation should be to retain those who have already chosen teaching as their profession rather than recruiting more new teachers into a fractured system (Abel & Sewell; 1999; Baker & Smith; 1997; Boe, Bobbitt, Cook, Whitener, & Weber, 1997; Ingersoll, 2002, Ingersoll, 2003a; Pisciotta, 2000).

Both researchers and educators agree there are consequences of not having enough qualified teachers in our classrooms which are significant and severe (Ingersoll, 1998; Murnane, Singer, Willett, Kemple, & Olsen, 1991; Lewis, 1998; Pisciotta, 2000). Teachers may be teaching out of their field, students may be performing poorly, class sizes may be increasing, and more and more students may be dropping out (Darling-Hammond, 2003a; Hafner & Owings, 1991). Some argue the high rates of teacher turnover have caused an erosion of professional maturity that will take decades to restore, thus directly impacting student achievement (Darling-Hammond, 1999; Hanushek, Kain, & Rivkin; 2004a; McCarthy, 2005). Additionally, many contend that the consistent turnover rate has impacted the profession with increased costs and disruptions related to the recruitment process and subsequent recruitment and induction process (Ingersoll & Smith, 2003; Weiss, 1999). Each teacher who exits the profession in the first three years directly impacts citizens by costing taxpayers approximately $50,000 in personnel costs, including recruitment, as well as lost productivity (Wong &

Asquith, 2002). Policy makers as well as researchers have dedicated a tremendous amount of energy and time to examine the causes and effects of teacher turnover because of the enormous costs, disruptions, and overall impact on education programs.

A great deal of complexity exists in determining why teachers leave their jobs. The teacher turnover process is difficult because of the large number of variables involved (Buckley, Schneider, & Shang; 2005). In economics, a framework provided by the human capital theory helps us understand some of the factors involved in the decision to join the teaching profession, and subsequently, a later decision to stay in teaching or leave the profession altogether. Generally, this theory classifies an individual's decision to stay or leave a job based on their impression of the value of the job, either real or perceived, compared to the overall investment one has made to the profession (Becker, 1993; Feiman-Nemser; 2001; Ehrenberg & Smith, 2003). A key principle of human capital theory relates to the notion that acquiring greater skills and knowledge in a job, whether from educational investments or job training, the more likely one is to stay in that job (Cappelli, 2004; Grissmer & Kirby, 1987; Kirby & Grissmer, 1993). Furthermore, if the benefit associated with leaving the job is greater than the expense, people will ultimately decide to make a change.

In short, human capital theory posits that someone will become a teacher and remain a teacher if teaching presents the most attractive opportunity among all those opportunities available to them (Feiman-Nemser, 2003). As a result, the supply of teachers is directly related to the attractiveness of the teaching profession. To make the teaching profession more attractive, the profession must create a workplace where the benefits outweigh the costs of choosing to become, and later remain, a teacher. To produce outcomes that are positive for the recruitment and retention of teachers, comparable changes in numerous policies would be necessary (Blair, 2001). Some of those changes could be policies related to certification requirements, beginning teacher salaries as well as salary differentials for experienced teachers, opportunities for professional development, awareness of and/or reductions in working conditions, and the overall perception of the field. Each of these could be manipulated at several levels, local, district, and state, in order to balance supply and demand. Districts and states have not ignored programs like these as means of attracting and retaining qualified teachers.

Financial Incentives

Salary has long been criticized as a chief deterrent in an individual's choice to become and remain a teacher (Brewer, 1996; Darling-Hammond, 1999; Grissmer & Kirby; 1987). As a result, several programs addressing financial incentives have been adopted in many states and districts as a popular teacher recruitment and retention strategy. In 2001 alone, 60% of the nation's governors debated higher salaries for teachers, and 56% of the state legislatures introduced legislation to increase teacher salary (Frankenberg, 2006; Johnson, 2006). Not only did many in the teaching profession receive comprehensive wage increases, many districts began giving stipends, initial contract bonuses, and housing incentives to entice potential teachers to the field – especially in critical shortage areas such as mathematics and science (Blair, 2001; Prince, 2002). In the 1990s, the average teacher salary increased by 31.5%, but salaries truly hovered around 4% during that decade when inflation is considered (Hirsch, Koppich, & Knapp, 2001). However, some researchers and policy makers will argue that salary is not the key issue in recruiting and retaining teachers (Nelson, Drown, & Gould, 2002).

Working Conditions

Although many policy makers and educators acknowledge working conditions are essential in the retention of teachers, very few districts and states have addressed working conditions from a policy standpoint (Ballou & Podgursky, 1997; Hirsch, 2005; Loeb, Darling-Hammond, & Luczak, 2005). In the past, limited data was available to evaluate the working conditions of teachers; however, recently some legislatures (e.g., North Carolina, Connecticut) began collecting data at the state level about working conditions to examine the complex nature of the teaching environment and make authentic comparisons with teacher retention (Haberman, 2005; Inman & Marlow; 2004; Marvel, Lyter, Peltola, Strizek, Morton, & Rowland, 2007).

The current concept of working conditions includes much more than resources, facilities, and class size. Understanding working conditions involves examining other concepts such as student demographics, standard labor issues (e.g., safety concerns), teacher autonomy, and administrative support (Guilford Education Alliance, 2009; Frankenberg, 2006; Monk, 2007). These additional domains of working conditions have not been investigated well when considering job satisfaction and teacher retention (Loeb, Darling-Hammond, & Luczak, 2005).

Professional Development

Professional development in K-12 public schools is often used to train teachers while they are “on-the-job” (Hawley & Valli, 2001; Jacob & Lefgren, 2004). Currently, 35 states mandate some type of professional development documentation for current teachers to renew their teaching certificates (Darling-Hammond, 1999; Jacob & Lefgren, 2004). Teachers have many options to broaden their knowledge and teaching skills. These include site-based coaching, study groups, graduate coursework, observations, and curriculum development; however, there is little support and guidance from schools and districts regarding the specific paths to follow (Buckley, Schneider, & Shang, 2005; Feiman-Nemser, 2001). Teachers, especially beginning teachers, are often left to determine their own paths (Feiman-Nemser, 2001). Along with salary and poor working conditions, young teachers also site the lack of support and guidance as a primary reason for leaving the field (Kelley, 2004; Smith & Ingersoll, 2004). Over the past two decades, teacher induction and mentoring has become the preferred professional development training program for beginning teachers. In the 1980s, induction or mentoring programs for beginning teachers existed in only about 15 states. However, by 1999, 38 states had established beginning teacher support programs that incorporated some type of induction program. It is important to note that many of these beginning teachers programs varied greatly in terms of new teacher participation and funding (Hirsch, Koppich, & Knapp, 2001). Of the 38 states with established programs, only 22 currently mandate and fund their mandated programs.

Policy makers seem to have little interest in the outcomes of each of these interventions on teachers in terms of their job satisfaction and retention. In examining working conditions, turnover behavior might be better explained when examined as a process associating individual teacher characteristics, teaching assignments and conditions, and school characteristics (Prince, 2002). Workplace conditions seem to be likely to collectively influence teachers' job satisfaction and their actual turnover behavior.

Job Satisfaction

When it comes to examining job performance and organizational effectiveness, job satisfaction has been investigated most frequently (Haberman, 2005; Hirsch, Emerick, Church, & Fuller, 2007; Inman & Marlow; 2004). Dissatisfied employees may either reduce their focus and effort or leave the job altogether (Darling-Hammond, 2003). Job satisfaction is closely aligned with teachers' performance and attitude, and teachers' work attitude and performance is closely associated with student learning (Ostroff, 1992). As a result, job satisfaction becomes an important policy issue. Some researchers debate the effects of dissatisfied teachers and their impact on the quality of instructional practice. Most others, however, agree that teachers who are dissatisfied are less likely to put in the greatest effort and do their best work in and out of the classroom and are more likely to leave the field (Evans, 1996). On the other hand, highly satisfied teachers have a better track record staying with a school and the profession in general (Baker & Smith, 1997; MacDonald, 1999). Few can argue that student learning and the workplace environment are disrupted and the recruitment effort can be costly when a teacher leaves a school or the profession. Thus, teacher dissatisfaction is a crucial area of interest for schools and policy makers, even when it does not lead to an immediate exit from the field.

Statement of the Problem

In many critical areas (e.g., science, mathematics, bilingual education) our schools are facing a need for teachers, and educators and researchers alike have identified teacher turnover as a major contributor to this challenge (Ingersoll, 2003a). However, no consensus exists in the research literature regarding the multiple factors affecting the science teacher turnover process. In addition, no consensus exists regarding the more important or less important factors affecting teachers' decision making process.

Previous researchers have considered both teacher compensation and working conditions as the independent variables that impact several dependent variables such as teachers' job satisfaction and retention. Professional development, including induction and mentoring programs, have been included in recent research studies as potentially predicting teacher turnover. Overall, past literature has been inconsistent in terms of the impact of a salary or a salary increase on job satisfaction and the decision to remain in teaching (Ballou & Podgursky, 1997; Gritz & Theobald, 1996; Hom & Kinicki, 2001; Ingersoll, 2001, Perie & Baker, 1997; Stinebricker, 1999). Some findings suggested that an increase in salary was associated with reduced teacher turnover; however, the effect of salary was insignificant and varied within different student demographic groups. These findings suggested that salary differentials within current teacher compensation plans may be the only necessary modification.

Previous research in working conditions found similar results; however, most research examined different working conditions components (e.g., Haberman, 2005; Holloway, 2000; Inman & Marlow, 2004; Weiss, 1999). Several of these studies applied factor analysis identifying regression models and factors of working conditions to examine the effects of these findings on teachers' job satisfaction, overall commitment, and ultimately, retention. Generally, findings found that teachers dissatisfied with the conditions at work had a greater likelihood of abandoning the teaching profession (Haberman, 2005; Holloway, 2000; Ingersoll, 2001, Inman & Marlow, 2004).

Although professional development programs are a top priority of most districts and states, education research has not focused on that aspect of the field in comparison to other disciplines (Feldman, 1996; Guskey & Peterson, 1996; Smith & Rowley, 2005). Examining research in other fields shows conflicting findings. Training in the workplace can make employees more valuable to the current employer while simultaneously adding skills and knowledge and thus making them more valuable to the external labor market (Guskey & Sparks, 1991; Parent, 1999). Parent (1999) found that training in the workplace is not a significant predictor of retention, while Smith and Rowley (2005) found workplace training to have a positive impact on retention. Recent studies examining induction programs for new teachers showed that these programs are a significant predictor of teacher retention status (Smith & Ingersoll, 2004; Strong, 2005). Each of these studies analyzed retention rates for teachers who participated in an induction program versus those teachers who did not participate in an induction program.

Teachers’ decisions to leave the field have been perceived in past literature as distinct decisions rather than a course of action involving multiple factors. Many of the reviewed studies examined separate factors on teacher turnover and often did not consider job satisfaction within their model. Finally, variations within the relationships among the variables by individual teacher characteristics, teaching assignments and conditions, or school characteristics have not been extensively explored. In short, determining which individual factors have a greater probability of impacting teacher retention requires more extensive knowledge of the relative importance of each of the working conditions examined separately in previous research studies.

These individual studies point to a need for a more comprehensive study that simultaneously considers multiple factors affecting separate outcome variables, and the relationship among the dependent variables within a single model. This type of study can identify and prioritize factors and school or teacher characteristics that need significant attention to address and potentially impact the high rate of teacher turnover.

Purpose of the Study

The purpose of this study is to assess the relative weights of individual teacher characteristics, teaching assignments and conditions, and school characteristics as working conditions and to better understand how these conditions are related to Texas high school science teachers’ job satisfaction and retention. Furthermore, this study explores the individual characteristics of teachers and demographic characteristics of schools and examines the relationships between and among those characteristics.

Significance of the Study

The functional implications of this examination are secured in integrating ideas that are effective in creating an action plan for retaining qualified teachers in one of our highest areas of need. The effects of teacher attrition not only impact the future of our profession, but it impacts the quality of our current educational system. This study incorporates professional development programs within the model of working conditions to predict the potential turnover of teachers. Professional development has been at the forefront lately in terms of teacher training and preparation, but it has not been examined in relation to working conditions and teacher retention.

This study also integrates background knowledge from a variety of disciplines as well as theories related to labor economics and organizational behavior management as an interdisciplinary approach. This alternative framework brings new light to the examination of science teacher job satisfaction and retention. Specifically, this study employs the concept of job satisfaction as an additional variable between the turnover factors (i.e., working conditions) and the actual turnover behavior. The goal is to provide a thorough explanation of the science teacher retention process.

Some districts and states have already exercised policies to improve working conditions for teachers in order to address teacher attrition (Hirsh, Emerick, Church, & Fuller, 2007; Shen, 1997). Policymakers would benefit from findings related to my study as it will provide the relative importance of working condition components impacting science teacher job satisfaction and retention.

Organization of the Manuscript

Chapter I has presented background information on teacher working conditions and the context of the study. Chapter II presents an analysis of current literature relevant to this particular study. In addition, this chapter presents a conceptual framework for the study and focuses on answering the following questions:

1. What are the theories related to teacher turnover?
2. What are the factors related to teacher turnover?
3. What are the working conditions associated with job satisfaction and retention?

Chapter III describes the development of a rubric to measure working conditions in Texas high school science classrooms and presents descriptive statistics as well as results of factor analysis related to this research. Chapters IV and V are independent studies investigating science teacher working conditions as they relate to job satisfaction and teacher retention, respectively. Each chapter contains its own research questions, purpose, methodology, analysis, implications, and conclusions. The final chapter, Chapter VI, provides a summary for the study.

CHAPTER II

LITERATURE REVIEW AND CONCEPTUAL FRAMEWORK

This examination of research literature samples an existing collection of knowledge surrounding general assumptions about teacher retention, specifically focusing on studies that identify factors related to teacher turnover and the theories that have driven researchers' thinking. This review focuses on theories traditionally associated with labor market and psychology, specifically in the contexts of social learning, human capital, job satisfaction, and the teacher labor market. These have been used as conceptual frameworks in studies that explore the correlations among the foundations of the teaching profession in general: working conditions, job satisfaction, and teacher retention. In addition, this chapter examines publications that focus on factors impacting the teacher turnover and retention process and job satisfaction, combining characteristics of teachers and schools. The chapter's final portion presents and provides an explanation of the conceptual framework. I have chosen to guide my research on science teachers' working conditions and mobility.

Approaches to the Teacher Turnover Process

Many models have been developed and tested to provide an explanation for turnover behavior of teachers. Although these models do not necessarily have the same content, they do focus on providing an explanation of the variables that impact deliberate turnover in the teaching profession. Moreover, these models have a common foundation developed from either social learning theory or human capital theory of occupational choice. Basically, human capital theory assumes a person makes a logical judgment regarding the advantages and disadvantages associated with staying in or leaving a profession. On the other hand, social learning theory associates turnover with the social learning process.

Human Capital Theory

Basic components of the human capital theory provide the foundation for the conceptual framework explaining a person's desire to pursue and continue in or leave the teaching profession. Specifically, this theory focuses on the associations within training and education, establishment, and the task of finding a new position in relation to returns and investments. (Baptiste, 2001; Sweetland, 1996). A major principle of human capital theory states that the more skills and knowledge one acquires, the lower one's likelihood to leave that occupation (Ehrenberg & Smith, 2003). Decisions related to turnover are primarily directed by beginning requirements (e.g., licensing) and prospective benefits of a potential job change such as a higher salary, improved working conditions, and job satisfaction (Baptiste, 2001). If the current benefit related to turnover exceeds the costs, the decision to change jobs is much more likely. The benefit of turnover will be greater with the following characteristics: (a) greater benefits from the new job; (b) lesser job satisfaction from the current job; and (c) low instant costs associated with the change (Sweetland, 1996).

Financial Benefits

Encompassed within human capital theory is a variety of potential financial assistance (e.g., pensions, health insurance, etc.). Within the profession of teaching, these benefits can be categorized as investment returns in training and education. Professional development can make those in the profession more effective, resulting in a better return on wages and other trade-offs associated with training costs (Ehrenberg & Smith, 2003). If teachers do not feel as if they are getting an adequate return as they progress through their profession, they are more likely to “check-out” and spend less time in activities related training and education. In short, teachers who believe they have dedicated substantially to teaching but have not received a comparable amount in return will ultimately decide to leave the profession (Sweetland, 1996). Unlike many professions, most teachers in the United States receive their pay based on a single salary schedule. With no distinction in pay reflecting their content, achievement, aptitude, or merit, most certified teaching professionals are paid the same (Hanushek, 2006). Generally speaking, within a school district all teachers receive their pay based on the same salary schedule without regard to the character of the school’s working conditions. It seems only natural that teachers will gravitate toward jobs with fewer demands, less stress, and better working conditions. If not, they will simply change to occupations that offer better salaries. Economists have suggested that single salary schedules should be altered to reflect the professional market with differences in pay that take into account the range of conditions making some jobs more desirable than others (Hanushek, 2006). Traditionally, teacher salary plans have not recognized teachers as their own human capital investors except in terms of their level of education.

Non-Financial Benefits

Teachers see other benefits as equally important as monetary benefits when determining their career. Some of those benefits are teacher and administrator support, school facilities, available resources, classroom autonomy, school decision-making processes, student learning attitudes, and teacher workload. Much of the research refers to those non-financial benefits as working conditions (Baptiste, 2001; Ehrenberg & Smith, 2003; Sweetland, 1996). These factors vary by the type of school, location of the school, and the demographics of the school. Researchers cite differences among determinations of job-specific human capital and generic human capital by stating that job-specific human capital is specific to the school and does not transfer to other schools. Generic human capital is not specific to the school and is easily transferred from school to school and profession to profession. Some job-specific human capital examples would be school policies and practices, seniority, respect, privilege, and autonomy (Becker, 1993; Black, Noel, & Wang, 1999; Grissmer & Kirby, 1987). Job-specific human capital is influential in keeping an individual in an occupation if the human capital is compensated (Sweetland, 1996). Teachers' decisions about where to work are significantly influenced by working conditions and/or school level characteristics and monetary compensation (Baptiste, 2001; Ehrenberg & Smith, 2003; Sweetland, 1996). When compared to monetary compensation, general working conditions have not had a significant presence in the literature within the last 20 years (Barro, 1992; Ingersoll, 2001). Many studies focused on salary schedules and extra duty reimbursement, and large scale surveys did not collect information related to working conditions (Ingersoll, 2001). At that time, data availability is partly to blame; however, as the availability of local, state, and national data about working conditions and/or school characteristics has increased, more research has produced results finding working condition factors to be effective predictors of teacher retention (Hirsch, Emerick, Church, & Fuller, 2007).

Professional Training Benefits

On-the-job training (professional development, induction, and mentoring programs) combined with formal schooling allow individuals to increase their store of human capital. In terms of human capital, training can be characterized as specific or general investment (Baptiste, 2001). Specific training is training specific to the school or school district where a teacher teaches. On the other hand, general training refers to training that can be transferred from district to district and even to other professions (Kirby & Grissmer, 1993). When an employee has only general training, a firm is less concerned with the employee's possibility of quitting. They have invested little in that specific employee, so if that employee quits, they can just hire another employee with a college degree and no experience. Similarly, those who have made an investment in specific training are less likely to resign or be fired. This suggests that as resignations go up, the more likely the amount of specific training an employee receives goes down. If we apply this same logic to teachers, then teachers with general training are more likely to resign than teachers with specific training. This could mean that professional development has important implications for the relationship between training, salary, and age. Teachers are receiving a greater amount of training at a younger age while also receiving a lower salary during that same training period. The return is collected at a later age when they are earning higher wages. Generally, the pattern of wages for trained persons is lower during the training period, while a sharp pay increase occurs after the training, and then a level off period occurs (Ehrenberg & Smith, 2003). More people would seek training if the training costs were paid and fewer would quit during that same period; however, the costs of labor associated with that training period would be high. In the teaching profession, specifically addressing teacher turnover, the gains made during the teaching experience would have to outweigh the negatives during this training period if the teacher is to be retained (Ehrenberg & Smith, 2003). This could be an explanation for the high turnover rates of beginning teachers. Human capital theory states that choices to remain in teaching or leave teaching are made based on the desirability of the profession compared to the time and effort used in becoming a teacher (Sweetland, 1996). Working conditions can heavily influence a teacher's perception of their job.

Social Learning Theory

In contrast to human capital theory, social learning theory focuses on the interaction between personal characteristics, environment, and social learning experience (Chapman, 1984). In 1979, Krumboltz developed a model of four factors that guide career decisions. He looked at factors such as gender, race, politics, money, training, technology, standards, and work habits and categorized them into genetic characteristics and special capabilities (e.g., race, gender, physical attributes, intelligence), learning background (e.g., training, technology, and resources), external influences and events (e.g., monetary, cultural, social, or political factors), and work ethic (e.g., habits, standards, values, skills, emotions, and perceptions). Career decisions are a result of the interactions between these factors. Researchers then took Krumboltz' social learning theory model and applied it to the public school teacher to develop a teacher retention model (Ruland, 2001; Shen, 1997). According to Chapman & Green (1986), teacher retention results from a combination of: (a) teacher characteristics (e.g., race, gender, age, education); (b) educational preparation program (type of program, student achievement); (c) experience (e.g., first year success and/or student teaching fulfillment); (d) professional association in teaching (e.g., personal distinction, skills, abilities); and (e) external influences (e.g., climate, other opportunities). They then tested their model on four groups of certified teachers (experienced teachers, intermittent teachers, teachers that exited the field altogether, teachers that never started the profession). They found that the groups were different on the specific factors listed in their model and concluded that the retention of teachers is influenced by the social learning process (Chapman & Green, 1986).

In examining both theories as related to teacher turnover, social learning theory appears to provide a more comprehensive portrait of the turnover process in the teaching profession than does an economic model such as human capital theory. However, used in conjunction with one another, we can revise our overall recognition of the components related to the teacher turnover process. Much like theories related to social learning, job satisfaction theories assist in identifying relationships among teaching elements (e.g., working conditions) and true turnover.

Two-Factor Job Satisfaction Theory

Designing representations that identify the differing determinants of job satisfaction within the general workforce and for the teaching profession in particular have driven some theorists. The most difficult aspect associated with researching job satisfaction is finding a single interpretation of the phrase, “job satisfaction” (Evans, 1996). One all-encompassing theory does not seem to exist. However, Herzberg’s (1968) two-factor job satisfaction theory is often cited in education literature. He suggests that job satisfaction consists of two dimensions: motivation and hygiene. The intrinsic dimension (motivation) consists of acknowledgment, accomplishment, improvement, engagement, and actual performance (Hirsh, Emerick, Church, & Fuller, 2001). These elements lead to positive attitudes on the job because they fulfill the individual’s desire for self-actualization (Judge, Bono, & Locke, 2000). Most teachers entering the field do so because they want to make a difference with students. Teachers are satisfied when they promote learning and create positive connections with their students (Farkas, Johnson, & Foleno, 2000). The extrinsic dimension (hygiene) consists of compensation, oversight, practices, working conditions, and relationships (Herzberg, 1968). Teachers who work with sub-standard hygiene factors often leave the profession; however, it goes without saying that teachers may differ in what makes a job satisfying. Depending on an individual teacher’s first choice and the significance of each factor, some positive factors could outweigh some negative factors. Generally speaking though, teachers cite discipline, classroom autonomy, administrative support, decision-making, and parental involvement as key factors that determine their job satisfaction (Betoret, 2006; Farkas, Johnson, & Foleno, 2000; Hiatt-Michael, 2006; Kim & Loadman, 1994; Opdenakker & Van Damme, 2006; Pisciotta, 2000). Monetary benefits do not seem to be significantly influential in job satisfaction (Betoret, 2006; Farkas et al., 2000; Kim & Loadman, 1994), while lack of professional development, frequent policy changes, inadequate facilities, and little respect are cited as sources of dissatisfaction (Boe et al., 1997; Prince, 2002).

Teacher Turnover Factors

Salary

In recent years, the nationwide teacher shortage has sparked new techniques, similar to those in the private sector, to recruit and retain teachers. Not only do teachers receive a basic salary increase, some districts and states are now also providing additional salary stipends for teachers that obtain advanced certifications or target critical subject or geographic areas affected by teacher shortages. Additionally, recent legislation has allowed fellowship programs, student loan forgiveness, special mortgage incentives, and various other approaches to help spark enthusiastic interest from college students not yet clear on their path and new teachers in the teaching profession. For most of the population, salary is the major rationale for working despite an individual's passion for the job. Prior research has shown fairly consistent views about the influence of salary in teacher retention (e.g., Buckley, Schneider, & Shang, 2005; Hanushek, Kain, & Rivkin, 1999; Imazeki, 2005; Ingersoll, 2001). In general, an increase in pay is correlated with higher teacher retention, but the impact of salary is slight. Imazeki (2005) found that an increase in salary decreased the likelihood that Texas teachers would resign from their school, but their likelihood to move was strongly correlated to student characteristics rather than to their individual salary. Murnane & Olsen (1990) conducted several studies using data from teacher salary surveys in Michigan and North Carolina to determine that teacher compensation was a significant factor in determining how long teachers stayed in the profession. They found that the more teachers were paid, the longer they stayed in the profession, while teachers with greater opportunity costs (science and math) stayed in teaching less than any other subject.

Many of these studies examining salary and teacher retention used small-scale data collected from individual school districts; however, a small number used the Schools and Staffing Survey and its follow-up, a large scale survey (See, Ingersoll, 2001; Ingersoll, Alsalam, Quinn, & Bobbitt, 1997). Controlling for specific teacher and school characteristics, Ingersoll (2001) utilized data collected from the Schools and Staffing Survey over three years (1988-89, 1990-91, and 1993-94) and the Teacher Follow-Up Survey of 1991-1992. He discovered that compensation for teachers with an advanced degree had a significant, positive impact on teacher retention. In a previous study, Ingersoll (1998) found that teacher commitment was positively associated with the level of compensation within the school. Additional research used data from the 1987-88 Schools and Staffing Survey and concluded that the beginning salary for a full-time teacher was a significant, positive predictor of whether a teacher was retained (Boe, Bobbitt, Cook, Whitener, & Weber, 1997).

In the past, there have been arguments that prior research has failed to produce adequate estimates because non-financial aspects of teaching were not adequately controlled. These researchers recognized that ignoring the characteristics of the schools themselves could point to inaccurate conclusions regarding the effects of compensation if that compensation was associated with excluded non-monetary school characteristics (Stinebrickner, 1999). Using the National Longitudinal Study, Stinebrickner examined the effectiveness of decreasing the student-teacher ratio relative to a wage increase. He noted that educational policy that targets salary was more effective in retaining teachers than addressing the non-monetary aspects (i.e., working conditions) of teaching; however, his study was old (1972 cohort) and he examined only two types of working conditions (student-teacher ratio and student ability level). Although compensation is likely a necessary component in the recruitment and retention of highly qualified teachers, frequently research shown that salary is not the only factor that draws teachers to the field and keeps them there. In other words, previous research has provided little evidence to show that teachers prefer a higher salary over improved working conditions or that a higher salary will offset poor working conditions.

Working Conditions

While researchers have examined a number of individual factors impacting teacher retention (e.g., monetary compensation, teacher autonomy, teacher demographic information, and workplace safety), the professional literature has not addressed a comprehensive list of *working condition* factors and their role in teacher retention and job satisfaction (e.g., Hanushek et al., 1999; Hanushek et al., 2004a; Ingersoll, 2001). From a sociological standpoint, numerous studies use qualitative methods on teacher working conditions (e.g., Olsen & Anderson, 2007; Perie & Baker, 1997; Rosenholtz &

Simpson, 1990; Stinebrickner, 1999; Wideen, Mayer-Smith, & Moon, 1998); however, limited studies have addressed the specific capacity of working conditions within a teacher retention model. The few studies exploring this relationship (e.g., Baker & Smith, 1997; Ingersoll, 2003b) used factor analysis to identify working conditions. In addition, they used logistic regression to explore the impact of those identified conditions on teacher turnover. Although the studies identified different working conditions, both found that teachers who found their conditions at work dissatisfying were more inclined to abandon the teaching profession. Furthermore, prior research established those serving low achieving, low income, minority students were more likely to move schools in favor of more educationally and economically advantaged environment (Loeb, Darling-Hammond, & Luczak, 2005).

Using the 1993-94 School and Staffing Survey, Ingersoll (2001) examined the impact of the school's working conditions on teacher retention. He used factor analysis to identify four working conditions that influenced teacher retention. Discipline problems with students, low salary, and a lack of faculty input and administrative support were the largest contributors to higher teacher turnover. Lankford, Loeb, and Wyckoff (2002) examined teacher career paths among New York State public school teachers who began their career in 1993. Their examination revealed teacher turnover rates were higher in urban schools, and generally, teachers were less likely to remain in schools where the population of minority and poor students was over 75% greater than the school from which they relocated. Similar conclusions were made in 1999 where Hanushek, Kain, and Rivkin provided strong evidence that teachers were more likely to be retained in schools where particular student characteristics (high-achieving, low-minority) existed. Shen (1997) drew a similar conclusion. Shen established that teachers who were retained in the same school from one year to the next were in schools with similar characteristics. The schools were more likely to have lower percentages of free/reduced lunch students, minority students, and inexperienced teachers. A great deal of evidence exists pointing to a teacher preference for specific student characteristics. In Texas, for example, the typical teacher prefers a high-achieving, non-minority student (Hanushek, Kain, & Rivkin, 2004b).

Using the Schools and Staffing Survey from 1987-88 and 1990-91, Weiss (1999) examined first-year teachers using factor analysis to reduce the working conditions data and examined the impact of those working conditions on teacher commitment, morale, and turnover using logistic regression. His findings revealed that first-year teachers' perceptions were that they were more likely to stay in schools where they felt the school had a supportive school administration and culture coupled with teacher discretion and autonomy. Although his findings did not examine actual teacher behavior, he was able to establish a relationship between teacher morale and the perception of the school environment (Weiss, 1999). Mont and Rees (1996) used a data set that spanned 10 years from the New York State Education Department to analyze the effect of teacher classroom characteristics on retention. They examined numerous factors including the number of class preparations, class size, and the number of classes taught outside of the teacher's certification area, in addition to other characteristics such as salary, teacher characteristics, and school characteristics. They found that a teacher's classroom characteristics were correlated to teacher retention. The average size of the class, along with teaching subjects outside of the teacher's certification area, was positively associated with leaving the school. However, a teacher's class load had no effect on teacher retention rates when average class size was controlled.

A further examination of the literature on teacher retention reveals two distinct components of working conditions: organizational conditions and demographic conditions. Organizational conditions consist of characteristics such as administrator and teacher behavior, administrative support, teacher autonomy, parental involvement, and collegiality. Demographic conditions are generally characterized as school or district characteristics that are outside policy control such as percentages of low performing students, minority students, and low socio-economic status students. Prior studies have contributed some insight into the correlations found between the demographics of student populations and teacher retention; however, much of this research has neglected to examine the role of working conditions and has not considered other components together into a single model (Loeb, Darling-Hammond, & Luczak, 2005). None of the studies examined the influence of specific working conditions on teacher job satisfaction and/or teacher retention.

Professional Development

Professional growth and development has been an increasing practice in the United States educational system in recent years (Jacob & Lefgren, 2004). About 70% of teachers experience some type of subject area or teaching method training each year (Parsad, Lewis, & Farris, 2001). Many teachers have little exposure to the specific grade-level curriculum that students are required to master (Commission on No Child Left Behind, 2006); therefore, continuing professional development is necessary. Our teachers are being asked to provide an education to a much more diverse, disadvantaged population in an environment consisting of higher academic standards within a complex society (Guskey, 2003; Knight, 2002). On-the-job training becomes an effective method to increase the content knowledge of the teacher education workforce. Some professional development activities include graduate courses, workshops and conferences, teacher classroom observations, and certification courses. Other activities allow teachers to experience personal and professional growth while increasing their classroom effectiveness. For example, some teachers also have the opportunity to interact with their colleagues and learn new methods to manage, teach, and assess student learning. Being an active participant in professional development identifies the level of commitment of a teacher to their profession and school. If they did not intend to remain in the profession, they would not invest their time and often, their personal finances, in their professional growth. In addition, professional development allows a teacher to enhance their teaching skills and build their core content knowledge which can also lead to greater commitment. Currently, professional development is the primary method through which our teaching force is achieving their “highly qualified” status as mandated by the NCLB legislation of 2002 (NCLB, 2002). Since the professional development of teachers is a method of increasing professionalism, professional development could have an impact on teacher commitment and retention within the school and the profession. Prior research focusing on teacher professional development has identified effective components of professional development programs (e.g., Guskey, 2003; Lawless & Pellegrino, 2007; Supovitz & Turner, 2000) and examined correlations between instructional practices and professional development (Kennedy, 1998; Smith, Desimone, & Ueno, 2005; Supovitz & Turnver, 2000).

While little research has considered the relationship between involvement in professional activities and teacher turnover, some studies have examined and concluded that learning opportunities for teachers have a direct relationship with a teacher's long-term commitment to education (Guskey, 2002; Kent, 2004). Both of these studies propose that teachers who participate in professional learning opportunities may increase retention by elevating their teacher commitment; however, neither study tested this conclusion. Recently, a more direct examination of the relationship between professional development involvement, school organization, and teacher retention was examined using a hierarchical linear modeling analysis with the 1999-2000 SASS (Smith & Rowley, 2005). These researchers concluded that the strongest link between professional development participation and a reduction in teacher turnover is based on teacher input in school policy initiatives. They greater input teachers had in school policy initiatives; the more likely they participated in professional development. On the other hand, some research has examined the effect of professional development on turnover in various employment settings and found contradictory results. In some cases, on-the-job training made employees more valuable to their present employer, while other cases found that on-the-job training made employees more valuable to the job market in general (e.g., Feldman, 1996; Parent, 1999; Trevor, 2001; Veum, 1997). Job satisfaction has also been shown to be affected by workplace training. In 2001, Tansky and Cohen, using correlational analysis and hierarchical multiple regression, examined the data collected from hospital managers and supervisors. They found that career development and organizational commitment were significant predictors of job satisfaction, and career development was positively correlated with organizational commitment.

My review of the literature indicates that a comprehensive examination of the effects of teacher professional development practices and their effects on job satisfaction and teacher retention is incomplete and needs further examination. Though the present findings are contradictory across subject areas, one can hypothesize that teachers who participate in professional development are likely to be more dedicated and fulfilled and less likely to leave the school or the profession altogether.

Teacher Characteristics

Most recent research on teacher turnover has focused on the most common teacher characteristics (i.e., demographics, qualifications, certification area) associated with those who leave the profession (Ingersoll, 2001; Loeb, Darling-Hammond, & Luczak, 2005; Smith & Ingersoll, 2004; Wayne & Young, 2003). Other than age, few demographic characteristics have been identified as meaningful predictors of teacher retention. Several studies have indicated that age is highly influential in teacher retention (Brown & Wynn, 2009; Chapman, 1983; Ingersoll, 2001). Young, as well as senior teachers, leave at alarmingly greater rates than their mid-career counterparts. Although there is no explanation, there appears to be a link between race and teacher retention, with black teachers having higher teacher retention rates (Darling-Hammond & Youngs, 2002; Guarino, Santibanez, & Daley, 2006; Jacob, 2007). Gender also seems to be a significant predictor of teacher retention, with females leaving at higher rates than males (Hanushek, Kain, & Rivkin, 2004a; Podgursky, Monroe, & Watson, 2004). Math and science teachers are also more difficult to retain. According to some research, higher paying career alternatives tend to lure those teachers away at greater rates than other subjects (Ingersoll, 2001; Weiss, 1999). However, once Ingersoll (2001) controlled for school characteristics, he found that the likelihood that math and science teachers would leave was the same as any other teacher. In addition to the subject area sometimes being significant, the type of degree also revealed conflicting results. Prior research found that teachers in their first year with advanced degrees were less likely to stay in teaching than those with bachelor's degrees (Darling-Hammond & Youngs, 2002; Hanushek, Kain, & Rivkin, 2004a), but other studies have shown that teachers in their first year with only an undergraduate degree were less likely to stay in teaching (Lankford, Loeb, & Wycoff, 2002). Further study is needed to determine the extent to which teacher characteristics impact teacher retention.

School Characteristics

Teacher retention studies have connected teacher turnover to the characteristics of a school such as grade level, size, region, and student socio-economic status. Although not every study reached the same conclusion, the highest attrition rates were often seen within urban schools in higher poverty areas (Lankford, Loeb, & Wycoff, 2002). In addition, Ingersoll (2002) discovered that the ability to effectively retain teachers is lower in rural K-12 public schools; while other studies revealed teacher turnover is higher in schools with larger proportions of low-achieving and minority students (Jacob, 2007; Lankford, Loeb, & Wyckoff, 2002). Other studies have suggested an inverse connection between teacher turnover and the school size (Ingersoll & Smith, 2003; Smith & Ingersoll, 2004). Although teachers in private schools are typically more fulfilled than their public school counterparts, they are also more likely to leave (Podgursky, Monroe, & Watson; 2004). This result could be related to the size of a private school in contrast to a public school which is typically larger. Still others have argued a relationship exists between the type of school (elementary, middle, or high school) and the retention status of a teacher (Smith & Ingersoll, 2004; Weiss, 1999). When compared to high school teachers, one study reported that teachers in middle school classrooms scored lower on morale when compared to those in elementary and high schools; however, they were more likely to stay in teaching. Teachers in high schools reported a reduction in job satisfaction when compared to elementary teachers (Bogler, 2002; Weiss, 1999).

Job Satisfaction

Much of the research focusing on job satisfaction has centered on specific factors within the job that are perceived to be associated with satisfaction or dissatisfaction on the job, and how job satisfaction can influence one's commitment and retention. Factors identified in the literature related to job satisfaction are many of the factors discussed above regarding teacher retention. Simply, teachers who are dissatisfied are more likely to change schools (Guarino, Santibanez, & Daley, 2006; Podgursky, Monroe, & Watson, 2004). Studies in other disciplines also confirm that the primary predictor of one's commitment to a profession and subsequent retention is job satisfaction (Larrabee & Janney, 2003; Wright & Bonnett, 2007). Clugston (2000) used job satisfaction as a mediating variable within several independent variables (e.g., working conditions, demographics) and effects (e.g., teacher retention). Teacher job satisfaction was most often influenced by leadership and/or administrative support over other working conditions (Ingersoll, 1998; Perie & Baker, 1997). Teachers were most satisfied in environments where administrators defined their vision and expectations, supported their staff, encouraged teacher learning and instructional practices, distributed teaching assignments fairly, and gave recognition and rewards to their staff when warranted (Brown & Wynn, 2009; Inman & Marlow, 2004). School leadership quality, along with administrative support, highly correlated with teacher job satisfaction, teacher perception of their assignment, and the culture of the school in general (Darling-Hammond & Sclan, 1996).

Additionally, student misbehaviors are also highly correlated to job satisfaction. Some of the most cited concerns deal with school safety, students' unwillingness to learn, tardiness, truancy, and major classroom disruptions (Lumsden, 1998; Perie & Baker, 1997). There has also been an examination into the connection between teacher demographics and job satisfaction. Not surprisingly, job satisfaction increases as teacher experience grows (Perie & Baker, 1997). Since dissatisfied teachers are at a greater risk of not being retained and therefore not having the opportunity to assimilate into teaching as a career, it seems logical that more experienced teachers tend to be more satisfied. There is also a positive correlation between job satisfaction and teacher age, with the exception of teachers in the range of 40 to 50 years old (Boe, Bobbitt, Cook, Whitener, & Weber, 1997; Johnson & Birkeland, 2003). Researchers agree that this particular age group has greater expectations regarding promotions, hence the lower job satisfaction when they remain in a teaching position. On the other hand, female teachers seem to be more satisfied than their male colleagues in the teaching profession as well as other fields (Ma & MacMillan, 1999).

Conceptual Framework

This study investigates the direct effect of science teachers' working conditions and their relative weights on teachers' decisions to remain in teaching, decisions which I argue are mediated by job satisfaction. I also examine the relationships of demographic characteristics of schools, students, and teachers on teacher retention. For this study, the conceptual framework originated from theories and studies within psychology, organizational behavior, education, and the labor market. The framework's basic structure was developed from existing components of human capital theory. I also incorporated various psychological elements from job satisfaction and social learning theories. I identified the major areas impacting teacher job satisfaction and retention: job-related factors (i.e., working conditions), characteristics of teachers (e.g., race, gender, degree, experience), and characteristics of schools (e.g., school type, size, student demographics). The main components of the conceptual framework are outlined below. I have included a graphic to assist the reader in visualizing the predicted relationships between the various components.

As displayed in Figure 1, job satisfaction is highlighted as a possible mediating variable between the independent variables, teacher characteristics, working conditions components, and school characteristics and the outcome variable, teacher retention. The first component, working conditions, is expected to affect teacher retention when one considers human capital theory. The framework suggests that offering better working conditions will reduce the turnover rate in the profession.

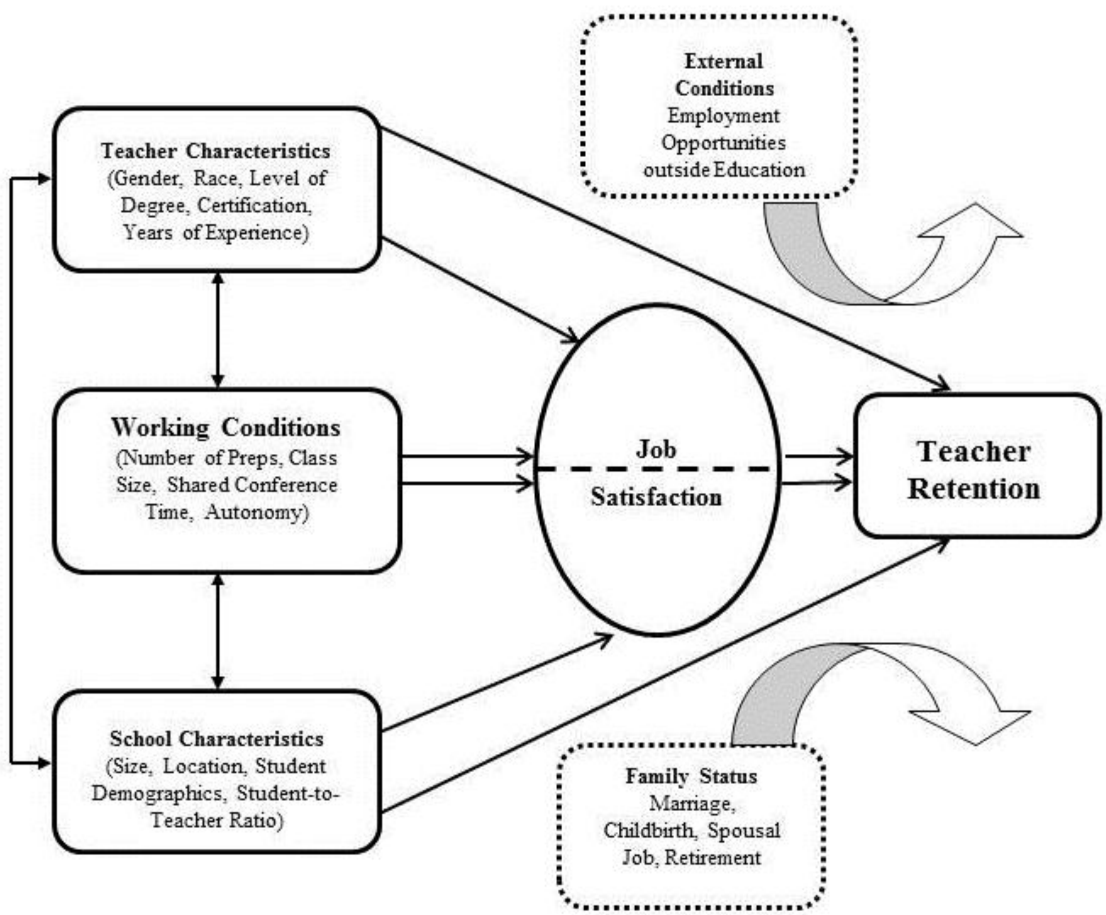

Figure 1. Conceptual framework describing the relationship between teacher characteristics, working condition components, school characteristics, job satisfaction, and teacher retention.

Within this study, *working conditions* largely refers to the overall climate at a school. This includes a combination of administrative, peer, and parental supports, as well as teacher perceptions of autonomy, classroom control, work load, safety, and classroom climate. Working conditions is distinguishable from school characteristics in that school characteristics refers to location, size, student demographics, and student-to-teacher ratio. Some previous research used the characteristics of individual schools as substitutes for working conditions mainly because they lacked actual working conditions data (Hanushek & Rivikin, 2007). However, since the examination of national databases has increased, it has become apparent that working conditions alone are meaningful predictors of teacher retention status (Ma & MacMillan, 1999). In my proposed study, working conditions is defined as teachers' perception of the non-financial elements that are incorporated within the structural environment at a school. By utilizing a framework that includes working conditions, this study predicts a relationship between science teachers' working conditions and job satisfaction and teacher retention, the dependent variables.

School and teacher characteristics are incorporated within the conceptual framework as independent variables that have indirect and direct effects on the dependent variables. Most current teacher retention studies also incorporated school and teacher characteristics as independent variables (e.g., Bogler, 2002; Strong, 2007; Wright & Bonett, 2007). Within this study, teacher characteristics include a broader range of characteristics including race, gender, education level, certification type, and overall teaching experience. Recent research has reported that female teachers and white teachers are more likely to be mobile and move within schools, while teachers holding advanced degrees are less likely to stay in teaching (Darling-Hammond & Youngs, 2002; Hanushek, Kain, & Rivkin, 2004b; Jacob, 2007; Podgursky, Monroe, & Watson, 2004). Although there are a few studies that conclude that these school-level characteristics are not significant factors in influencing teacher retention (Smith & Ingersoll, 2004; Strong, 2007), the majority of research has revealed some sort of association between school characteristics and teacher retention (Ingersoll, 2001; Smith & Ingersoll, 2004; Darling-Hammond & Youngs, 2002). Specifically, studies have concluded that teachers in low-performing schools, with a high proportion of minority and low-income students are more likely to leave schools and teaching (Jacob, 2007; Lankford, Loeb, & Wyckoff, 2002).

In this study, school characteristics are classified as school type, location, size, and student demographics based on the minority student enrollment proportion of each teacher's school. Determining whether teacher retention differs by school characteristics is an important factor in the advancement of practical policy interventions to address and reduce teacher turnover. When examining the conceptual model in Figure 1, the decision of a teacher to stay in the teaching field can be identified as a connected process rather than a discontinuous decision. In that regard, science teacher retention is related to other factors, namely teacher job satisfaction, but it is also influenced by teacher and school characteristics. Examination of these aspects concurrently in one study, addresses current gaps in research that examine true turnover. The presentation of this framework assumes that there are emotional factors intertwined within job satisfaction and teacher decisions to leave. A combination of working conditions and teacher and school characteristics predicting actual teacher turnover are likely.

Job satisfaction is incorporated in this framework as a mediating variable between working conditions (including teacher and school characteristics) and teacher retention. It is described as the extent to which one has a positive perception about the many aspects associated with their job (Bogler, 2002).

Teacher retention in this study will be derived from the numbers of "stayers," "movers," and "leavers." Teachers who taught in the same school from year one of the study to year two of the study are defined as "stayers." Those teachers who taught in one school in the first year of the study and then moved to another school the second year of the study are classified as "movers." "Leavers" are defined as teachers who teachers who moved from one school to another in year two of the study, as well as teachers who left the teaching field in year two of the study and were no longer listed as active teachers in the Texas database maintained by the State Board for Educator Certification (SBEC). For the purposes of this study, "movers" and "leavers" are combined into one group referred to as "non-stayers."

The final factor within the conceptual model includes the influence of external conditions, as well as personal factors that can influence teachers' career decisions (see Figure 1). These factors were not included in this study because the data from this study did not contain the necessary components to measure these factors.

In summary, human capital theory suggests that attrition is expected when the benefits of changing jobs outweighs staying in a job. Teachers logically would leave positions where the salary is low and the working conditions are more difficult in favor of better, more attractive options. Social learning and job satisfaction theories both suggest that psychological factors related to the environment at work function as important components in teacher retention. Teachers who receive less guidance are not as satisfied and more likely to leave their school. In addition, the effect of working conditions on teacher retention is expected to be dependent upon varying teacher and school characteristics. A solid well-developed research design will investigate the assumptions described within the conceptual framework.

CHAPTER III

DEFINING WORKING CONDITIONS: THE DEVELOPMENT OF A RUBRIC MEASURING THE WORKING CONDITIONS OF SCIENCE TEACHERS IN TEXAS HIGH SCHOOLS

The only way to meet the goal of having qualified science teachers in every classroom across our nation is to stop the attrition of teachers. We must provide every means we can to help teachers remain in teaching. Otherwise, we will see an increase in the mass exodus of teachers from the field. The science teacher of today is aware of her options (Darling-Hammond, 2003). Teaching is the chosen profession because new teachers are passionate about their jobs and want to work with young people (Darling-Hammond, 2003). However, if working conditions interfere with a teacher's success in the classroom, the teachers of today are much more likely than their predecessors to leave (Viadero, 2002). Other options exist with better pay, opportunities for advancement, and less stress. For science teachers in particular, science-related positions other than teaching provide opportunities that can be much more attractive than those offered by public schools.

Problem Statement

The working conditions of science teachers become our students' learning conditions (see Hirsch, 2005). Recently, more and more teachers are citing working conditions over salary as the reason they are leaving the profession (Hanushek & Rivkin, 2007). Currently, however, we do not have a comprehensive method for identifying the specific working conditions nor do we have a method for assessing them and their impact on the field. By developing a way to assess science teachers' working conditions in a particular school, we can identify potential problems and develop strategies and policies to effectively address them. Poor working conditions can impact both teachers and their students. Poor working conditions translate to lower job satisfaction, lower job satisfaction leads to teacher attrition, and in the end, student achievement suffers.

Literature Review

While researchers have examined a number of individual factors impacting teacher retention (e.g., monetary compensation, teacher autonomy, teacher demographic information, and workplace safety), the professional literature has not addressed a comprehensive list of *working conditions* and their role in science teacher retention and job satisfaction (e.g., Hanushek, Kain, & Rivkin, 1999; Hanushek, Kain, & Rivkin, 2004b; Ingersoll, 2001). From a sociological standpoint, numerous studies have used qualitative methods to investigate teacher working conditions (Billingsley, 2004; Boyd, Grossman, Lankford, Loeb, Michelli, & Wycoff, 2006; Guarino, Santibanez, & Daley, 2006; Hollins, McIntyre, DeBose, Hollins, & Towner, 2004). However, little research has addressed the specific role of working conditions in teacher retention. Two studies exploring this relationship (e.g., Baker & Smith, 1997; Ingersoll, 2003b) used factor analysis to identify working conditions, and then used those identified factors in logistic regression models to assess the effects on teacher retention. Although these two studies identified different working conditions, both found that teachers who were dissatisfied with their working conditions were more likely to leave teaching. More recent investigations have also established that teachers serving low socio-economic, low achieving, minority students were more likely to leave in favor of schools that were more educationally and economically advantaged (Bogler, 2002; Wright & Bonett, 2007).

Using the 1993-94 School and Staffing Survey, Ingersoll (2001) examined the impact of the school's working conditions on teacher retention. He used factor analysis to identify four working conditions that influenced teacher retention. Discipline problems with students, low salary, and a lack of faculty input and administrative support were the largest contributors to higher teacher turnover. Lankford, Loeb, and Wyckoff (2002) examined teacher career paths among New York State public school teachers who began their career in 1993. Their examination revealed teacher turnover rates were higher in urban schools, and generally, teachers were less likely to remain in schools where the population of minority and poor students was over 75% greater than the school from which they relocated. Similar conclusions were drawn in 1999 where Hanushek, Kain, and Rivkin provided strong evidence that teachers were more likely to be retained in schools where particular student characteristics (high-achieving, low-minority) existed. Shen (1997) drew a similar conclusion. Shen established that teachers who were retained in the same school from one year to the next were in schools with similar characteristics. The schools were more likely to have lower percentages of free/reduced lunch students, minority students, and inexperienced teachers. A great deal of evidence exists pointing to a teacher preference for specific student characteristics. In

Texas, for example, the typical teacher prefers a high-achieving, non-minority student (Hanushek, Kain, & Rivkin, 2004b).

Using the Schools and Staffing Survey from 1987-88 and 1990-91, Weiss (1999) examined first-year teachers using factor analysis to reduce the working conditions data and examined the impact of those working conditions on teacher commitment, morale, and turnover using logistic regression. His findings revealed that first-year teachers' perceptions were that they were more likely to stay in schools where they felt the school had a supportive school administration and culture coupled with teacher discretion and autonomy. Although his findings did not examine actual teacher behavior, he was able to establish a relationship between teacher morale and the perception of the school environment (Weiss, 1999). Mont and Rees (1996) used a data set that spanned 10 years from the New York State Education Department to analyze the effect of teacher classroom characteristics on retention. They examined numerous factors including the number of class preparations, class size, and the number of classes taught outside of the teacher's certification area, in addition to other characteristics such as salary, teacher characteristics, and school characteristics. They found that a teacher's classroom characteristics were correlated to teacher retention. The average size of the class, along with teaching subjects outside of the teacher's certification area, was positively associated with leaving the school. However, a teacher's class load had no effect on teacher retention rates when average class size was controlled.

A further examination of the literature on teacher retention reveals two distinct components of working conditions: organizational conditions and demographic conditions. Organizational conditions consist of characteristics such as administrator and teacher behavior, administrative support, teacher autonomy, parental involvement, and collegiality. Demographic conditions are generally characterized as school or district characteristics that are outside policy control such as percentages of low performing students, minority students, and low socio-economic status students. Prior studies have contributed some insight into the correlations found between the demographics of student populations and teacher retention; however, much of this research has neglected to examine the role of working conditions and has not considered other components together into a single model (Loeb, Darling-Hammond, & Luczak, 2005).

Generally, prior research points to some trends, but "the hole" in the research is even larger when it comes to science teachers. Science teachers have greater opportunities for employment in science-related fields outside of education with higher pay, substantial benefits, and more opportunities for advancement.

Research Questions

Using a rubric especially designed to assess the working conditions of science teachers, I calculated a working conditions score for each science teacher participant (n = 385) within my study to answer the following research questions:

1. What variables contribute to the development of a reliable measure of science teachers' working conditions in Texas high schools?
2. What is the range of working conditions for Texas high school science teachers?

a. What are the frequencies of occurrence of these working conditions for science teachers in schools that vary in size?
b. What are the frequencies of occurrence of these working conditions for induction, mid-career, and veteran high school science teachers?
c. What are the frequencies of occurrence of these working conditions for science teachers in schools that vary in minority student enrollment proportion?

Research Design

I used data from a five-year research study (Policy Research Initiative in Science Education; PRISE) that was designed to answer three necessary policy research questions about the high school science teacher professional continuum (TPC) in Texas: Where are we? Where do we want to go? How do we get there? (Stuessy, McNamara, & the PRISE Research Group, 2008). Using a mixed methods research approach, the PRISE project sought to link prior research findings to current policies and practices in high school science teacher recruitment, induction, renewal, and retention.

The PRISE Research Group selected 50 schools to proportionally represent the 1,333 public high schools in Texas by using a two-stage stratified random sampling plan (Stuessy, McNamara, & the PRISE Research Group, 2008). School size and minority student enrollment proportion (MSEP) were the two explicit stratification variables used in the sampling procedures. Schools were grouped into three categories based on student enrollment for school size: *Small* (secondary student enrollment equal to or less than 189 students; n=15), *Medium* (secondary student enrollment equal to or greater than 190 and less than or equal to 899 students; n=17), and *Large* (n=29; secondary student enrollment greater than or equal to 900 students; n=18). School MSEP was divided into four categories that corresponded to state-established proportions: *Lowest* (less than 35% minority student enrollment; n=21), *Low* (36%-49% minority student enrollment, n=8), *High* (50%-74% minority student enrollment; n=9), and *Highest* (greater than 75% minority student enrollment; n=12). To ensure that our samples were geographically representative of the state of Texas, an additional implicit stratification method was used. By accounting for the schools' location within the Texas Regional Education Service Centers (ESCs), the sampling plan also conformed geographically and politically with policy planning at the state and national levels (McNamara & Bozeman, 2007). Of the 50 schools originally selected, 39 agreed to participate. The eleven non-cooperating schools were matched with replacement schools using the original design of the sampling plan to obtain a total of 50 participating schools. These methods were employed to maximize the generalizability of the PRISE survey research findings to all (n = 1,333) high schools in Texas.

Finally, once sample schools were identified, PRISE researchers contacted campus principals (n=50) to gain their permission to conduct research and obtain access to the schools. From there, all science teachers from all 50 schools (n=385) were asked to complete a comprehensive survey (see Appendix A) addressing multiple issues associated with their science teaching. The working conditions component of the survey was a small portion of a much more comprehensive instrument measuring job satisfaction and professional activity.

List of Variables and Instruments

Variables

As I read through the literature, some themes emerged surrounding the definition of working conditions within the teaching profession. Specifically, working conditions fell within three categories: teacher characteristics, working condition components, and school characteristics (see, e.g., Darling-Hammond, 2003; Hanushek & Rivkin, 2007). I combined the variables most cited within the literature to create *an a priori* list of working conditions to be investigated in my study. Table 1 displays the categories and variables that emerged from the literature review.

Instruments

According to Allen & Knight (2009), rubrics are an effective way to measure specific outcomes. Rubrics can provide an efficient and equitable means of assessment that can be easily understood by most readers. Stevens and Levi (2005) reiterated that rubrics allow the researcher to (1) provide a description of the task; (2) create a measurement scale; (3) develop scope of the task; and (4) provide a description of the scope relative to the measurement being used.

For the purposes of this study, I recruited five experts in the field of education to determine the relative importance of the individual working conditions listed in Table 1. I provided each expert a list of the 20 working conditions compiled on the basis of my

Table 1

Working Conditions: Categories and Variables Identified Through Literature Review

Individual Teacher Characteristics	Teaching Assignments and Conditions	School Characteristics
Gender	Number of Preparations	School Size
Race	TAKS Preparations	Location
Level of Degree	Shared Conference	Minority Student Enrollment Proportion
Certification	Mentor Program	Administrator Support
Years of Experience	Perception of Autonomy	
	Professional Development	
	Perception of Safety	
	Leadership Opportunities	
	Team Planning	
	Facilities	
	Resources	

review of the literature. Each expert was then given instructions on how to score each working condition to determine an eventual weight for each within the rubric. To provide approximately equal numbers of highly, moderately, and less important variables in determining a teacher's decision to leave her current position, I instructed each expert to provide six ratings of one, seven ratings of three, and seven ratings of five for the list of given conditions. Ratings of one, three, and five were chosen to calculate final working condition scores for each individual. Higher ratings for a variable indicated the variable most likely to be associated with a reason for leaving the school. A rating of five represented the most important factors that the expert associated with a teacher's decision to leave; a rating of three represented the factors that the expert associated with being in the mid-range of importance in a teacher's decision to leave; and a rating of one represented the factors that the expert associated with being of lowest importance in affecting a teacher's decision to leave her current position.

Once the experts documented their responses, I tallied their responses and assigned the rating where the majority of the raters agreed. Table 2 shows the distribution of individual ratings, the measure of agreement (IRR) for each item, and the final assigned rating for each working condition. The result of the interrater analysis was Kappa = 0.87 with $p < 0.001$.

Data Collection and Analysis Methods

Data Collection

During the 2007-2008 school year, PRISE researchers interviewed principals at the 50 participating high schools to acquire a better understanding of current school policies and practices influencing science teachers at various stages within the teacher professional continuum. All principals (n=50; 100% return rate) completed a field-based semi-structured interview. Principals' interviews were audio recorded, transcribed, and

Table 2

Individual Expert Ratings, Interrater Reliability, and Final Ratings of Working Conditions Rubric

Individual Teacher Characteristics	Totals	Rater 1 (RH)	Rater 2 (DY)	Rater 3 (CP)	Rater 4 (JM)	Rater 5 (LR)	IRR	Final Rating
Gender	9	1	1	5	1	1	0.8	1
Race	7	1	3	1	1	1	0.8	1
Level of Degree	15	3	3	3	3	3	1.0	3
Certification	19	5	5	3	5	1	0.6	5
Years of Experience	23	5	5	5	5	3	0.8	5
Teaching Assignments and Conditions								
Number of Preparations	21	5	5	5	5	1	0.8	5
TAKS Preparations	13	3	3	1	3	3	0.8	3
Shared Conference	23	5	3	5	5	5	0.8	5
Mentor Program	15	3	3	3	3	3	1.0	3
Perception of Autonomy	19	3	5	5	3	3	0.6	3
Professional Development Participation	17	3	3	3	3	5	0.8	3
Perception of Safety	13	3	1	3	3	3	0.8	3
Leadership Opportunities	25	5	5	5	5	5	1.0	5
Team Planning	9	1	1	1	1	5	0.8	1
Facilities	21	5	5	1	5	5	0.8	5
Resources	24	5	5	3	5	5	0.8	5
School Characteristics								
School Size	5	1	1	1	1	1	1.0	1
Location	5	1	1	1	1	1	1.0	1
MSEP	5	1	1	1	1	1	1.0	1
Administrator Support	5	3	3	3	3	5	0.8	3

transferred to data charts. Some principals (n = 5) did not allow PRISE researchers to record the interview; therefore, field notes were used as the primary data source and were subsequently transferred into data charts (Stuessy, McNamara, & the PRISE Research Group, 2008).

After the initial principal's interview, all science teachers at the individual schools were contacted to complete a 22-question survey developed, piloted, and revised by the PRISE Research Group (see Appendix A). Science teachers (n=385; 89.6% return rate) completed the survey which contained questions about teachers' professional involvement, job satisfaction, working conditions, and general demographic information. In addition, master schedules were collected from each of the 50 sample schools. Information reflected on the master schedule included the number of science teachers at the school, specific science subjects taught, the number of TAKS (Texas Assessment of Knowledge and Skills) preparation courses, the overall school schedule, and common planning periods. Academic Excellence Indicator System (AEIS) reports were collected at the state level. This report reflected TAKS scores for individual schools, accountability ratings, campus subpopulations, number of students taking ACT/SAT tests and dual credit courses, as well as general teacher and student demographics. All of these data sources were combined to obtain an accurate portrait of working conditions within each of the 50 PRISE sample schools (See Appendix B for a complete list of working condition category sources).

Data Analysis

In the first phase of the study, the working conditions rubric was developed to capture aspects of the science teacher work environment, including working condition components, teacher characteristics, and school characteristics. Within each element, teacher participants earned a score ranging from zero to one in the less significant working condition components as determined by expert ratings to zero to fifteen in the more significant working condition components.

In the second phase of the study, the working conditions rubric was analyzed using factor analysis. The factor analysis revealed the underlying structure of the working conditions instrument, thus reducing the number of items to a small numbers of factors that represented clusters of similar working conditions. The factor analysis contributes to the overall development of the rubric by proposing that each observed response is influenced by underlying common factors. These factors can be used in subsequent analyses to represent a more cohesive collection of similar working conditions and therefore simplify the interpretation of findings. Non-responses by individual teachers were addressed by calculating the mean value of individual items within school clusters.

Next, the finalized weighted rubric was applied to all 385 science teachers from each of the 50 sample schools to obtain a *working conditions score* for each individual teacher. From there, descriptive statistics were used to describe the frequency and percentages of working conditions components across different PRISE sample schools and teacher types. This analysis enabled me to comprehend the comprehensive data structure of each variable and demographic characteristics of schools and teachers, using frequency counts, means, and standard deviations. See Figure 2 for a display of the research design for integration of the collection and analysis of mixed methods data (Creswell & Plano-Clark, 2007).

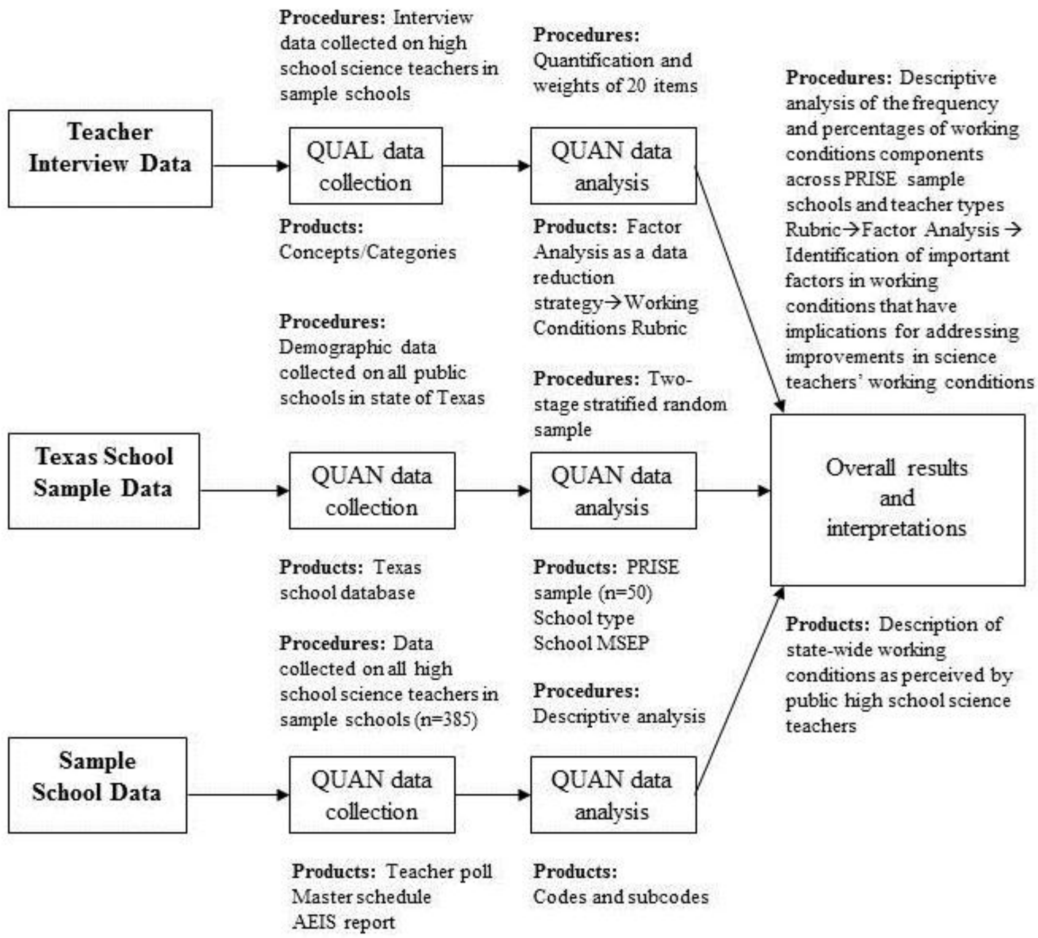

Figure 2. Visual model of descriptive analysis examining variables contributing to working conditions of science teachers. Adapted from *Designing and Conducting Mixed Methods Research* by J.W. Creswell and V.L. Plano-Clark, 2007.

Results

The findings from this portion of the study are presented in four sections, with each section corresponding to a research question. Working condition scores were tabulated for the entire sample population and categorized by school size, teacher type, and school type (MSEP). Refer to Table 3 to associate data sources with research questions and strategies for data analysis.

Table 3

Research Questions, Data Sources, and Data Analysis

Research Question	Data Sources	Data Analysis
What variables contribute to the development of a reliable measure of science teachers' working conditions in Texas high schools?	Literature Review Teacher Interviews Teacher Poll	Concepts/Categories Quantification and Weights for 20 items Factor Analysis
What is the range of working conditions for Texas high school science teachers?	Working Conditions Rubric Scores	Means Standard Deviations Frequency Distributions Percentages Range
What are the frequencies of occurrence of these working conditions for science teachers in schools that vary by size?	Working Conditions Rubric Scores	Means Standard Deviations Frequency Distributions Percentages Range
What are the frequencies of occurrence of these working conditions for induction, mid-career, and veteran high school science teachers?	Working Conditions Rubric Scores	Means Standard Deviations Frequency Distributions Percentages Range
What are the frequencies of occurrence of these working conditions for science teachers in schools that vary in minority student enrollment proportion?	Working Conditions Rubric Scores	Means Standard Deviations Frequency Distributions Percentages Range

Research Question 1: What variables contribute to the development of a reliable measure of science teachers' working conditions in Texas high schools?

Figure 3 displays the scoring rubric developed with advice from the five experts who assisted in determining weights for each of the working conditions variables. Variables were clustered in three areas: individual teacher characteristics, teaching assignments and conditions, and school characteristics. A teacher's gender, race, participation in team planning, school size, school location, and school minority student enrollment proportion were given the lowest rating indicating the experts' belief that these components contributed the least to a teacher's decision to leave the school when compared to the remaining components. A teacher's level of college degree, whether she taught a TAKS prep course, whether the school had a mentor program, a teacher's perception of the autonomy, administrative support, and safety at her school, and her involvement in professional development scored in the middle range, indicating these components contributed more to a teacher's decision to leave the school. The experts rated the following categories the highest score indicating their belief that these components would contribute the most to a teacher's decision to leave the school: teacher certification, years of experience, number of classroom preparations, shared conference times, leadership opportunities, and adequacy of facilities and resources. Figure 3 displays the weighted working conditions scoring rubric before the factor analysis.

After developing the working conditions scoring rubric, scores from 385 science teachers were used to examine the factorability of 20 working condition items. Eighteen

Working Condition Categories	Relative Weight[1]	Scoring Rubric Specific Weights[2] and Final Weights[3]			
Individual Teacher Characteristics					
Gender	x1[1]	Male (0)[2] 0 x 1 = 0[3]	Female = (1) 1 x 1 = 1		
Race	x1	African-American (0) 0 x 1 = 0	Other = (1) 1 x 1 = 1		
Level of College Degree	x3	Bachelors = (0) 0 x 3 = 0	Masters = (3) 1 x 3 = 3	PhD = (6) 2 x 3 = 6	
Certification	x5	Yes = (0) 0 x 5 = 0	No = (5) 1 x 5 = 5		
Years of Teaching Experience[4]	x5	Veteran = (0) 0 x 5 = 0	Mid-Career = (5) 1 x 5 = 5	Beginning = (10) 2 x 5 = 10	
Teaching Assignments and Conditions					
# of Preps	x5	1 (0) 0 x 5 = 0	2 (1) 1 x 5 = 5	3+ (2) 2 x 5 = 10	
Teaches TAKS Prep Course(s)	x3	No (0) 0 x 3 = 0	Yes (1) 1 x 3 = 3		
Shared Conference	x5	Yes (1) 1 x 5 = 5	No (2) 2 x 5 = 10		
Mentor Program	x3	Yes (0) 0 x 3 = 0	No (1) 1 x 3 = 3		
Team Planning	x1	Very Satisfied (0) 0 x 1 = 0	Satisfied (1) 1 x 1 = 1	Dissatisfied (2) 1 x 2 = 2	Very Dissatisfied (3) 1 x 3 = 3
Perception of Autonomy	x3	Very Satisfied (0) 0 x 3 = 0	Satisfied (1) 1 x 3 = 3	Dissatisfied (2) 2 x 3 = 6	Very Dissatisfied (3) 3 x 3 = 9
Professional Development	x3	Very Satisfied (0) 0 x 3 = 0	Satisfied (1) 1 x 3 = 3	Dissatisfied (2) 2 x 3 = 6	Very Dissatisfied (3) 3 x 3 = 9
Safety	x3	Very Satisfied (0) 0 x 3 = 0	Satisfied (1) 1 x 3 = 3	Dissatisfied (2) 2 x 3 = 6	Very Dissatisfied (3) 3 x 3 = 9
Leadership Opportunities	x5	Very Satisfied (0) 0 x 5 = 0	Satisfied (1) 1 x 5 = 5	Dissatisfied (2) 2 x 5 = 10	Very Dissatisfied (3) 3 x 5 = 15
Facilities	x5	Very Satisfied (0) 0 x 5 = 0	Satisfied (1) 1 x 5 = 5	Dissatisfied (2) 2 x 5 = 10	Very Dissatisfied (3) 3 x 5 = 15
Resources	x5	Very Satisfied (0) 0 x 5 = 0	Satisfied (1) 1 x 5 = 5	Dissatisfied (2) 2 x 5 = 10	Very Dissatisfied (3) 3 x 5 = 15
School Characteristics					
School Size	x1	Small (0) 0 x 1 = 0	Medium (1) 1 x 1 = 1	Large (2) 1 x 2 = 2	
Location	x1	Rural (1) 1 x 1 = 1	Urban (2) 1 x 2 = 2		
Minority Student Enrollment Proportion	x1	0-35% (0) 0 x 1 = 0	36-49% (1) 1 x 1 = 1	50-74% (2) 1 x 2 = 2	75%+ (3) 1 x 3 = 3
Administrator Support	x3	Yes (0) 0 x 3 = 0	No (1) 1 x 3 = 3		
					Final Working Conditions Score

[1,2,3]As weights in this rubric increase, the difficulty of working conditions increases. In other words, the higher score indicates the more likely a teacher will leave his/her assignment. Overall likelihood of leaving the profession is determined by a specific weight and a relative weight.

[1]Relative weight is a result of expert group negotiation representing the relative likelihood of the component to contribute to a teacher's decision to leave the school in which she is employed. For example, Years of Experience is 5 times more likely than Gender to contribute to a teacher's decision to leave the profession.

[2] The number inside the parentheses indicates the specific weight assigned to each answer choice within a component. These weights were negotiated by a second expert group. For example, in the instance of Gender, a woman is more likely than a man to leave the teaching profession; in the instance of Leadership Opportunities, the response of a teacher who indicated that she was very dissatisfied with the opportunities for leadership at her school would be 3 times more likely to leave her school than a response indicating that she was satisfied

[3]Formulas indicate the calculation of final weight for the answer choice of each component, final weight score is the product of multiplying the relative weight by the specific weight.

[4] Veteran teachers = 8+ years; Mid-career teachers = 4-7 years; Beginning teachers = 1-3 years

Figure 3. Working weighted rubric for working conditions before factor analysis. Use of a priori categories clustering variables in three areas: individual teacher characteristics, teaching assignments and conditions, and school characteristics.

of the 20 items correlated at least .6 with at least one other item, suggesting reasonable factorability. Second, the Kaiser-Meyer-Olkin measure of sampling adequacy was calculated to be .71, above the recommended value of .6, and Bartlett's test of sphericity was significant (χ^2 (190) = 1457.58, $p < .01$). Principle Component Analysis was used in this analysis because the primary purpose of the analysis was to identify and compute working condition scores for the factors underlying the teaching profession as working condition components. While practical clusters of variables were used to develop the working rubric shown in Figure 2, factor analysis was used to investigate the underlying structure of the items.

The initial Eigenvalues showed that the first factor explained approximately 17% of the variance (see Table 4), the second factor approximately 12% of the variance, a third factor about 8% of the variance, and a fourth factor explained about 7% of the variance. The fifth, sixth, and seventh factors each explained about 5 to 6% of the variance, together totaling about 16% of the variance. The seven factor solution was examined using Varimax with Kaiser Normalization rotation method of the factor loading matrix. The seven factor solution, which explained 60% of the variance, was preferred because of its theoretical support, and the "leveling off" of Eigenvalues on the Scree plot after seven factors (shown in Figure 4).

The first factor was labeled *Barriers to Camaraderie* due to the high loadings by the following items: whether a teacher shared a conference period with another teacher in the same discipline; whether the school was located in an urban or rural area; school size; and number of different courses taught by the teacher. The first factor explained

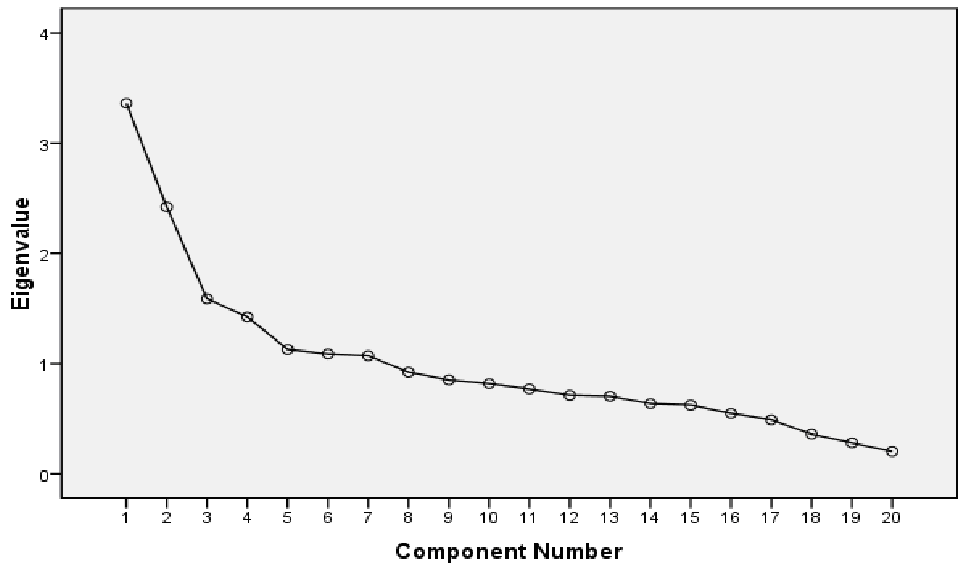

Figure 4. Scree plot displaying the 'leveling off' of Eigenvalues after seven factors for working conditions.

Table 4

Total Variance Explained among the Seven Factors Identified Through the Principal Component Analysis.

Component	Initial Eigenvalues		
		% of Variance Explained	Cumulative % of Variance
1	3.363	16.813	16.813
2	2.412	12.109	28.922
3	1.589	7.944	36.866
4	1.129	7.119	43.985
5	1.129	5.645	49.630
6	1.088	5.438	55.068
7	1.072	5.358	60.426

16.81% of the variance. The second factor was labeled *Satisfaction with Facilities, Equipment, and Safety* due to the high loadings by the following factors: satisfaction with school laboratory facilities; satisfaction with school laboratory equipment; and personal safety. The second factor explained 12.11% of the variance. The third factor was labeled *Role of School Support and Professional Development* due to high loadings of the following components: satisfaction with the ability to make decisions regarding instructional methods; satisfaction with science specific professional development options; and satisfaction with school support in professional development. This factor explained 7.94% of the variance. The fourth factor, explaining 7.12% of the variance, was labeled *Community* due to high loadings by the following items: teacher ethnicity; minority student enrollment proportion; improving student achievement is a team effort; and identification as a Science TAKS preparation teacher. The fifth factor was labeled *Leadership* due to high loadings by the following factors: teacher is a mentor; level of teaching experience; and teacher formally serves in a leadership role. Factor 5 explained 5.65% of the variance. Factor 6 was labeled *Role of Education* due to high loadings by the following components: level of college degree and type of teacher certification. This factor explained 5.44% of the variance. Accounting for 5.36% of the variance, the seventh factor was labeled *Gender* due to the high loading by the final variable gender. Table 5 displays all factor loadings related to the factor analysis for teacher working conditions.

Research Question 2: What is the range of working conditions for Texas high school science teachers?

The study included 385 high school science teachers. Forty-seven teachers participating in the study had missing values of some kind within their data. To address the non-response on those individual items, the mean value of the item within school clusters was used. Forty-nine of the 50 schools had a response rate of at least 66% making this method a reliable means to obtain scores across all 385 teachers. Using the weighted final *Working Conditions Rubric*, each teacher was assigned a working conditions score by assigning a value to each response and adding the values for each variable to produce an overall score. The possible range on the working conditions scoring rubric was 6 to 269 points, where higher scores indicated a perception of more difficult working conditions. Among the 385 scores, the mean working condition score was 124.46 (*SD* = 16.81; Range = 97). The distribution of scores is fairly symmetric with the mean, median, and mode all congregating towards the middle of the distribution. Skewness measures the direction and degree of asymmetry with a normal distribution having a skewness equal to zero. The skewness of this data was -.08 (*SE* = .124). Kurtosis is a measure of the heaviness of the tails of a distribution, with nearly normal distributions having kurtosis values close to 0. The kurtosis of this data was -.267 (*SE* = .248) indicating a nearly normal distribution. The normality of the data indicates that the working conditions score variable is an appropriate variable to use in subsequent analyses.

Table 5

Factor Analysis Table for Teacher Working Conditions

	Loadings						
	Factor 1: Barriers to Camaraderie	Factor 2: Satisfaction with Facilities, Equipment, Safety	Factor 3: Role of School Support & PD	Factor 4: Community	Factor 5: Leadership	Factor 6: Role of Education	Factor 7: Gender
Shared Conference	**.704**	-.016	.003	-.165	.003	-.095	.063
Location: Urban/Rural	**-.593**	-.295	.193	.161	-.006	.069	.173
School Size	**-.824**	-.061	-.153	.011	.067	.102	.015
# of Preps	**.730**	-.085	.139	.112	.121	.020	.185
Facilities	-.003	**.856**	.155	.055	.020	.004	-.007
Resources	-.004	**.866**	.198	-.023	.048	.081	.004
Personal safety	.107	**.566**	.201	-.114	-.017	-.053	.056
Perception of Autonomy	.151	.382	**.481**	-.033	.252	-.033	-.074
Professional Development	.031	.222	**.855**	.038	.019	.026	.036
Administrator Support	.021	.228	**.847**	.058	-.017	.010	-.008
Teacher Ethnicity	.194	.109	.007	**.658**	.136	-.024	-.036
MSEP	-.390	-.266	.144	**.451**	-.114	-.209	.107
Team Planning	-.158	.261	.183	**.485**	.132	-.223	.079
Teaches TAKS Prep Course(s)	.340	-.039	-.071	**.630**	.116	.161	-.203

Table 5 continued

	Loadings						
	Factor 1: Barriers to Camaraderie	Factor 2: Satisfaction with Facilities, Equipment, Safety	Factor 3: Role of School Support & PD	Factor 4: Community	Factor 5: Leadership	Factor 6: Role of Education	Factor 7: Gender
Mentor Program	.061	.019	-.042	.104	**.644**	.086	-.095
Years of Teaching Experience	-.106	.160	-.039	-.119	**.590**	.288	.375
Leadership Opportunities	.037	-.030	.189	-.107	**.726**	-.224	-.088
Level of College degree	-.033	.004	.152	-.239	-.1116	**.683**	-.132
Certification	-.149	.004	-.086	.196	.143	**.662**	.084
Gender	.106	.015	-.006	.007	-.088	-.053	**. 893**
Eigenvalues	3.363	2.422	1.589	1.424	1.129	1.088	1.072
% of Total Variance	16.813	12.109	7.944	7.119	5.645	5.438	5.358
Total Variance	16.813	28.922	36.866	43.985	49.630	55.068	60.426

FINAL WEIGHTED RUBRIC FOR WORKING CONDITIONS

Working Condition Categories	Relative Weight	Explanation of Rankings				Total Score
Factor 1: Barriers to Camaraderie (Contributors to Isolation)						
Shared Conference	5	Yes (1) 1 x 5 = 5	No (2) 2 x 5 = 10			
Location: Urban/Rural	1	Rural (1) 1 x 1 = 1	Urban (2) 1 x 2 = 2			
School Size	1	Small (0) 0 x 1 = 0	Medium (1) 1 x 1 = 1	Large (2) 1 x 2 = 2		
# of Preps	5	1 (0) 0 x 5 = 0	2 (1) 1 x 5 = 5	3+ (2) 2 x 5 = 10		
Factor 2: Satisfaction with Facilities, Materials, Safety						
Facilities	5	Very Satisfied (0) 0 x 5 = 0	Satisfied (1) 1 x 5 = 5	Dissatisfied (2) 2 x 5 = 10	Very Dissatisfied (3) 3 x 5 = 15	
Lab Equipment/Resources	5	Very Satisfied (0) 0 x 5 = 0	Satisfied (1) 1 x 5 = 5	Dissatisfied (2) 2 x 5 = 10	Very Dissatisfied (3) 3 x 5 = 15	
Safety	3	Very Satisfied (0) 0 x 3 = 0	Satisfied (1) 1 x 3 = 3	Dissatisfied (2) 2 x 3 = 6	Very Dissatisfied (3) 3 x 3 = 9	
Factor 3: School Support and Professional Development						
Autonomy	3	Very Satisfied (0) 0 x 3 = 0	Satisfied (1) 1 x 3 = 3	Dissatisfied (2) 2 x 3 = 6	Very Dissatisfied (3) 3 x 3 = 9	
PD	3	Very Satisfied (0) 0 x 3 = 0	Satisfied (1) 1 x 3 = 3	Dissatisfied (2) 2 x 3 = 6	Very Dissatisfied (3) 3 x 3 = 9	
Support	3	Yes (0) 0 x 3 = 0	No (1) 1 x 3 = 3			
Factor 4: Community						
Ethnicity	1	African-American (0) 0 x 1 = 0	Other = (1) 1 x 1 = 1			
MSEP	1	0-35% (0) 0 x 1 = 0	36-49% (1) 1 x 1 = 1	50-74% (2) 1 x 2 = 2	75%+ (3) 1 x 3 = 3	
Team Planning	1	Very Satisfied (0) 0 x 1 = 0	Satisfied (1) 1 x 1 = 1	Dissatisfied (2) 1 x 2 = 2	Very Dissatisfied (3) 1 x 3 = 3	
TAKS Prep teacher	3	No (0) 0 x 3 = 0	Yes (1) 1 x 3 = 3			
Factor 5: Leadership						
Mentor Program	3	Yes (0) 0 x 3 = 0	No (1) 1 x 3 = 3			
Years of Experience	5	Veteran = (0) 0 x 5 = 0	Mid-Career = (5) 1 x 5 = 5	Beginning = (10) 2 x 5 = 10		
Leadership Opportunities	5	Very Satisfied (0) 0 x 5 = 0	Satisfied (1) 1 x 5 = 5	Dissatisfied (2) 2 x 5 = 10	Very Dissatisfied (3) 3 x 5 = 15	
Factor 6: Education						
Level of College Degree	3	Bachelors = (0) 0 x 3 = 0	Masters = (3) 1 x 3 = 3	PhD = (6) 2 x 3 = 6		
Certification	5	Yes = (0) 0 x 5 = 0	No = (5) 1 x 5 = 5			
Factor 7: Gender						
Gender	1	Male (0) 0 x 1 = 0	Female (1) 1 x 1 = 1			

Figure 5. Final working conditions scoring rubric categorized by factors derived from factor analysis.

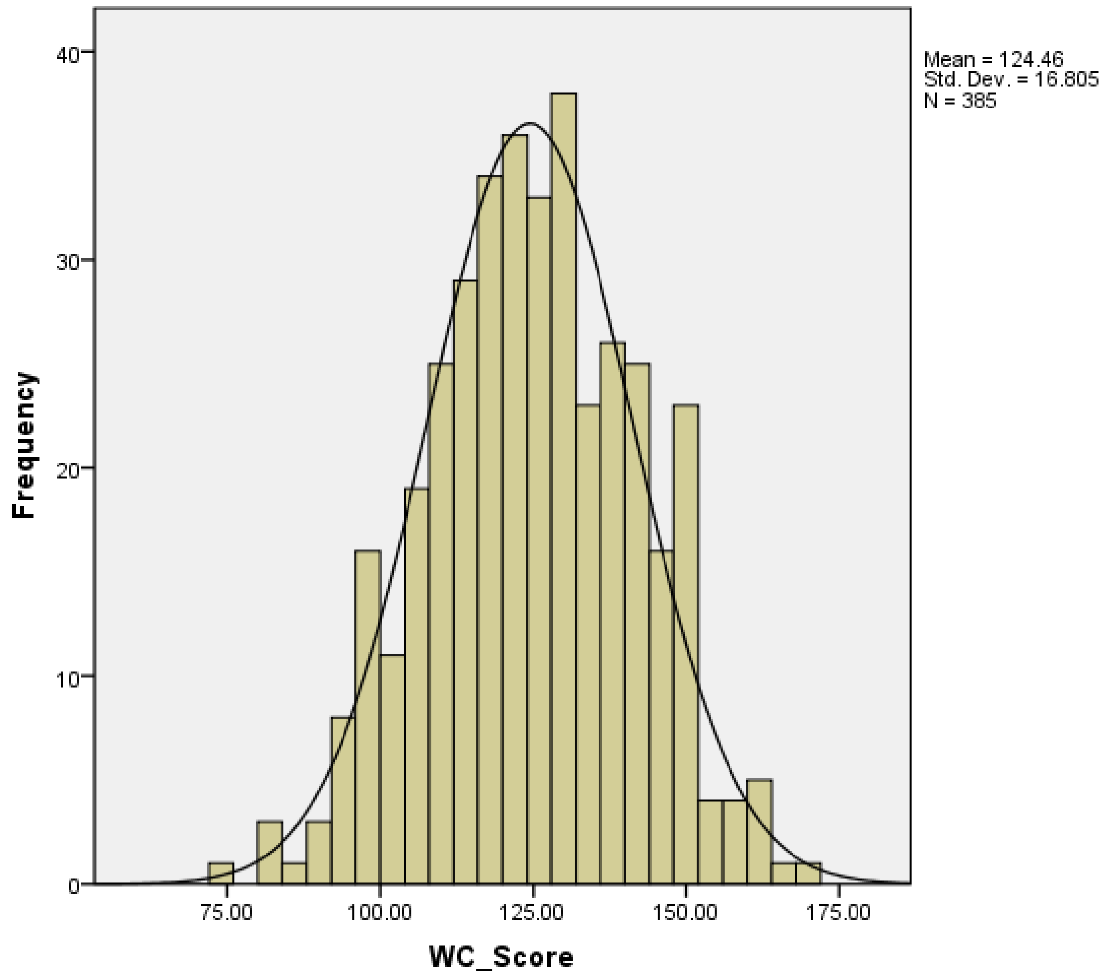

Figure 6. Working condition scores of all high school science teachers (n=385).

Figure 5 displays the final weighted scoring rubric for working conditions and the corresponding factor analysis loadings combined in one figure. Figure 6 displays the range of scores among the 385 high school science teachers.

Research Question 2a: What are the frequencies of occurrence of these working conditions for science teachers at small, medium, and large-sized high schools across the state?

High school science teachers from small schools (n = 26) had a mean working conditions score of 142.40 (*SD* = 14.18, Range = 53). High school science teachers from medium schools (n = 87) had a mean working conditions score of 127.70 (*SD* = 16.49, Range = 81). Finally, high school science teachers from large schools (n = 272) had a mean working conditions score of 121.72 (*SD* = 15.92, Range = 66). As school size increased, working condition scores decreased.

As previously mentioned, I measured a working conditions score for each of the 385 science teachers in the PRISE sample. Box-and-whisker diagrams are a useful way to display the median values of a data set and provide a visual comparison. Figure 7 illustrates each teacher score grouped in a box-and-whisker plot according to the size of teacher's school. The box illustrates scores within the second and third quartiles. The values for the lower and upper edges of the box provide the values for calculating the Inter-Quartile Range (IQR). The lower whisker for each plot illustrates scores within the first quartile, and the higher whisker illustrates scores within the fourth quartile. Any teacher scores outside the lower and higher whisker describe an outlier. An extreme outlier is any value more than 1.5 times the IQR away from the first or third quartile value.

As Figure 7 illustrates, the median working conditions score for science teachers in small schools was somewhat higher (M = 141.25) than the median value for science teachers in either medium (M = 128.00) or large (M = 122.00) schools. The data described in Figure 7 suggests that a science teacher's working conditions score is related to the size of a science teacher's school. In addition to differences in median values, the whiskers illustrating the first and fourth quartiles for teachers' scores in small schools are shorter than the whiskers illustrating the same quartiles for teachers' scores in either medium or large schools. Additionally, the only outliers are associated with teachers working in medium or large schools.

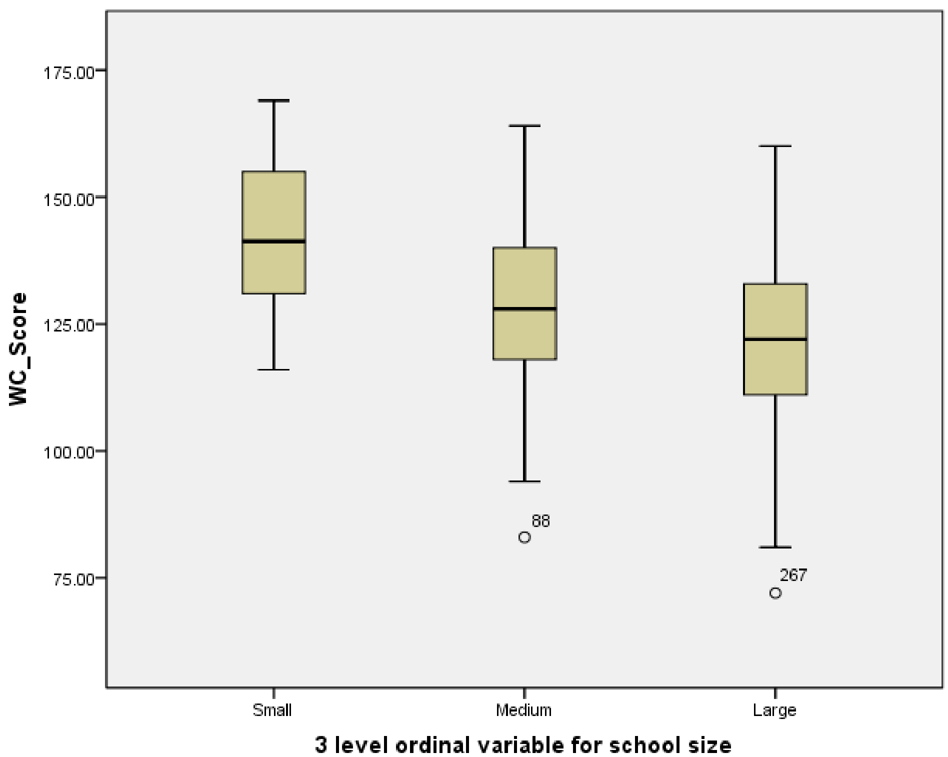

Figure 7. Working condition scores grouped by small, medium, and large schools.

These results warrant further statistical analysis to quantify and describe the significance of the difference in teachers' scores by school size. Consequently, I ran a Kruskall-Wallis Test. The results of the analysis indicates that there was a not a significant difference in the medians, X^2 (2, *N* = 385) = 35.879. While generally there appears to a difference in working condition scores when compared by the size of a science teacher's school, one should exercise caution when concluding that school size impacts a science teacher's working conditions scores.

Research Question 2b: What are the frequencies of occurrence of these working conditions for induction, mid-career, and veteran high school science teachers?

Induction year teachers (defined as teachers with 1 to 3 years of experience; n = 90) had a mean working conditions score of 112.56 (*SD* = 15.05; Range = 72). Mid-career teachers (defined as teachers with 4 to 7 years of experience; n = 62) had a mean working conditions score of 124.28 (*SD* = 14.39; Range = 64). Finally, veteran year teachers (defined as teachers with 8 or more years of experience; n = 213) had a mean working conditions score of 129.76 (*SD* = 16.17; Range = 78). The box-and-whisker plot in figure 8 below displays the mean working condition scores of all teacher types.

As Figure 8 illustrates, the median working conditions score for induction science teachers was lower (M = 113.00) than the median working condition score for science teachers in either medium (M = 123.00) or large (M = 131.00) schools. The data described in Figure 8 suggests that a science teacher's working conditions score is related to the level of a science teacher's experience. In addition to differences in median values, the whiskers illustrating the first and fourth quartiles for teachers' scores for induction and veteran teachers are longer than the whiskers illustrating the same quartiles for teachers' scores for mid-career teachers. Additionally, there were no outliers associated with teachers' scores based on their level of teaching experience.

These results warrant further statistical analysis to quantify and describe the significance of the difference in teachers' scores by level of teaching experience. Consequently, I ran a Kruskall-Wallis Test. The results of the analysis indicates that there was not a significant difference in the medians, X^2 (2, N = 385) = 62.002. While there appears to be a difference in working conditions scores when categorized by the level of a science teacher's experience, this test indicates there is no significant difference in working condition scores by the type of teacher (induction, mid-career, veteran).

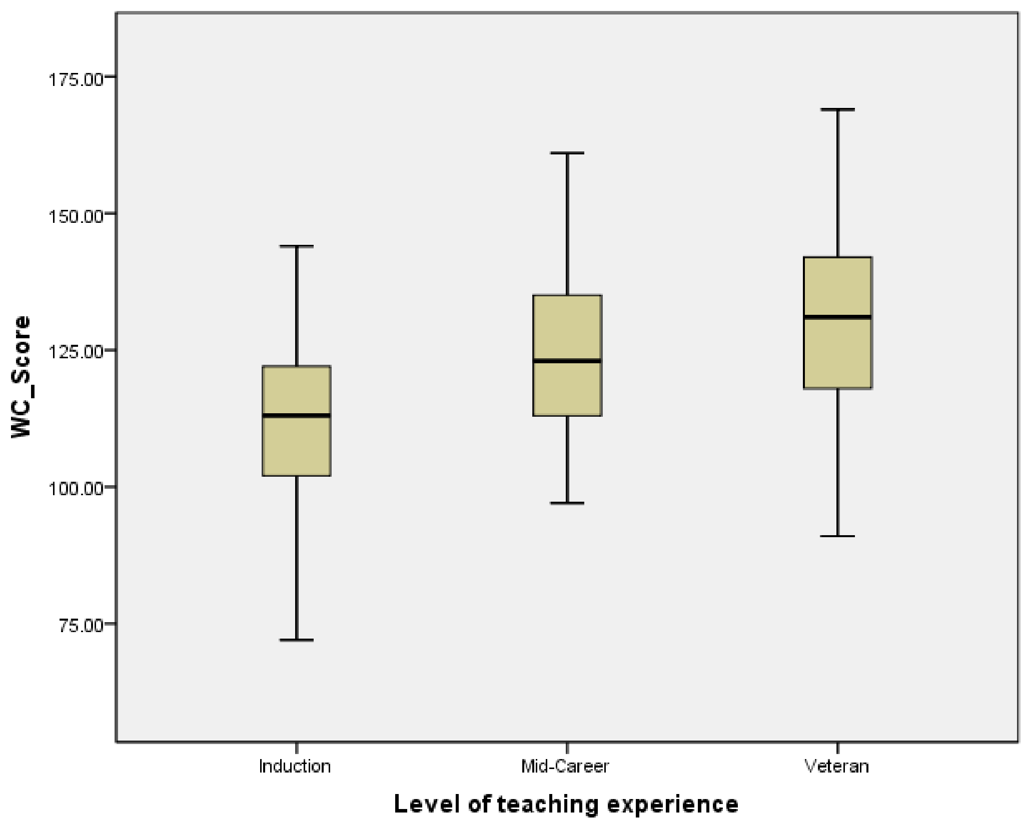

Figure 8. Working condition scores grouped by induction, mid-career, and veteran teachers.

Research Question 2c: What are the frequencies of occurrence of these working conditions for science teachers in the four categories of minority student enrollment proportion (lowest, low, high, and highest) high schools?

Science teachers from the lowest minority schools (defined by the Texas Education Agency as schools with less than 35% minority student enrollment proportion; n = 133) had a mean working conditions score of 126.68 (*SD* = 15.07; Range = 75). Science teachers from the low minority schools (defined as schools with 35%-49% minority student enrollment proportion; n = 47) had a mean working conditions score of 132.78 (*SD* = 17.90; Range = 60). Science teachers from the high minority schools (defined as schools with 50%-74% minority student enrollment proportion; n = 70) had a mean working conditions score of 119.55 (*SD* = 16.15; Range = 88). Finally, science teachers from the highest minority schools (defined as schools with greater than 75% minority student enrollment proportion; n=135) had a mean working conditions score of 121.94 (*SD* = 17.12, Range = 77). Figure 9 below shows the mean distribution of working condition scores by school type.

As Figure 9 illustrates, the median working condition score for science teachers in high minority schools was lower (M = 119.00) than the median working condition score for science teachers in the lowest (M = 126.00), low (M = 136.00), or highest (M = 123.00) minority schools. The data described in Figure 9 suggests that a science teacher's working conditions score is related to the minority student enrollment proportion in her school. In addition to differences in median values, the whiskers illustrating the first and fourth quartiles for teachers' scores in the low minority student enrollment proportion school are shorter than the whiskers illustrating the same quartiles for teachers' scores in the three other types of schools. Additionally, the only outlier is associated with teachers working in high minority student enrollment proportion schools.

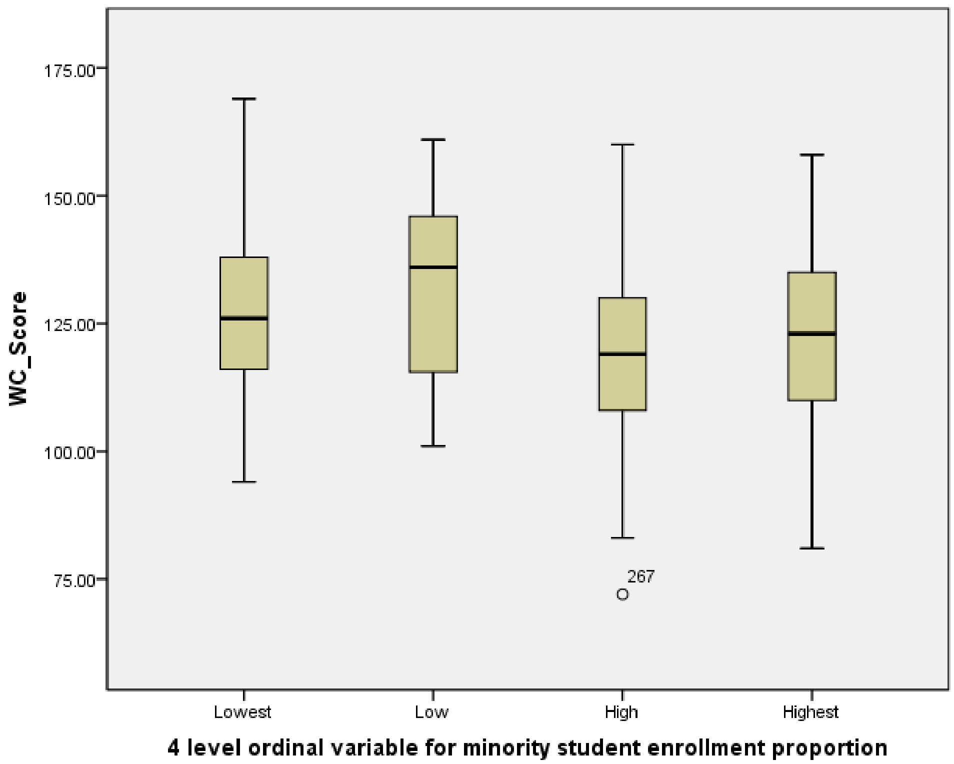

Figure 9. Working condition scores grouped by Minority Student Enrollment Proportion (MSEP).

These results warrant further statistical analysis to quantify and describe the significance of the difference in teachers' scores by school type. Consequently, I ran a Kruskall-Wallis Test. The results of the analysis indicates that there was not a significant difference in the medians, X^2 (2, N = 385) = 19.162. While there appears to be a difference in science teachers' working conditions scores when categorized by the school's minority student enrollment proportion, this test indicates there is no significant difference in working condition scores by the type of school.

Discussion

Overall, these analyses indicated that seven distinct factors describe categories in working conditions and contribute to 60.4% of the variance. The factor structure proposed in this study reduced the number of working conditions from 20 to 7, providing not only a reduced list, but a prioritized list indicating levels of importance. These include (1) Barriers to Camaraderie, (2) Satisfaction with Facilities, Equipment, and Safety, (3) Role of School Support and Professional Development, (4) Community, (5) Leadership, (6) Role of Education, and (7) Gender. A normal distribution was evident for science teachers' working conditions scores indicating that the data was adequately suited for parametric statistical analyses. An important product of this research, therefore, is a working conditions rubric that has been subjected to factor analysis, yielding an instrument that is ready to use in subsequent studies examining the working conditions of high school science teachers. The finding that Barriers to Camaraderie is the most important factor in working conditions supports recently published literature (e.g., Fulton, Yoon, & Lee, 2005; Kardos & Johnson, 2007) that indicates the importance of professional culture in sustaining teachers' retention and contribution to others. Satisfaction with Facilities, Equipment, and Safety is also supported by recent research that links school facility conditions to teacher satisfaction and success and suggests that well-prepared teachers are the most important factor in student success (Leithwood, 2006; NSTA, 2003; Schneider, 2003). The Role of School Support and

Professional Development supports current research that suggests learning opportunities for teachers have a direct relationship with a teacher's long-term commitment to education (e.g., Guskey, 2002; Kent, 2004). In short, retained teachers offer stability, commitment, and often, better quality instruction due to increased content knowledge and experience (Darling-Hammond & Youngs, 2002; Jacob, 2007; Podgursky, Monroe, & Watson, 2004).

Findings from this study suggest that (a) science teachers from small schools experience tougher working conditions than teachers from both medium and large schools; (b) veteran science teachers experience tougher working conditions than both induction and mid-career science teachers; and (c) science teachers from lower minority schools experience tougher working conditions than science teachers from higher minority schools. Much as the literature suggests (Guilford Education Alliance, 2009; Monk, 2007), teachers from small schools often have additional responsibilities including extra-curricular duties, extra preparations, and extra roles (i.e., coaching, bus driver, after-school detention). As school size increases, the demands imposed by working conditions decrease. Small schools often have fewer resources; therefore, teachers have increasing responsibilities when compared to larger schools. However, while a trend appears to exist by size of school, the statistical analyses indicated that working condition scores were not significantly different among science teachers from small, medium, and large schools. Chapters IV and V will examine whether these extra responsibilities impact job satisfaction and retention.

In contrast to current literature (Darling-Hammond, 2003; McCann & Johannessen, 2005; Patterson, 2005), this study found that beginning science teachers' working conditions scores were less than those of mid-career and veteran teachers. Although the analyses in this study indicate that the working condition scores were not significantly different among teacher types, a long-standing perception has been that beginning teachers experience significantly more difficult working conditions than their peers. Perhaps principals and districts have finally listened to the outcry that beginning teachers need decreased responsibilities, and this study shows the outcome of that change. On the other hand, the belief that beginning teachers have more difficult working conditions from the onset of their career could be a gross overstatement and a complete misconception. Another explanation could be linked to teacher perception. In studies where teacher's perceptions were used as an indicator of working conditions, novice teachers could perceive their jobs to be harder than those of more experienced teachers, due to their inexperience in juggling the multiple tasks associated with teaching.

Finally, this study found that science teachers from higher minority schools experienced a mean working conditions score that was less than science teachers from lower minority schools. Although the findings in this study were not statistically significant, the findings of a trend suggest contradictions with recent literature (Frankenberg, 2006; Johnson, 2006; National Commission on Teaching & America's Future, 2003; Olsen & Anderson, 2007). It is widely assumed that schools with a lower minority student enrollment proportion (MSEP) have a greater advantage in resources and, as a result, reduced working conditions for teachers (i.e., their job is easier).

A closer examination of these variables and how they interact with one another is necessary to provide a more complete portrait of how working conditions impacts the teaching profession. Chapters IV and V will examine these same variables and their impact on job satisfaction and retention.

Limitations

The predominant strength of this study is that the design of the PRISE sampling plan allows the empirical data to be generalized to all public high schools in Texas. As with any study, there are limitations to the findings. First, the working conditions rubric does not contain an exhaustive list of all working conditions affecting teachers. The identification of variables to be included in this study was based on findings of previous studies as well as assumptions widely discussed in the field. While unlikely, other working conditions could exist that this study did not include in the rubric. Second, non-response answers on individual items within the study were replaced with the mean value calculated by school cluster. One school within the study had a response rate of 33%. Replacing non-response answers with mean values from schools where the return rate was less than 50% is concerning. The mean value of the answers within that one school cannot be assumed to be an accurate representation of the answers from that school. Science teachers' perspectives about working conditions were encompassed within a much larger process of data collection including the entire teacher professional continuum, from recruitment to retention.

Finally, multiple sources were gathered after data collection in order to provide a complete examination of working conditions. Working with pre-existing data collected exhaustively in association with a large-scale study supported by an externally funded agency has its advantages. Disadvantages also exist, however. The initial focus of the PRISE research group did not include a full-scale study about science teacher working conditions. As a result, I was unable to include some working condition variables as they were not part of the initial data collection and could not be gathered post hoc. Preliminary results here suggest implications for a full-scale study with an *a priori* instrument and data collection strategies focused predominantly on working conditions.

CHAPTER IV

SCIENCE TEACHERS' WORKING CONDITIONS AND JOB SATISFACTION IN TEXAS HIGH SCHOOLS

A major goal of education is to improve student learning (Darling-Hammond, 1999). This responsibility is shared by our teachers and parents, administrators, policymakers, and the students. Individually, these groups have their own contributions to make, but the teacher's contribution mediates the effects of all the other groups' contributions. What our teachers decide to do depends greatly on their own internal motivations, abilities, and individual working conditions.

Problem Statement

In recent years, almost all interventions to improve student learning have focused on teachers. However, inadequate working conditions can undermine the potential effects of these efforts. In a report to North Carolina's governor, Hirsh (2005) stated, "Teacher working conditions are student learning conditions (p. vii)." According to Leithwood, Harris, & Hopkins (2008), teachers' feelings and knowledge are the immediate cause of what teachers do and those same feelings and knowledge are significantly influenced by the working conditions under which teachers are expected to perform their duties. Obviously some working conditions will benefit the environment and have positive effects on teachers, while others will have negative effects. Accordingly, a teachers' performance will be influenced. Prior research suggests an influence of working conditions on teachers' work performance that eventually impacts morale, commitment, and overall job satisfaction (Darling-Hammond, 2003; Hanushek & Rivkin, 2007).

Literature Review

The examination of a connection between on-the-job performance and job satisfaction is a long-standing tradition in research psychology. Industrial psychologists describe this as the "holy grail" of their field (Landy, 1989). Workplace attitudes and productivity research began with the Hawthorne studies and continues today (Roethlisberger & Dickson, 1939). Researchers commonly credit the Hawthorne studies with stressing the link between performance and workplace attitudes, although researchers were more aware of all the circumstances within the outcomes of their findings than most were aware (e.g., Roethlisberger, 1941). What is apparent, however, is that this research piqued the interest of others in examining relationships between performance on the job and job satisfaction. In 1955, Brayfield and Crockett published the most instrumental analysis of the job satisfaction-job performance movement. This article reviewed not only job satisfaction-job performance studies, but also integrated a number of studies examining other performance outcomes (leaves, absences, and attrition) and found little or no relationship between job performance and job satisfaction (Brayfield & Crockett, 1955). Since then, numerous other narrative analyses have been published (e.g., Herzberg, Mausner, Peterson, & Capwell, 1957; Janssen & Van Yperen, 2004; Locke, 1970; Schwab & Cummings, 1970; Vroom, 1964; Wright & Cropanzano, 2000). Although the reviews often differed greatly in their assessment regarding the satisfaction-performance relationship, they did issue a solid directive for theory-driven investigations.

Some scholars have designed models that identify the numerous sources of satisfaction and dissatisfaction for the everyday workforce and for the teaching field in particular. The most difficult aspect associated with researching job satisfaction is finding a single interpretation of the phrase, “job satisfaction” (Evans, 1996). One all-encompassing theory does not seem to exist. However, Herzberg’s (1968) two-factor job satisfaction theory is often cited in education literature. He suggests that job satisfaction consists of two dimensions: motivation and hygiene. The intrinsic dimension (motivation) consists of acknowledgment, accomplishment, improvement, engagement, and actual performance (Hirsh et al., 2001). These elements lead to positive attitudes on the job because they fulfill the individual’s desire for self-actualization (Judge, Bono, & Locke, 2000). Most teachers entering the field do so because they want to make a difference with students. Teachers are satisfied when they promote learning and create positive connections with their students (Farkas, Johnson, & Foleno, 2000). The extrinsic dimension (hygiene) consists of compensation, oversight, practices, working conditions, and relationships (Herzberg, 1968). Teachers who work with sub-standard hygiene factors often leave the profession; however, it goes without saying that teachers may differ in what makes a job satisfying. Depending on an individual teacher’s first choice and the significance of each factor, some positive factors could outweigh some negative factors. Generally speaking though, teachers cite discipline, classroom autonomy, administrative support, decision-making, and parental involvement as key factors that determine their job satisfaction (Betoret, 2006; Farkas et al., 2000; Hiatt-Michael, 2006; Kim & Loadman, 1994; Opdenakker & Van Damme, 2006; Pisciotta, 2000). Monetary benefits do not seem to be significantly influential in job satisfaction (Betoret, 2006; Farkas et al., 2000; Kim & Loadman, 1994), while lack of professional development, frequent policy changes, inadequate facilities, and little respect are cited as sources of dissatisfaction (Boe et al., 1997; Prince, 2002).

Generally, there is a lack of research examining science teachers' job satisfaction. A 2007-2008 study by the PRISE Research Group (Bozeman & Stuessy, 2009), however, explored a variety of school components related to Texas science teachers' job satisfaction. Figure 10 displays the percentage response rates of high school science teachers recording satisfied or very satisfied to questions on the *Texas Poll of Secondary Science Teachers* (Bozeman & Stuessy, 2009). This "Report Card" summarized science teachers' responses to 14 questions on the Texas Poll that specifically addressed their satisfaction with a variety of aspects in the professional work environment. The report card used the percentage of teachers' favorable responses to the questions related to their work environment on the Texas Poll and translated the responses to correlate with a typical grade scale where A = 90-100%; B = 80-89%; C = 70-79%; D = 60-69%; and F = < 60%. As Figure 10 summarizes, high school science teachers generally indicated they were "satisfied" or "very satisfied" to 10 of the 14 questions related to job satisfaction on the Texas Poll. However, there were no attempts in this research group's examinations of job satisfaction to associate their findings with working conditions.

Texas High School Science Teachers' Job Satisfaction
Percentage Response Rates of Sample High School Science Teachers Responding Satisfied or Very Satisfied to Questions on the Texas Poll

B- Autonomy and Recognition

All	Small[1]	Medium[1]	Large[1]	Low MSEP[2]	High MSEP[2]
91.4	96.2	92.0	90.8	93.9	89.3
70.9	77.0	74.7	69.1	73.3	68.8

A Occupational Choice

All	Small[1]	Medium[1]	Large[1]	Low MSEP[2]	High MSEP[2]
95.6	96.2	94.3	96.0	95.6	95.6

F Science Lab Facilities and Equipment

All	Small[1]	Medium[1]	Large[1]	Low MSEP[2]	High MSEP[2]
56.6	61.5	65.5	53.3	60.5	53.1
54.2	50.0	66.7	50.7	63.3	46.4

B- Personal Safety

All	Small[1]	Medium[1]	Large[1]	Low MSEP[2]	High MSEP[2]
83.9	100.0	90.8	80.1	91.1	77.6

B+ Collegiality and Cooperation Among Teachers

All	Small[1]	Medium[1]	Large[1]	Low MSEP[2]	High MSEP[2]
88.3	96.2	86.2	88.2	88.9	87.8

B Administrative Communication and Teaching Assignment

All	Small[1]	Medium[1]	Large[1]	Low MSEP[2]	High MSEP[2]
79.2	88.5	81.6	77.6	84.5	74.6
85.9	88.5	89.7	84.5	87.7	84.4

B Professional Development Support – General and Science-Related

All	Small[1]	Medium[1]	Large[1]	Low MSEP[2]	High MSEP[2]
87.0	92.3	87.3	86.4	85.5	88.2
73.2	96.2	72.4	71.3	74.4	72.2

B Student-Centered Focus on Academics

All	Small[1]	Medium[1]	Large[1]	Low MSEP[2]	High MSEP[2]
88.8	84.6	83.9	90.8	86.7	90.7

D- Student-Centered Focus on Careers and Informal Science Activities

All	Small[1]	Medium[1]	Large[1]	Low MSEP[2]	High MSEP[2]
64.2	76.9	61.0	63.9	66.1	62.4
60.2	84.6	72.4	54.0	67.2	54.1

[1]Small, Medium, Large = Size of School
[2]Low (<50%) and High (>50%) Minority Student Enrollment Proportion (MSEP)

Figure 10. Percentage response rates of sample high school science teachers responding *satisfied or very satisfied* to questions on the Texas Poll by the PRISE Research Group.

Source: Bozeman, T.D., & Stuessy, C. (2009). *Job Satisfaction of High School Science Teachers in Texas.* Retrieved from http://prise.tamu.edu.

Research Questions

Using a working conditions rubric developed directly for use in this study, I calculated a working conditions score and job satisfaction score for each high school science teacher participant (n = 385) within my study to answer the following research questions:

1. What is the relationship between science teachers' working condition scores and job satisfaction scores for science teachers in Texas high schools?
2. Will there be a significant difference in working conditions scores for science teachers in Texas high schools with regard to:

   (a) teacher type (induction, mid-career, veteran)?

   (b) school size (small, medium, large)?

   (c) school type (lowest, low, high, highest Minority Student Enrollment Proportion)?
3. Will there be a significant difference in working conditions scores and job satisfaction scores for science teachers in Texas high schools with regard to:

   (a) teacher type (induction, mid-career, veteran)?

   (b) school size (small, medium, large)?

   (c) school type (lowest, low, high, highest Minority Student Enrollment Proportion)?

Research Design

A five-year research study (Policy Research Initiative in Science Education; PRISE) was designed to answer three necessary policy research questions about the high school science teacher professional continuum (TPC) in Texas: Where are we? Where do we want to go? How do we get there? Using a mixed methods research approach, this project seeks to link prior research findings to current policies and practices in high school science teacher recruitment, induction, renewal, and retention.

The PRISE Research Group selected 50 schools to proportionally represent the 1,333 public high schools in Texas by using a two-stage stratified random sampling plan (Stuessy, McNamara, & the PRISE Research Group, 2008). School size and minority student enrollment proportion (MSEP) are the two explicit stratification variables used in the sampling procedures. Schools were grouped into three categories based on student enrollment for school size: *Small* (secondary student enrollment equal to or less than 189 students; n=15), *Medium* (secondary student enrollment equal to or greater than 190 and less than or equal to 899 students; n=17), and *Large* (secondary student enrollment greater than or equal to 900 students; n=18).

For this study, school MSEP is divided into four categories: *Lowest* (less than 35 percent minority student enrollment proportion; n=21), *Low* (36-49% minority student enrollment proportion; n=8), *High* (50-74% minority student enrollment proportion; n=9), and *Highest* (greater than 75% minority student enrollment proportion; n=12). To ensure our samples were representative of the state of Texas geographically, an additional implicit stratification method was used. By accounting for the schools' location within the Texas Regional Education Service Centers (ESCs), the PRISE Research Group's sampling plan conforms with policy planning at the state and national levels (McNamara & Bozeman, 2007). These methods were employed to maximize the generalizability of the PRISE survey research findings to all public high schools in Texas. Of the 50 schools originally selected, 39 agreed to participate. Non-cooperating schools were matched with replacements schools using the original design of the sampling plan to obtain a total of 50 participating schools.

Finally, once sample schools were identified, PRISE researchers contacted campus principals (n=50) to gain their permission to conduct research and obtain access to the schools. From there, all science teachers from all 50 schools (n=385) were asked to complete a comprehensive survey addressing multiple issues about their current positions. The PRISE Research Group developed a questionnaire to assess science teachers' current levels of satisfaction with their work environment (see Appendix A). The group developed, tested, and revised the *Texas Poll of Secondary Science Teachers (Texas Poll)*. The Texas Poll requested information about (a) teachers' job satisfaction and (b) involvement in professional activities. Regarding a teacher's job satisfaction with their school, fourteen Likert-type questions encompassed these categories: satisfaction with autonomy and recognition; satisfaction with the physical environment; satisfaction with collegiality and cooperation; satisfaction with administrative support; and satisfaction with the school's focus on students (Stuessy, 2009). The working conditions component of the survey is a small portion of a much more comprehensive study.

List of Variables and Instruments

Variables

The variables used for this study are as follows:

1. Science teachers' perceptions of their working conditions score
2. Teacher type (induction, mid-career, veteran)
3. School size (small, medium, large)
4. School type (lowest, low, high, highest Minority Student Enrollment Proportion)
5. Job satisfaction scores

Instruments

Initially, the working conditions of science teachers participating in this study were scored, using the *Working Conditions Scoring Rubric* (Hollas, 2011). Teacher type classifications (i.e., induction, mid-career, veteran) resulted from an analysis of information obtained from the teacher poll and Public Education Information Management System (PEIMS) data. Demographic information about faculty, students, and courses were acquired from the state-maintained Academic Excellence Indicator System (AEIS; TEA, 2010) "snapshot" summaries of all Texas schools and districts. The AEIS reports were used to obtain information about school size, (small, medium, or large) and school type (Minority Student Enrollment Proportion). Finally, each science teacher's job satisfaction score was obtained using teachers' responses on the Texas Poll requesting answers to a series of questions related to job satisfaction. Answers about teachers' job satisfaction were then coded to reflect a numerical value and an overall job satisfaction score was rendered for each individual teacher.

Data Collection and Analysis Methods

Data Collection

During the 2007-2008 school year, PRISE researchers interviewed principals at the 50 participating high schools to acquire a better understanding of current school policies and practices influencing teachers at a variety stages within the teacher professional continuum. All principals (n=50; 100% return rate) completed a field-based semi-structured interview. Principal interviews were audio recorded, transcribed, and transferred to data charts. Some principals (n = 5) did not allow PRISE researchers to record the interview; therefore, field notes were used as the primary data source and were subsequently transferred into data charts (Stuessy, McNamara, & the PRISE Research Group, 2008).

After the initial principal interview, science teachers at the individual schools were contacted to complete a 22-question survey (the Texas Poll of Secondary Science Teachers) developed, piloted, and revised by the PRISE Research Group (See Appendix A). Science teachers (n=385; 89.6% return rate) completed the survey, which contained questions about teachers' professional involvement, job satisfaction, working conditions, and general demographic information. In addition, master schedules were collected from each of the 50 sample schools. Information reflected on the master schedule included the number of science teachers at the school, specific science subjects taught, the number of TAKS (Texas Assessment of Knowledge and Skills) preparation courses, the overall school schedule, and common planning periods. Academic Excellence Indicator System (AEIS) reports were collected at the state level. This report reflected TAKS scores for individual schools, accountability ratings, campus subpopulations, number of students taking ACT/SAT tests and dual credit courses, as well as general teacher and student demographics. All of these data sources were combined to obtain an accurate portrait of working conditions within each of the 50 PRISE sample schools.

Data Analysis

In this study, several data analyses were conducted. To summarize the data set, descriptive statistics are presented along with more formal analyses. To identify relationships between the variables, Pearson's correlation coefficients were calculated. In addition, to identify significant differences between variables, MANOVA tests were used. An alpha level of .05 was used for determining significance in all statistical tests. See Figure 11 for a display of the research design for the integration of the quantitative and qualitative data collection and analysis (Creswell & Plano-Clark, 2007) and Table 6 for a visual display of the research questions, data sources, and analysis methods.

Results

The findings from this portion of the study are presented in three sections, with each section corresponding to a research question. Working condition scores and job satisfaction scores were calculated for the entire sample population of high school science teachers and for subcategories of teachers by their school size, teacher type, and school MSEP. Non-responses by individual teachers were addressed by calculating the

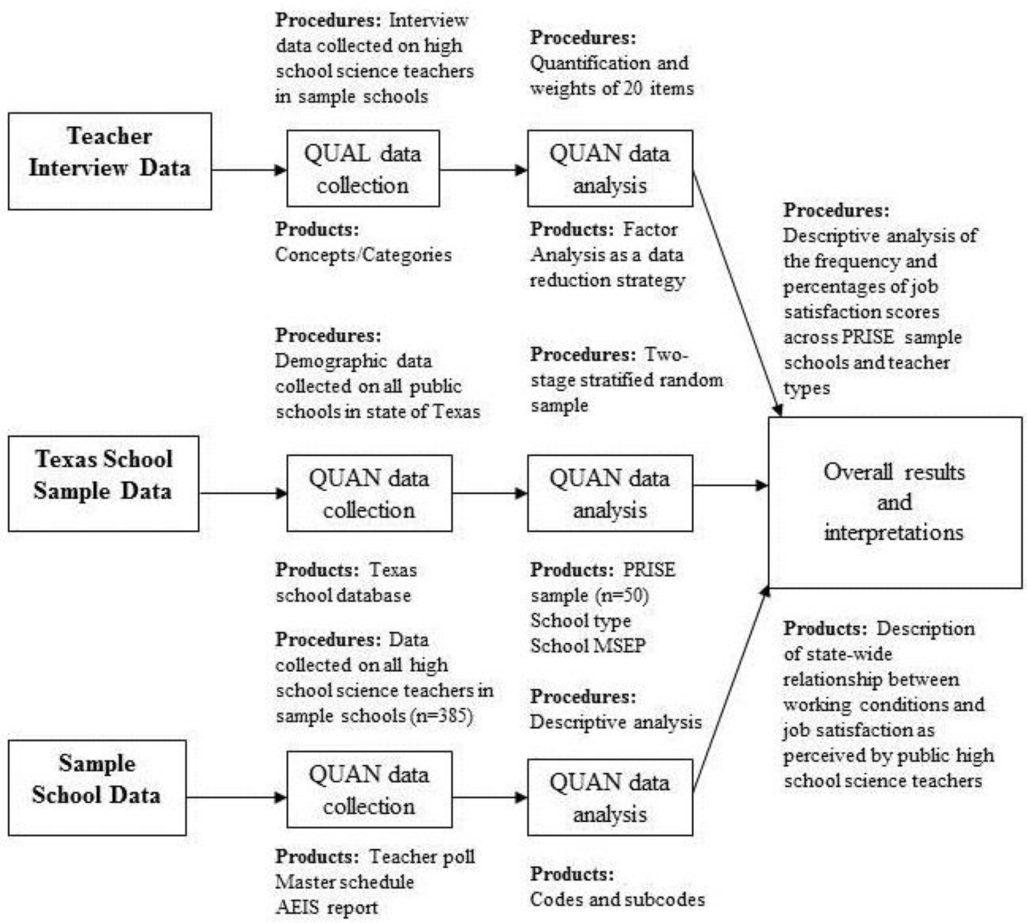

Figure 11. Visual model of descriptive analysis examining relationships and differences between working conditions variables. Adapted from *Designing and Conducting Mixed Methods Research* by J.W. Creswell and V.L. Plano-Clark, 2007.

mean value of individual items within school clusters and then applying those mean values to the missing value. I therefore was able to report working condition and job satisfaction scores for all 385 teachers.

Table 6

Research Questions, Data Sources, and Data Analysis

Research Question	Data Sources	Data Analysis
What is the relationship between teachers' working condition scores and job satisfaction scores for science teachers in Texas high schools?	Working Condition Scores Job Satisfaction Scores	Pearson's correlation
Will there be a significant difference in working condition scores for science teachers in Texas high schools with regard to teacher type (induction, mid-career, veteran), school size (small, medium, large), and school type (lowest, low, high, highest MSEP)?	Working Condition Scores Job Satisfaction Scores PEIMS data Teacher Poll	ANOVA (with follow-up post hoc tests)
Will there be a significant difference in working condition scores and job satisfaction scores for science teachers in Texas high schools with regard to teacher type, school size, and school type?	Working Condition Scores Job Satisfaction Scores PEIMS data Teacher Poll	Multivariate Analysis

Research Question 1: What is the relationship between science teachers' working condition scores and job satisfaction scores for teachers in Texas high schools?

A Pearson product-moment correlation coefficient was computed to assess the relationship between science teachers' working condition scores and job satisfaction scores. The possible range on the job satisfaction measure was 0-69, where higher scores indicated higher levels of job satisfaction. The obtained range was 22-56. The possible range on the working conditions scoring rubric was 6-269, where higher scores indicated harder working conditions. The obtained range was 72-169. There was a significant, strong, positive correlation between scores on the job satisfaction measure and those on the working conditions measure (r = .708, p = .01). Table 7 summarizes the descriptive statistics of working condition scores and job satisfaction scores and Table 8 displays the Pearson's correlation of both scores. Job satisfaction scores increased as perception of the difficulty of working conditions also increased.

Table 7

Descriptive Statistics of Working Condition Scores and Job Satisfaction Scores

Variable	*n*	*M*	*SD*
Working conditions score	385	124.47	16.81
Job satisfaction score	385	42.01	6.30

Research Question 2a: Will there be a significant difference in working conditions scores for science teachers in Texas high schools with regard to teacher type (induction, mid-career, veteran)?

A one-way ANOVA test was used to examine differences among three types of science teachers regarding their working conditions score (see Table 9). Working conditions differed significantly across the three teacher types, F (2, 362) = 38.43, p = .000. Table 10 summarizes Tukey's post-hoc comparisons of the three groups. The analysis indicated that veteran teachers (M = 129.76, 95% CI [127.57, 131.94]) reported significantly harder working conditions than both mid-career (M = 124.28, 95% CI

[120.62, 127.93]) and induction teachers (*M* = 112.56, 95% CI [109.40, 115.71]), and mid-career teachers indicated significantly harder working conditions than induction teachers ($p < .05$).

Table 8

Pearson's Correlation of Working Condition Scores and Job Satisfaction Scores

		Working Conditions Score	Job Satisfaction Scores
Working Condtions Scores	Pearson Correlation	1	.708**
	Significance (2-tailed)		.000
	Sum of Squares and Cross-Products	108443.55	28798.55
	Covariance	282.41	75.00
	N	385	385
Job Satisfaction Scores	Pearson Correlation	.708**	1
	Significance (2-tailed)	.000	
	Sum of Squares and Cross-Products	28798.55	108443.55
	Covariance	75.00	282.41
	N	385	385

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

Table 9

ANOVA of Working Condition Scores by Teacher Type

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	18724.34	2	9362.17	38.426	.000
Within Groups	88197.44	362	243.64		
Total	106921.77	364			

Table 10

Tukey's Post-hoc Results of Working Condition Scores by Teacher Type

Level of teaching experience	Level of teaching experience	Mean Difference	Standard Error	Sig.	95% CI	
					LL	*UL*
Induction	Mid-Career	-11.72*	2.58	.000	-17.78	-5.66
	Veteran	-17.20*	1.96	.000	-21.82	-12.58
Mid-Career	Induction	11.72*	2.58	.000	5.66	17.78
	Veteran	-5.48*	2.25	.041	-10.78	-.18
Veteran	Induction	17.20*	1.96	.000	12.58	21.82
	Mid-Career	5.48*	2.25	.041	.18	10.78

*. The mean difference is significant at the 0.05 level.

Note. CI = confidence interval; *LL* = lower limit; *UL* = upper limit

Research Question 2b: Will there be a significant difference in working conditions scores for science teachers in Texas high schools with regard to school size (small, medium, large)?

A one-way ANOVA test was used to examine differences among three types of school size regarding science teachers' working conditions scores (see Table 11). Working conditions differed significantly across the three school sizes, F (2, 32) = 22.29, p = .000. Table 12 summarizes Tukey's post-hoc comparisons of the three groups.

The analysis indicated that teachers in small-sized schools (*M* = 142.40, 95% CI [136.68, 148.13]) reported significantly harder working conditions than teachers in both medium-sized schools (*M* = 127.70, 95% CI [124.19, 131.21]) and large-sized schools (*M* = 121.72, 95% CI [119.81, 123.62]), and teachers in medium-sized schools indicated significantly harder working conditions than teachers in large-sized schools ($p < .05$).

Table 11

ANOVA of Working Condition Scores by School Size

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	11334.30	2	5667.15	22.29	.000
Within Groups	97109.25	382	254.21		
Total	108443.55	384			

Table 12

Tukey's Post-hoc Results of Working Condition Scores by School Size

School Size	School Size	Mean Difference	Standard Error	Sig.	95% CI	
					LL	*UL*
Small	Medium	14.70*	3.56	.000	6.32	23.09
	Large	20.69*	3.27	.000	12.99	28.39
Medium	Small	-14.70*	3.56	.000	-23.09	-6.32
	Large	5.99*	1.96	.007	1.36	10.61
Large	Small	-20.69*	3.27	.000	-28.39	-12.99
	Medium	-5.99*	1.96	.007	-10.61	-1.36

*. The mean difference is significant at the 0.05 level.

Note. CI = confidence interval; *LL* = lower limit; *UL* = upper limit

Research Question 2c: Will there be a significant difference in working conditions scores for science teachers in Texas high schools with regard to school type (lowest, low, high, highest Minority Student Enrollment Proportion)?

Finally, a one-way ANOVA test was used to examine differences among science teachers' working conditions scores among the four school types categorized by MSEP (lowest, low, high, highest). Working conditions differed significantly across the four school types, F (3, 381) = 8.03, p = .000 (see Table 13). Table 14 summarizes Tukey's post-hoc comparisons of the four groups. The analysis indicated that teachers in the lowest MSEP schools (M = 126.68, 95% CI [124.10, 129.27]) reported significantly harder working conditions than teachers in high MSEP schools (M = 119.55, 95% CI [115.70, 123.40]), and teachers in the low MSEP schools (M = 132.78, 95% CI [127.52, 138.03]) indicated significantly harder working conditions than teachers in high MSEP schools and highest MSEP schools (M = 121.94, 95% CI [119.02, 124.85]; $p < .05$). There were no other significant findings in this portion of the study.

Table 13

ANOVA of Working Condition Scores by School Type

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	6451.24	3	2150.41	8.03	.000
Within Groups	101992.31	381	267.70		
Total	108443.55	384			

Table 14

Tukey's Post-hoc Results of Working Condition Scores by School Type

MSEP	MSEP	Mean Difference	Standard Error	Sig.	95% CI	
					LL	*UL*
Lowest	Low	-6.09	2.78	.126	-13.26	1.07
	High	7.13*	2.42	.018	.90	13.36
	Highest	4.74	2.00	.084	-.41	9.9
Low	Lowest	6.09	2.78	.126	-1.07	13.26
	High	13.22*	3.09	.000	5.26	21.18
	Highest	10.84*	2.77	.001	3.69	17.99
High	Lowest	-7.13*	2.42	.018	-13.36	-.89
	Low	-13.22*	3.09	.000	-21.18	-5.26
	Highest	-2.38	2.41	.76	-8.60	3.83
Highest	Lowest	-4.74	2.00	.084	-9.90	.41
	Low	-10.84*	2.77	.001	-17.99	-3.69
	High	2.39	2.41	.756	-3.83	8.60

*. The mean difference is significant at the 0.05 level.
Note. CI = confidence interval; *LL* = lower limit; *UL* = upper limit

Research Question 3a: Will there be a significant difference in working conditions scores and job satisfaction scores for science teachers in Texas high schools with regard to teacher type (induction, mid-career, veteran)?

A multivariate analysis using two dependent, continuous, scored latent variables and three independent fixed factors was used to compare science teachers' working conditions scores (n = 385) and job satisfaction scores (n = 385) on several factors. Descriptive findings are summarized below for each group for comparison purposes, followed by the results of the multivariate analysis.

Figure 12 summarizes the descriptive findings for working condition scores and job satisfaction scores by teacher type. Induction teachers (n = 90) had a mean working conditions score of 112.56 (*SD* = 15.05) and a mean job satisfaction score of 40.93 (*SD*

= 5.87). Mid-career teachers (n = 62) had a mean working conditions score of 124.28 (*SD* = 14.39) and a mean job satisfaction score of 41.98 (*SD* = 5.82). Veteran teachers (n = 213) had a mean working conditions score of 129.76 (*SD* = 16.17) and a mean job satisfaction score of 42.45 (*SD* = 6.67).

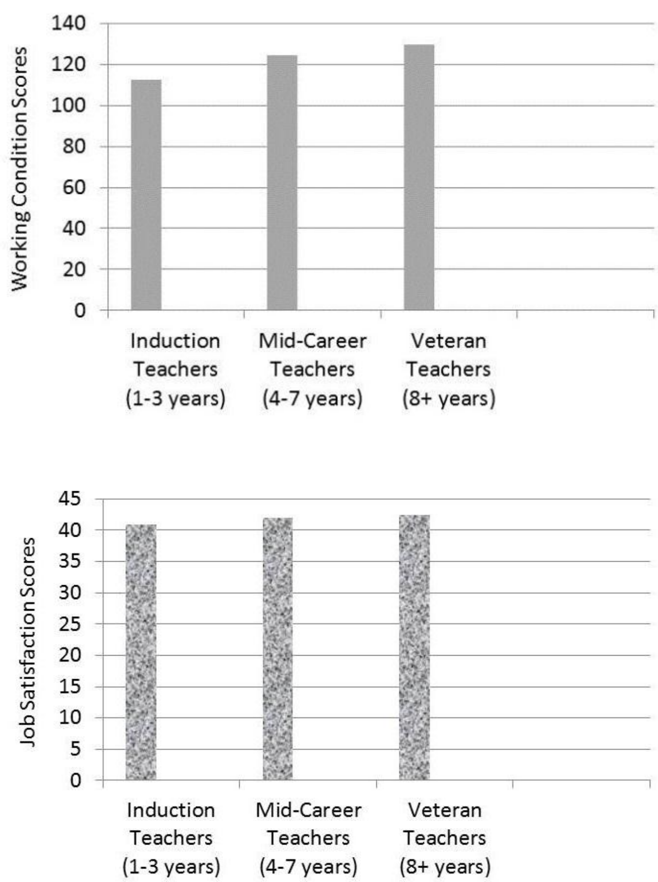

Figure 12. Mean job satisfaction scores and working condition scores by teacher type.

Figure 13 summarizes the descriptive findings for working conditions scores and job satisfaction scores by school size. Teachers in small-sized schools (n = 26) had a mean job satisfaction score of 46.12 (*SD* = 6.38) and a mean working conditions score of

142.20 (*SD* =14.18). Teachers in medium-sized schools (n = 87) had a mean job satisfaction score of 42.75 (*SD* = 5.72) and a mean working conditions score of 127.70 (*SD* = 16.49). Teachers in large-sized schools (n = 272) had a mean job satisfaction score of 41.38 (*SD* = 6.32) and a mean working conditions score of 121.72 (*SD* = 15.92).

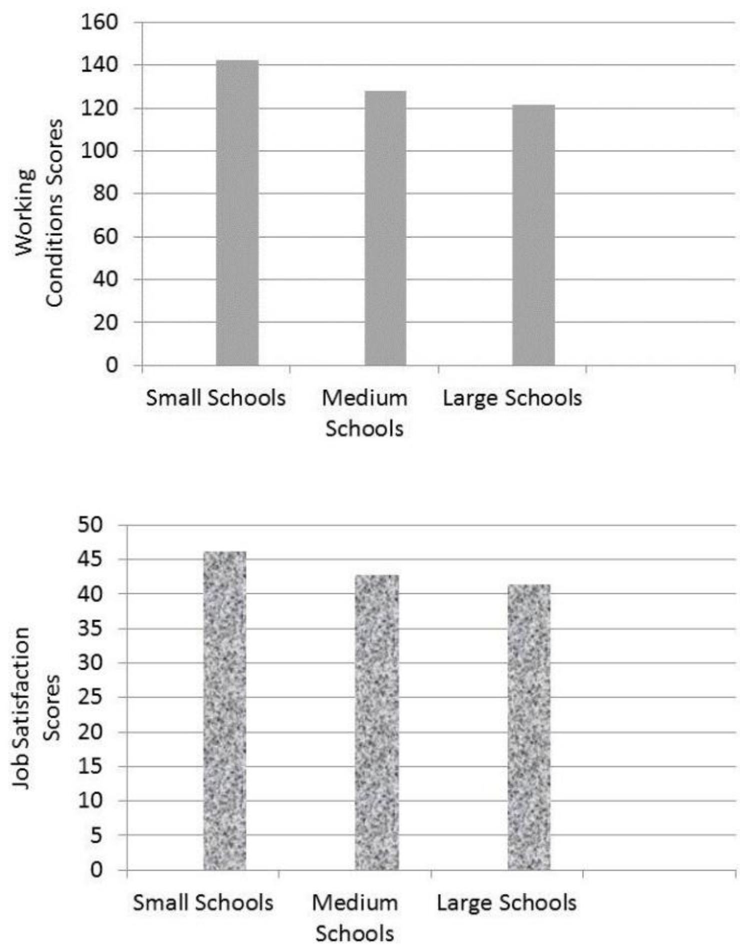

Figure 13. Mean job satisfaction scores and working condition scores by school size.

Research Question 3b: Will there be a significant difference in working conditions scores and job satisfaction scores for science teachers in Texas high schools with regard to school size (small, medium, large)?

Figure 14 summarizes the descriptive findings for working conditions scores and job satisfaction scores by the Minority Student Enrollment Proportion (MSEP) in each individual science teacher's school. Science teachers in schools with the lowest MSEP (n = 133) had a mean job satisfaction score of 42.67 (*SD* = 5.90) and a mean working conditions score of 126.68 (*SD* = 15.07). Science teachers in schools with low MSEP (n = 47) had a mean job satisfaction score of 45.02 (*SD* = 5.95) and a mean working conditions score of 132.78 (*SD* = 17.90). Science teachers in schools with high MSEP (n = 70) had a mean job satisfaction score of 39.11 (*SD* = 6.59) and a mean working conditions score of 119.55 (*SD* = 16.15). Science teachers in schools with the highest MSEP (n = 135) had a mean job satisfaction score of 41.82 (*SD* = 6.08) and a working conditions score of 121.94 (*SD* = 17.12).

Research Question 3c: Will there be a significant difference in working conditions scores and job satisfaction scores for science teachers in Texas high schools with regard to school type (lowest, low, high, highest Minority Student Enrollment Proportion)?

There was a significant effect of teachers' type, school size, and MSEP on working condition scores and job satisfaction scores, $F(33, 331) = 5.81$, $p < .01$. Partial Eta-squared was computed for each effect in the model displayed in Figure 15, which summarizes the proportion of total variance contributing to the determinant, excluding

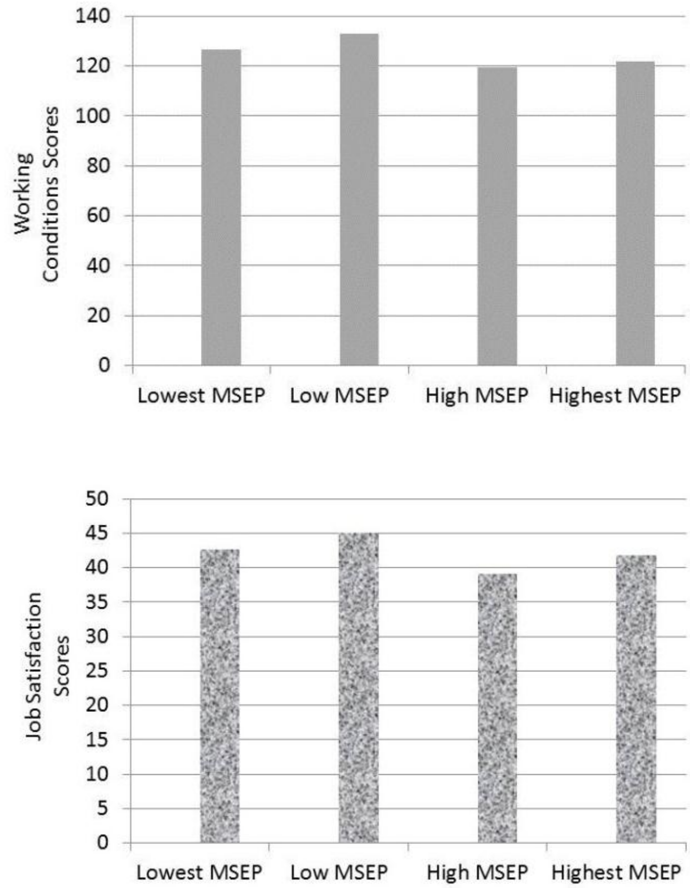

Figure 14. Mean job satisfaction scores and working condition scores by school MSEP.

other determinants from the total variation. The overall model accounts for 50% of the variance between working condition scores and job satisfaction scores ($r^2 = .50$). Working conditions scores for teachers grouped by school size accounted for almost 11% of the variance in this model ($\eta^2 = .105$, $p < .01$), while job satisfaction scores for teachers grouped by school size accounted for almost 4% of the variance in this model ($\eta^2 = .042$, $p < .01$). Working conditions scores for teachers grouped by their experience level (induction, mid-career, and veteran) accounted for approximately 8% of the variance ($\eta^2 = .081$, $p < .01$). There were no other significant findings in this study. Table 15 summarizes the results of the multivariate analysis of variance testing a model with two dependent variables, science teachers' working condition scores and job satisfaction scores, predicted by teacher type, school size, and school MSEP.

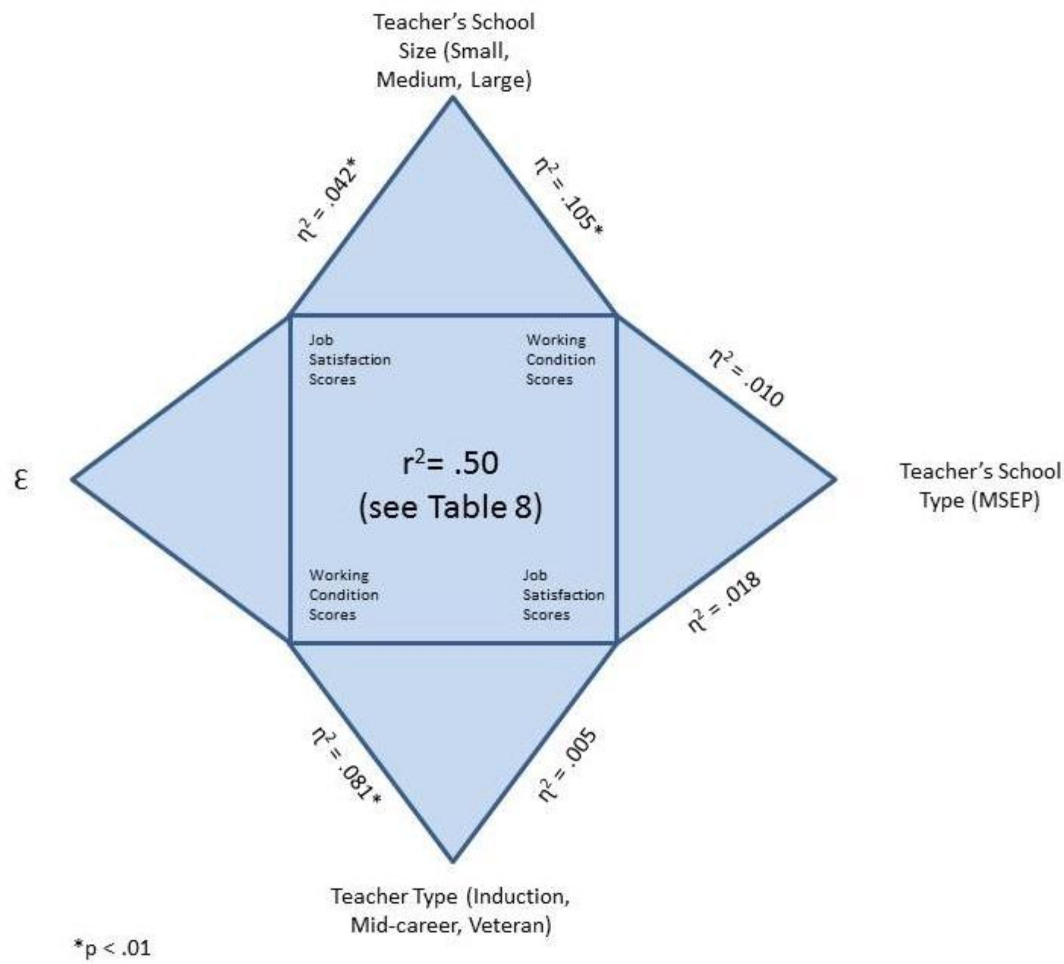

Figure 15. Model representation of the effect sizes of job satisfaction scores and working condition scores on teacher's school size, MSEP, and type. Partial Eta-squared values were computed for each effect in the model displayed, which summarizes the proportion of total variation contributing to the determinant, excluding other determinants from the total variation.

Table 15

MANOVA of Working Condition Scores and Job Satisfaction Scores by Teacher Type, School Size, and School MSEP.

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig. [b]	Partial Eta Squared	Noncent. Parameter	Observed Power
Corrected Model	WC_Score	39307.790[a]	33	1191.145	5.831	.000	.368	192.429	1.000
	JobSat Score	2745.006[c]	33	83.182	2.304	.000	.187	76.021	1.000
Intercept	WC_Score	1412415.493	1	1412415.493	6914.391	.000	.954	6914.391	1.000
	JobSat Score	163816.653	1	163816.653	4536.760	.000	.932	4536.760	1.000
School Size	WC_Score	7931.014	2	3965.507	19.413	.000	.105	38.826	1.000
	JobSat Score	526.610	2	263.305	7.292	.001	.042	14.584	.936
School MSEP	WC_Score	682.362	3	227.454	1.113	.344	.010	3.340	.300
	JobSat Score	217.292	3	72.431	2.006	.113	.018	6.018	.514
Teacher Type	WC_Score	5934.149	2	2967.075	14.525	.000	.081	29.050	.999
	JobSat Score	56.309	2	28.154	.780	.459	.005	1.559	.183
Error	WC_Score	67613.980	331	204.272					
	JobSat Score	11951.991	331	36.109					
Total	WC_Score	5772134.986	365						
	JobSat Score	658473.000	365						
Corrected Total	WC_Score	106921.770	364						
	JobSat Score	14696.997	364						

a. R Squared = .368 (Adjusted R Squared = .305)

b. Computed using alpha = .05

c. R Squared = .187 (Adjusted R Squared = .106)

Discussion

Overall, these analyses indicated that a significant relationship exists between science teachers' working condition scores and job satisfaction scores, although the relationship is not what conventional wisdom would predict. As job satisfaction scores increased, working conditions scores also increased. The working conditions rubric is designed so that scores increase if conditions are more difficult. As shown in the results above, science teachers in small schools experienced significantly tougher working conditions, yet their job satisfaction results indicated that they were also significantly more satisfied than teachers in medium and large sized schools. This relationship indicates that working conditions is likely not the best predictor of job satisfaction in small schools. As schools get larger, the job satisfaction scores go down, and the working conditions scores decrease as well. Larger schools usually have more resources allowing teachers to experience greater flexibility in conditions normally associated with the positive aspects of teaching (i.e., common planning time, better facilities, organized curriculum, etc.). However, this study implies that, despite those advantages, teachers are less satisfied with their jobs. School size likely plays an important role and warrants further study.

In addition, the results of this study indicate that veteran science teachers experienced significantly harder working conditions than both induction and mid-career science teachers, and that they were also the most satisfied with their job. Current literature suggests that induction teachers experience the hardest working conditions (Darling-Hammond, 2003); however, this study measures science teacher's actual working conditions. Veteran teachers are subjected to harder working conditions today when compared to the working conditions they experienced many years ago. Current research suggests the veteran teachers are subjected to larger class sizes, increased requirements in record keeping, and greater demands in curriculum preparation and planning (McCarthy, 2005; Valli & Buese, 2007). Induction teachers may be prepared to experience harder working conditions; however, this study finds their working conditions are actually less difficult than those of mid-career and veteran teachers. Despite the result that their working conditions are not as difficult as one might think, induction teachers are still less satisfied than the more experienced teachers in the field. Multi-tasking has yet to be mastered by the induction teacher and may have a broader impact on overall satisfaction. This indicates that the field is still at an increased risk of losing those induction teachers within the first five years and preparing them for the working conditions that come with the profession may not change that. Further research within the individual teacher groups could be beneficial to examine differences within induction, mid-career, and veteran teachers.

In contrast to recent literature suggesting that teachers from schools with higher percentages of minorities experience more difficult working conditions (Hanushek, Kain, & Rivkin, 2004b; Haycock, 2001), the results of this study indicate that teachers from schools with higher percentages of minorities scored significantly lower on their perceptions of their working conditions than teachers from schools with lower percentages of minorities. Not unlike induction teachers, this could indicate these teachers hear and are prepared for what they eventually experience. Despite that, their job satisfaction scores indicate they are less satisfied than those teachers in the schools with lower percentages of minorities.

This study suggests that working conditions are a small piece of a much larger, much more complex puzzle that defines the profession of science teaching. The model presented in this study used teacher type, school size, and school MSEP as predictors for combined dependent variables of working conditions and job satisfaction. These three independent variables contributed to 50% of the variance in the combined dependent variables indicating that many other factors exist that were not included in this model. These other factors account for the remaining 50%. While we do not want to purposefully burden our teachers with difficult working conditions, the results of this study indicate we must expand our vision for further research and implication for practice that include factors beyond working conditions alone.

Limitations

The predominant strength of this study is that the design of the PRISE sampling plan allows the empirical data to be generalized to all public high schools in Texas. As with any study, there are limitations to the findings. First, the working conditions rubric does not contain an exhaustive list of all working conditions affecting teachers. Variables included in this study were based on findings of previous studies as well as assumptions widely discussed in the field. Although unlikely, the possibility does exist that other working conditions may exist that have not been identified in the literature or from my other sources. Second, non-response answers on individual items within the study were replaced with the mean value calculated by school cluster. One school within the study had a response rate of 33%. Replacing non-response answers with mean values from schools where the return rate was less than 50% is concerning. The mean value of the answers within that school cannot be assumed to be an accurate representation of the answers from that school.

Another limitation is the use of correlational research in this study. Correlational analyses do not account for directionality in the data or causality in relationships among variables. For example, in this study we do not know whether job satisfaction scores are causing changes in working condition scores or if working condition scores are causing changes in job satisfaction scores. We just know that a significant relationship exists between the two variables. In addition, we do not know whether another unknown, unmeasured variable is contributing to this relationship. As a result, we cannot conclude anything about causality in investigating the relationship between the two variables.

Finally, teachers' perspectives about working conditions were encompassed within a much larger data collection process that included high school science teachers in the entire teacher professional continuum, from recruitment to retention. For this study, I gathered data from multiple sources after the data collection efforts of the research group had been collected in order to provide a complete examination of working conditions. While use of extant data has many advantages, a serious disadvantage is that data *has* already been collected. The initial focus of the PRISE research group did not include a full-scale study for teacher working conditions. As a result, some working condition variables were not included as they were not part of the initial data collection and could not be gathered post hoc. Preliminary results here suggest implications for a full-scale study with an *a priori* instrument focused on working conditions.

CHAPTER V

WORKING CONDITIONS, JOB SATISFACTION, AND RETENTION OF TEXAS HIGH SCHOOL SCIENCE TEACHERS

Traditionally, teaching has been represented as an occupation that comes standard with excessive attrition levels, especially among beginning teachers (Lortie, 1975). It is true, in fact, that all occupations experience some level of attrition in newcomers to the field. However, teaching has had alarmingly high rates of attrition among all levels of teachers for at least 35 years (Lortie, 1975). Several studies have found that about 40% to 50% of new teachers are more likely to leave the profession within their first five years of entry (e.g., Grismmer & Kirby, 1987; Hafner & Owings, 1991; Huling-Austin, 1990; Ingersoll & Smith, 2003; Murnane, Singer, Willet, Kemple, & Olsen 1991; Veenman & de Laat, 1998). Among teachers, our “best and the brightest” appear to be those who are leaving the profession (Henke, Chen, Geis, & Knepper, 2000; Murname et.al., 1991; Schlecty & Vance, 1981).

Problem Statement

The lack of qualified teachers threatens the overall quality of education received by the students in our country. Attrition plays a significant role in the teacher shortage problem, and efforts to improve teacher retention must be informed by an educated understanding of the factors that contribute to teacher attrition. Specifically, this paper seeks to examine the factors contributing to science teacher attrition and retention including: (1) teacher characteristics, (2) working condition characteristics, and (3) school characteristics.

Literature Review

In recent years, the nationwide teacher shortage has sparked new techniques, similar to those in the private sector, to recruit and retain teachers. Not only do teachers receive a basic salary increase, some districts and states are now also providing additional salary stipends for teachers that obtain advanced certifications or target critical subject or geographic areas affected by teacher shortages. Additionally, recent legislation has allowed fellowship programs, student loan forgiveness, special mortgage incentives, and various other approaches to help spark enthusiastic interest from college students not yet clear on their path and new teachers in the teaching profession. For most of the population, salary is the major rationale for working despite an individual's passion for the job. Prior research has shown fairly consistent views about the influence of salary in teacher retention (e.g., Buckley, Schneider, & Shang, 2005; Hanushek, Kain, & Rivkin, 1999; Imazeki, 2005; Ingersoll, 2001). In general, an increase in pay is correlated with higher teacher retention, but the impact of salary is slight. Imazeki (2005) found that an increase in salary decreased the likelihood that Texas teachers would resign from their school, but their likelihood to move was strongly correlated to student characteristics rather than to their individual salary. Murnane & Olsen (1990) conducted several studies using data from teacher salary surveys in Michigan and North Carolina to determine that teacher compensation was a significant factor in determining how long teachers stayed in the profession. They found that the more teachers were paid, the longer they stayed in the profession, while teachers with greater opportunity costs (science and math) stayed in teaching less than any other subject.

Many of these studies examining salary and teacher retention used small-scale data collected from individual school districts; however, a small number used the Schools and Staffing Survey and its follow-up, a large scale survey (See, Ingersoll, 2001; Ingersoll, Alsalam, Quinn, & Bobbitt, 1997). Controlling for specific teacher and school characteristics, Ingersoll (2001) utilized data collected from the Schools and Staffing Survey over three years (1988-89, 1990-91, and 1993-94) and the Teacher Follow-Up Survey of 1991-1992. He discovered that compensation for teachers with an advanced degree had a significant, positive impact on teacher retention. In a previous study, Ingersoll (1998) found that teacher commitment was positively associated with the level of compensation within the school. Boe, Bobbitt, Cook, Whitener, & Weber (1997) used data from the 1987-88 Schools and Staffing Survey and concluded that the beginning salary for a full-time teacher was a significant, positive predictor of whether a teacher was retained.

In the past, there have been arguments that prior research has failed to produce adequate estimates because non-financial aspects of teaching were not adequately controlled. These researchers recognized that ignoring the characteristics of the schools themselves could point to inaccurate conclusions regarding the effects of compensation if that compensation was associated with excluded non-monetary school characteristics (Stinebrickner, 1999). Using the National Longitudinal Study, Stinebrickner examined the effectiveness of decreasing the student-teacher ratio relative to a wage increase. He noted that educational policy that targets salary was more effective in retaining teachers than addressing the non-monetary aspects (i.e., working conditions) of teaching; however, his study was old (1972 cohort) and he examined only two types of working conditions (student-teacher ratio and student ability level). Although compensation is likely a necessary component in the recruitment and retention of highly qualified teachers, frequently research shown that salary is not the only factor that draws teachers to the field and keeps them there. In other words, previous research has provided little evidence to show that teachers prefer a higher salary over improved working conditions or that a higher salary will offset poor working conditions. A 2007-2008 study by the PRISE Research Group examined science teacher retention trends (Stuessy, Bozeman, & Ivey, 2009). They found 4 out of 5 (80%) high school science teachers in small schools were retained, while 74.7% in medium schools and 75.4% in large schools were retained. However, no significant research has examined science teacher working conditions and teacher retention.

Research Questions

Three research questions guided this inquiry investigating relationships between and among working conditions, job satisfaction, and retention of Texas high school science teachers.

1. What is the range of working conditions for retained (stayers) and not retained (non-stayers) Texas high school science teachers regarding:

   (a) teacher type (induction, mid-career, veteran)?

   (b) school size (small, medium, large)?

(c) school type (lowest, low, high, highest Minority Student Enrollment Proportion)?

2. Is there a significant difference in working condition scores for science teachers who are "stayers" and science teachers who are "non-stayers" in Texas high schools?

3. What relationships exist between and among:

    (a) Texas high school science teachers' working conditions scores;

    (b) teacher type (induction, mid-career, veteran);

    (c) school size (small, medium, large);

    (d) school type (lowest, low, high, highest Minority Student Enrollment Proportion);

    (e) job satisfaction scores;

    (f) teacher retention status?

4. How well do teacher type, school size, school MSEP, and job satisfaction differentiate science teachers classified as "stayers" from those classified as "non-stayers."

Research Design

A five-year research study (Policy Research Initiative in Science Education; PRISE) was designed to answer three necessary policy research questions about the high school science teacher professional continuum (TPC) in Texas: Where are we? Where do we want to go? How do we get there? Using a mixed methods research approach, this project seeks to link prior research findings to current policies and practices in high school science teacher recruitment, induction, renewal, and retention.

The PRISE research group selected 50 schools to proportionally represent the 1,333 science teaching public high schools in Texas by using a two-stage stratified random sampling plan (Stuessy, McNamara, & the PRISE Research Group, 2008). School size and minority student enrollment proportion (MSEP) are the two explicit stratification variables used in the sampling procedures. Schools were grouped into three categories based on student enrollment for school size: *Small* (secondary student enrollment equal to or less than 189 students; n=15), *Medium* (secondary student enrollment equal to or greater than 190 and less than or equal to 899 students; n=17), and *Large* (n=29; secondary student enrollment greater than or equal to 900 students; n=18).

For this study, school minority student enrollment proportion (MSEP) is divided into four categories: *Lowest* (less than 35 percent MSEP; n=21), *Low* (36-49% MSEP, n=8), *High* (50-74% MSEP, n=9), and *Highest* (greater than 75% MSEP; n=12). To ensure our samples were representative of the state of Texas geographically, an additional implicit stratification method was used. By accounting for the schools' location within the Texas Regional Education Service Centers (ESCs), the PRISE Research Group's sampling plan conforms with policy planning at the state and national levels (McNamara & Bozeman, 2007). These methods were employed to maximize the generalizability of the PRISE survey research findings. In addition, to replace non-cooperating schools, a modified random sampling plan was employed. Non-cooperating schools were matched with replacements schools using the original design of the sampling plan to obtain a total of 50 participating schools.

Finally, once sample schools were identified, PRISE researchers contacted campus principals (n=50) to gain their permission, obtain access, and use their school as research sites. From there, all science teachers from all 50 schools (n=385) were asked to complete a comprehensive survey addressing multiple issues in the teaching profession. The working conditions component of the survey is a small portion of a much more comprehensive study.

List of Variables and Instruments

Variables

The variables used for this study are as follows:

1. Teacher working condition scores
2. Teacher types (induction, mid-career, veteran)
3. School size (small, medium, large)
4. School type (lowest, low, high, highest MSEP)
5. Teacher retention data (stayer, non-stayer)

Instruments

Initially, teachers participating in this study were given a working conditions score calculated based on the *Working Conditions Scoring Rubric* (Hollas, 2011). Information obtained from the teacher poll and Public Education Information Management System (PEIMS) data was used to categorize teachers by their teacher type (induction, mid-career, or veteran). The Academic Excellence Indicator System (AEIS) reports provide a variety of information about every public school and district in the state. These reports also provide extensive demographic information about staff and programs (TEA, 2010). The AEIS reports were used in this study to obtain information about school size (small, medium, or large) and school type (Minority Student Enrollment Proportion). Finally, teacher retention data was obtained using the master schedules acquired over the 2007-08 and 2008-09 school years. Teacher lists from each year were compared. Teacher retention status was then coded to reflect a numerical value for each individual teacher (i.e., stayer, non-stayer).

Data Collection and Analysis Methods

Data Collection

During the 2007-2008 school year, PRISE researchers interviewed principals at the 50 participating high schools to acquire a better understanding of current school policies and practices influencing science teachers at various stages within the teacher professional continuum. All principals (n=50; 100% return rate) completed a field-based semi-structured interview. Principal interviews were audio recorded, transcribed, and transferred to data charts. Some principals did not allow PRISE researchers to record the interview (n=5); therefore, field notes were used as the primary data source and were subsequently transferred into data charts.

After the initial principal interview, science teachers at the individual schools were contacted to complete a 22-question survey developed, piloted, and revised by the PRISE Research Group (See Appendix A). Science teachers (n=385; 89.6% return rate) completed the survey which contained questions about teachers' professional involvement, job satisfaction, working conditions, and general demographic information. In addition, master schedules were collected from each of the 50 sample schools over the 2007-08 and 2008-09 school years. Information reflected on the master schedule included the number of science teachers at the school, specific science subjects taught, the number of TAKS (Texas Assessment of Knowledge and Skills) preparation courses, the overall school schedule, common planning periods, and teacher names. Academic Excellence Indicator System (AEIS) reports were collected at the state level. This report reflected TAKS scores for individual schools, accountability ratings, campus subpopulations, number of students taking ACT/SAT tests and dual credit courses, as well as general teacher and student demographics. All of these data sources were combined to obtain an accurate portrait of working conditions within each of the 50 PRISE sample schools.

Data Analysis

This inquiry was designed to investigate relationships between and among working conditions, job satisfaction, and retention of a random sample of 385 Texas high school science teachers from the end of one school year (2007-2008) to the next (2008-2009). Working conditions was measured using a rubric developed as part of the first paper written for my dissertation to describe the working conditions of Texas high school science teachers. Teachers' job satisfaction was measured from a subscale on the *Texas Poll of Secondary Science Teachers*, which was developed in conjunction with an ambitious research agenda established by the Policy Research Initiative in Science Education (PRISE). A high school science teacher's retention status was determined by comparing two consecutive school years' master schedules. Stayers were defined as teachers who stayed from year one of the study to year two of the study teaching science in the same school. Teachers defined as non-stayers were those who left the school from year one of the study to year two of the study, regardless of whether she left the field of teaching altogether or simply moved schools/districts.

To answer research questions posed for this investigation, I conducted numerous data analyses. Descriptive data for all measured variables were derived to provide measures of central tendency, ranges, and standard deviations, and to provide information to support the appropriateness of these measures for subsequent analyses. I used T-tests to examine differences between variables. Pearson's correlation was used to determine the strength, direction, and probability levels for relationships between variables. Finally, I used discriminant analysis to predict group membership (i.e., stayers vs. non-stayers), based on a linear combination of a number of variables, including teachers' years of experience, the size and MSEP of the school in which they taught, and their levels of job satisfaction and working condition scores. The procedure began with a set of observations where both group membership and the values of the interval variables were known, and the end result was a model that allowed prediction of group membership when only the interval variables were known. I also performed the discriminant function analysis to better understand the data set, understanding that an examination of the prediction model resulting from the analysis can give some insights into the relationship between group membership and the variables used to predict it. See Figure 16 for a display of the research design for integration in the collection and analysis of quantitative data (Creswell & Plano-Clark, 2007) and Table 16 for a visual display of the research questions, data sources, and analysis methods.

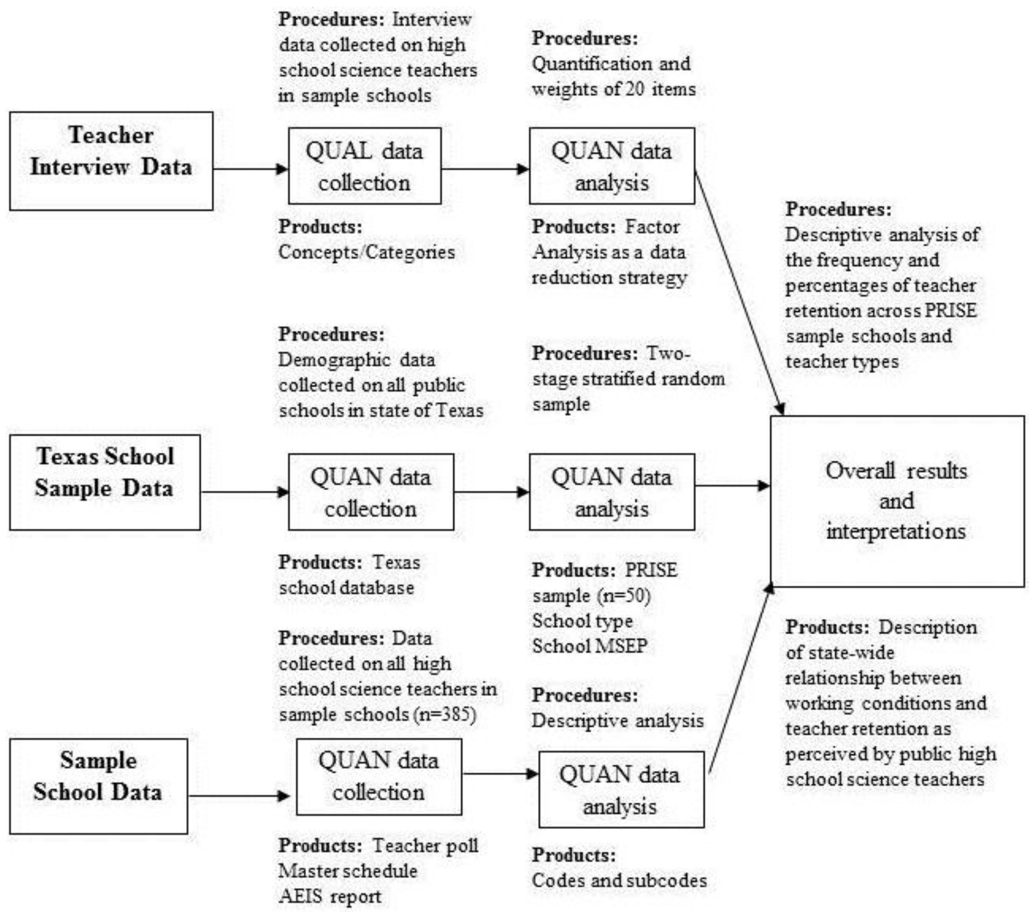

Figure 16. Visual model of descriptive analysis for a study examining working conditions, job satisfaction, and retention of Texas high school science teachers. Adapted from *Designing and Conducting Mixed Methods Research* by J.W. Creswell and V.L. Plano-Clark, 2007.

Table 16

Research Questions, Data Sources, and Data Analysis

Research Question	Data Sources	Data Analysis
What is the range of working conditions for retained (stayers) and not retained (non-stayers) Texas high school science teachers regarding: (a) teacher type (induction, mid-career, veteran)? (b) school size (small, medium, large)? (c) school type (lowest, low, high, highest Minority Student Enrollment Proportion)?	Working Condition Scores Master Schedule 2007-08 Master Schedule 2008-09	Descriptive Statistics
Is there a significant difference in working condition scores for science teachers who are "stayers" and science teachers who are "non-stayers" in Texas high schools?	Working Condition Scores Master Schedule 2007-08 Master Schedule 2008-09	Independent samples T-test
What relationships exist between and among: (a) Texas high school science teachers' working conditions scores; (b) teacher type (induction, mid-career, veteran); (c) school size (small, medium, large); (d) school MSEP (lowest, low, high, highest); (e) job satisfaction scores; (f) teacher retention status?	Working Condition Scores Master Schedule 2007-08 Master Schedule 2008-09 Job Satisfaction Scores	Pearson's Correlation
How well do teacher type, school size, school MSEP, job satisfaction, and working conditions differentiate science teachers classified as "stayers" from those classified as "non-stayers?"	Working Condition Scores Master Schedule 2007-08 Master Schedule 2008-09 Job Satisfaction Scores	Discriminant Analyses

Results

The findings from this portion of the study are presented in four sections, with each section corresponding to a research question. Working condition scores were calculated for the entire sample population and categorized by school size, teacher type, and school type (MSEP). Non-response by individual teachers was addressed by calculating the mean value of individual items within school clusters and then applying those mean values to the missing value. This resulted in the ability to report working condition scores for all 385 teachers. Teacher retention status was calculated for all 385 by comparing master schedules from the 2007-2008 school year and the 2008-2009 school year. Teachers were classified as *stayers* if they remained in the same school from year one of the study to year two of the study. Teachers were classified as *non-stayers* if they did not remain in the same school from year one of the study to year two of the study, regardless of whether they remained in teaching.

Research Question 1: What is the range of working conditions for retained (stayers) and not retained (non-stayers) Texas high school science teachers regarding:

(a) teacher type (induction, mid-career, veteran)?

(b) school size (small, medium, large)?

(c) school type (lowest, low, high, highest Minority Student Enrollment Proportion)?

Mean working condition scores of induction, mid-career, and veteran science teachers by retention status is displayed in Figure 17. The mean working conditions score for induction science teachers classified as stayers (n = 61) was 112.38 (*SD* = 15.22), while the mean working conditions score for induction science teachers classified as non-stayers (n = 29) was 112.93 (*SD* = 14.94). The mean working conditions score for mid-career science teachers classified as stayers (n = 47) was 124.73 (*SD* = 15.57), while the mean working conditions score for mid-career science teachers classified as non-stayers (n = 15) was 122.85 (*SD* = 10.16). The mean working conditions score for veteran science teachers classified as stayers (n = 172) was 129.78 (*SD* = 16.31), while the mean working conditions score for veteran science teachers classified as non-stayers (n = 41) was 129.64 (*SD* = 15.74). Clearly, working condition scores stayed fairly consistent for each teacher type regardless if they were "stayers" or "non-stayers." Induction teachers indicated slightly harder working conditions as "non-stayers" than those who were classified as "stayers." On the other hand, both mid-career and veteran teachers classified as "stayers" indicated slightly harder working conditions than the same teachers classified as "non-stayers." Overall, veteran science teachers reported the hardest working conditions when compared to both induction and mid-career teachers.

Mean working condition scores of science teachers from small, medium, and large-sized schools by retention status is displayed in Figure 18. The mean working conditions score for science teachers from small schools that were stayers (n = 21) was 143.21 (*SD* = 14.33), while the mean working conditions score for science teachers from small schools that were non-stayers (n = 5) was 139.00 (*SD* = 14.56). The mean working

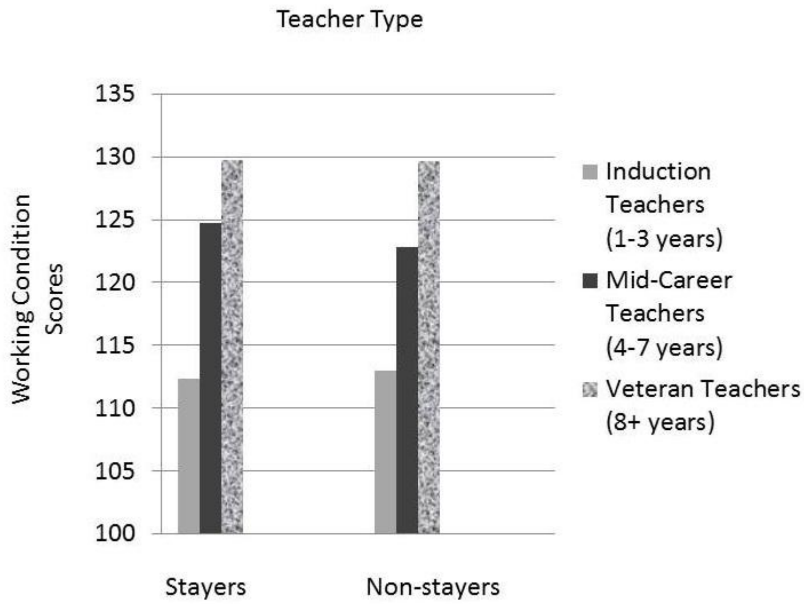

Figure 17. Mean working condition scores of induction, mid-career, and veteran teachers by retention status.

conditions score for stayers from medium-sized schools (n = 65) was 128.78 (*SD* = 16.44), while the mean working conditions score for non-stayers from medium-sized schools (n = 22) was 124.51 (*SD* = 16.59). The mean working conditions score for stayers from large-sized schools (n = 205) was 121.93 (*SD* = 16.29), while the mean working conditions score for non-stayers from large-sized schools (n = 67) was 121.05 (*SD* = 14.83). Much like teacher type, working condition scores did not vary much among science teachers from the same size school when categorized by their retention status. Across all three school sizes, “stayers” had slightly higher working condition scores than “non-stayers” indicating higher working conditions for “stayers”. Science teachers from small schools indicated much harder working conditions than science teachers from both medium and large schools. This is consistent with literature that indicates small schools have greater challenges than their large counterparts across numerous domains, including working conditions (Ayer & Klonsky, 2000; Raywid, 1998; Wasley, Fine, Gladden, & Holland, 2000).

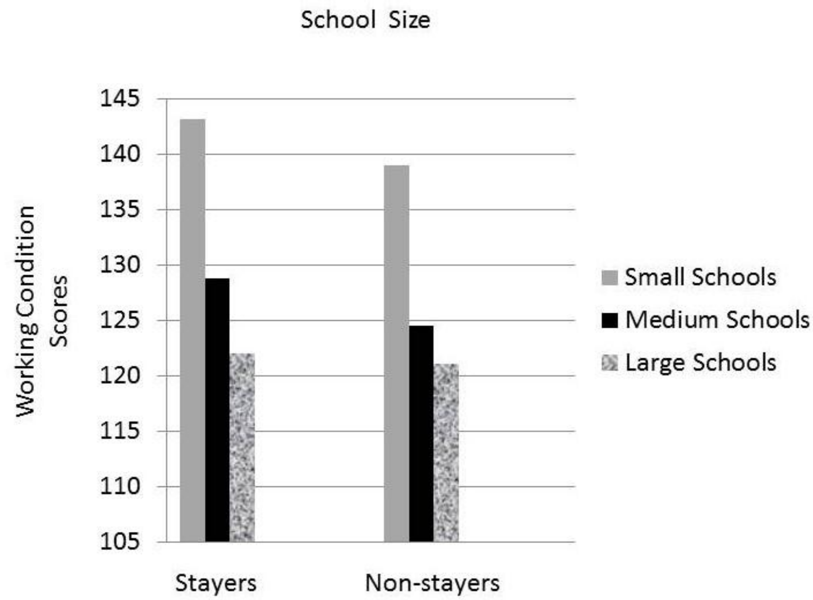

Figure 18. Mean working condition scores of teachers from small, medium, and large-sized schools by retention status.

Mean working condition scores of science teachers from low, lowest, high, and highest MSEP schools by retention status is displayed in Figure 19. The mean working conditions score for science teachers from the lowest MSEP schools that were stayers (n = 101) was 127.58 (*SD* = 15.34), while the mean working conditions score for science teachers from the lowest MSEP schools that were non-stayers (n = 32) was 123.84 (*SD* = 14.05). The mean working conditions score for stayers from the low MSEP schools (n = 35) was 134.65 (*SD* = 17.81), while the mean working conditions score for non-stayers from low MSEP schools (n = 12) was 127.31 (*SD* = 17.78). The mean working conditions score for stayers from high MSEP schools (n = 55) was 119.62 (*SD* = 17.79), while the mean working conditions score for non-stayers from high MSEP schools (n = 15) was 119.31 (*SD* = 7.98). The mean working conditions score for stayers from the highest MSEP schools (n = 100) was 121.97 (*SD* = 16.67), while the mean working conditions score for non-stayers from the highest MSEP schools (n=35) was 121.84 (*SD* = 18.59). Consistent with teacher type and school size, “stayers” across all four types of MSEP reported slightly harder working conditions than “non-stayers.” Science teachers from low MSEP schools reported harder working conditions than the other three groups regardless if they were “stayers” or “non-stayers.”

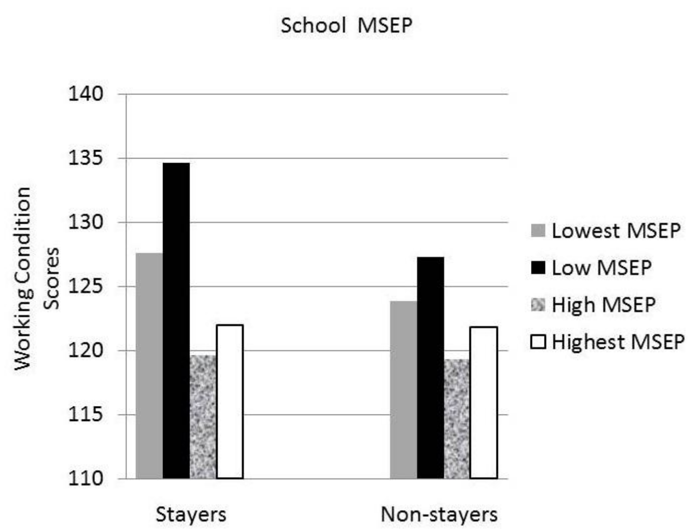

Figure 19. Mean working conditions scores of teachers from lowest (less than 35% MSEP), low (36-49% MSEP), high (50-74% MSEP), and highest (greater than 75%) MSEP schools by retention status.

One notable observation across all three groups is the level of consistency of working condition scores within the groups. For example, science teachers from small schools have similar working condition scores regardless of their retention status. This is consistent for all groups suggesting that working condition scores can be predicted by a teacher's association within each group (school size, teacher type, and school type).

Research Question 2: Is there a significant difference in working condition scores for science teachers who are "stayers" and science teachers who are "non-stayers" in Texas high schools?

On average, science teachers classified as stayers (n = 291) reported higher working conditions scores (*M* = 125.00, *SE* = 1.01) than science teachers classified as non-stayers (n = 94, *M* = 122.82, *SE* = 1.61). This difference was not significant $t(383) = -1.095$, p = .274 (see Figure 20).

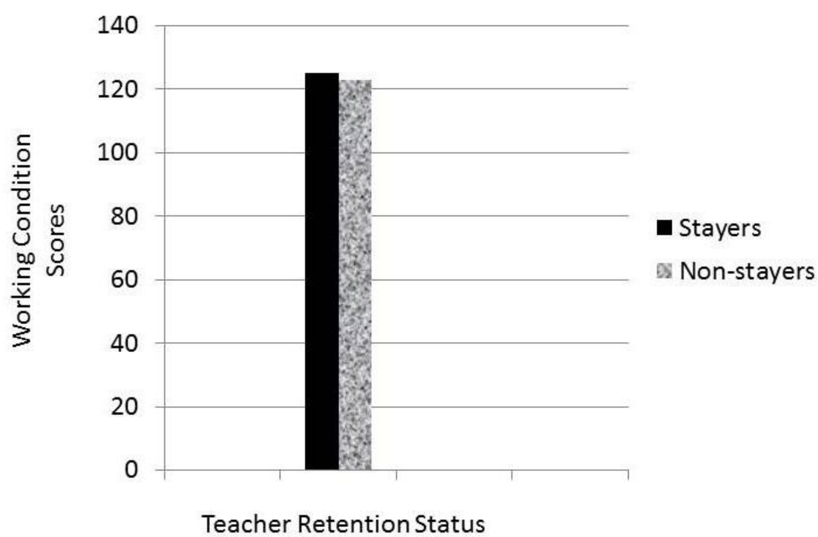

Figure 20. Mean working condition scores of retained (n=291) and not retained (n=94) science teachers in Texas high schools.

Overall, mean working condition scores do not vary much when comparing "stayers" and "non-stayers" across all science teachers. However, as previous descriptive analyses suggest, the differences exist among science teachers categorized by their teacher type, school type, and school size rather than their retention status. Individual teacher groups should be examined more closely to determine their impact on each other as well as their impact on job satisfaction.

Research Question 3: What relationships exist between and among:

(a) Texas high school science teachers' working conditions scores

(b) teacher type (induction, mid-career, veteran)

(c) school size (small, medium, large)

(d) school type (lowest, low, high, highest Minority Student Enrollment Proportion)

(e) job satisfaction scores

(f) teacher retention status (stayers, non-stayers)?

A Pearson's correlation (see Table 17) reveals significant relationships between several variables. There was a positive, significant relationship between teacher type and school size (r = .122, p = .020), teacher type and working conditions scores (r = .413, p = .000), and teacher type and retention status (r = .127, p = .015). There was also a positive, significant relationship between school size and school type (r = .251, p = .000), while a negative, significant relationship exists for school size and working conditions scores (r = -.311, p = .000) and school size and job satisfaction scores (r = -.189, p = .000). A negative, significant relationship is reported between the variables of school type and working conditions scores (r = -.160, p = .002) and school type and job satisfaction scores (r = -.111, p = .030). Finally, there was a positive, significant correlation between working conditions scores and job satisfaction scores (*r* = .708, p = .000).

Table 17

Correlation Matrix between Teacher Type, School Size, School Type, Working Conditions, and Job Satisfaction.

	School Size	School Type (MSEP)	Working Conditions Score	Job Satisfaction Scores	Teacher Retention Status
Teacher Type	.122*	-.086	.413**	.098	.127*
School Size		.251**	-.311**	-.189**	-.019
School Type (MSEP)			-.160**	-.111*	-.012
Working Conditions Score				.708**	.056
Job Satisfaction Scores					.042

* Correlation is significant at the 0.05 level (2-tailed)
** Correlation is significant at the 0.01 level (2-tailed)

In short, as a science teacher's experience level increased, she was more likely to teach in a larger school. In addition, as a science teacher's experience level increased, she was more likely to have a higher working conditions score and more likely to stay in her current school. As the science teacher's school size increased, she was more likely to teach in a higher MSEP school and have a lower working conditions score and job satisfaction score. As the science teacher's school type increased (lowest to highest MSEP), she was more likely to have a lower working conditions score and a lower job satisfaction score. Finally, as a science teacher's working condition scores increased, her job satisfaction score increased.

Research Question 4: How well do teacher type, school size, school type (MSEP), job satisfaction, and working conditions differentiate science teachers classified as "stayers" from those classified as "non-stayers?"

Using discriminant analysis, I looked to see how I could best separate "stayers" and "non-stayers" using the predictors of teacher type, school size, school type (MSEP), job satisfaction scores, and working condition scores. "Stayers" were categorized as teachers who remained as science teachers from one year to the next. "Non-stayers" were categorized as teachers who did not return a second year, thus lumping both "movers" and "leavers" into one category. To run the analysis, I chose retention status as the grouping variable (i.e., stayers, non-stayers) and entered the predictors into the model. Table 18 displays the results of the test of mean differences. Teacher type (induction, mid-career, veteran) was the only significant contributor to the discriminant function (retention status).

The structure matrix (Table 19) shows the correlations of each variable with the discriminant function, retention status. A larger standardized beta coefficient indicates a greater contribution to discriminate between the groups (stayers vs. non-stayers).

Teacher type is the greatest contributor discriminating between stayers and non-stayers, followed by working conditions scores, job satisfaction scores, school size, and school MSEP, respectively. Comparisons of standardized weights indicate strength of relationship, indicating that teacher type (i.e., induction, mid-career, veteran) is approximately twice as strong as working conditions or job satisfaction in predicting retention status. Both school size and school MSEP indicate very weak contributions to discriminating between stayers and non-stayers.

Table 18

Tests of Equality of Group Means

	Wilks' Lambda	F	df1	df2	Sig.
Teacher Type	.984	5.994	1	363	.015*
School Size	1.000	.003	1	363	.955
MSEP	1.000	.001	1	363	.974
Working Conditions Scores	.996	1.279	1	363	.259
Job Satisfaction Scores	.997	1.140	1	363	.286

*Significance at the 0.05 level.

I calculated a percent difference of function coefficients to determine the greatest predictor of the independent variables to science teacher retention status. Based on those calculations (see Table 20), teacher type was the best predictor of science teacher retention status, followed by job satisfaction scores, school MSEP, working conditions scores, and school size. The model correctly predicted 64.3% of science teachers that were "non-stayers" and 51% of science teachers that were "stayers."

Table 19

Structure Matrix Displaying Standardized Beta Coefficients

	Standardized Beta Coefficients
Teacher Type (Induction, Mid-Career, Veteran)	.886
Working Conditions Score	.409
Job Satisfaction Score	.386
School Size	-.020
School MSEP	.012

Table 20

Model Displaying Calculated Percent Difference of Function Coefficients

	Retention Status		% Difference of Function Coefficients
	Retained	Not Retained	
Teacher Type	-2.29	-2.74	16.42%
Job Satisfaction Scores	0.28	0.25	12.00%
School MSEP	1.44	1.40	2.90%
Working Conditions Scores	0.55	0.56	1.80%
School Size	12.23	12.36	1.10%

Discussion

In most cases, there was no difference in working conditions scores for stayers versus non-stayers across teacher types, school size, and school type. Overall, non-stayers reported a mean working conditions score lower than stayers. While recent studies (e.g., Loeb et.al, 2003; Ingersoll, 2001) have found working conditions to be a significant factor influencing teacher's decision to leave the profession, the discriminant analysis in this study contradicts those findings.

Working conditions was a more meaningful predictor of science teachers' job satisfaction than teacher retention, shown by the strong, positive correlation. However, this is an inverse relationship since working condition scores increase as the working conditions become more difficult, and job satisfaction scores increase as job satisfaction is higher. This study includes science teachers across small, medium, and large schools. As shown in previous research (Bozeman & Stuessy, 2009), science teachers from small schools are more satisfied with their jobs than science teachers from both medium and large schools, despite their more difficult working conditions. With only 26 teachers from small schools in the study, it is difficult to say whether teachers from small schools are skewing the data. Future research would benefit from separating the population by school size and evaluating the relationship between job satisfaction and working conditions independently.

No variables had a strong, significant impact on teacher retention; however, school size and teacher type had the strongest relationships with working condition scores and job satisfaction scores. Science teachers from small schools reported the toughest working conditions and the greatest job satisfaction. Science teachers from large schools perceived their working conditions as better when compared to teachers from medium-sized schools, yet teachers from large schools scored the lowest on the job satisfaction measure. These findings are consistent with current research that promotes the “school within a school” model. The argument is that teachers and students do better in an atmosphere where they perceive that the school is smaller (Haenn, 2002; McAndrews & Anderson, 2002; Ready & Lee, 2004). Using the data from this study, further research examining the differences between school sizes is warranted.

Veteran science teachers also reported more difficult working conditions and the greatest job satisfaction. Since veteran teachers in this study have been in the profession for eight years or more, one would expect that they are more satisfied with their job than their colleagues. The longer one is in a job, the more satisfied one becomes (Katz & Kahn, 1978). However, it is concerning that veteran teachers reported the more difficult working conditions, yet induction teachers were leaving at higher rates. The question then becomes, “What is driving new science teachers out of the field?” This study examined numerous variables related to the science teaching profession to produce the working conditions score and subsequent model, yet those variables accounted for only 50% of the variance. An additional 50% remains unexplained. This model indicates school size does matter. Despite the difficult working conditions, science teachers are more satisfied in a smaller environment. However, when examining induction teachers, no matter where they are, they are less satisfied than their colleagues.

Many more factors need to be included to have a more complete portrait of the science teaching profession. Working conditions are important, but they are only one piece to a much larger, more complex structure that incorporates other factors not evaluated in this study. Future research should consider the influence of high-stakes testing, student misbehavior, and family/parent support. Within this study many variables were covered that are pertinent to science teacher working conditions and retention; however, due to data limitations, many other variables were not included in this study that should be included when planning future research.

Limitations

The predominant strength of this study is that the design of the PRISE sampling plan allows the empirical data to be generalized to all public high schools in Texas. As with any study, there are limitations to the findings. First, the working conditions rubric does not contain an exhaustive list of all working conditions affecting teachers. The included variables were based on findings of previous studies as well as assumptions widely discussed in the field. Second, non-response answers on individual items within the study were replaced with the mean value calculated by school cluster. One school within the study had a response rate of 33%. Replacing non-response answers with mean values from schools were the return rate was less than 50% is concerning. The mean value of the answers within that school cannot be assumed to be an accurate representation of the answers from that school.

Schools and teachers were classified using several data sources, some of which were provided by the school. These sources are only as accurate as the person reporting them. Teachers' classification by total years of experience and number of preparations were not verified with the individual teachers themselves and therefore, some errors could exist. In addition, schools were classified based on UIL methodology that changes from year to year. As a result, population in schools that were once rated in one category could change to another from year to year.

Science teacher job satisfaction data was self-reported by teachers using the Teacher Poll on multiple days within varying timeframes. No consideration was made to provide a similar testing atmosphere to all teachers participating in the study. Some teachers were surveyed in the morning on a Monday, while others were surveyed on Friday afternoon, while some were allowed to take the survey home over the weekend and complete at their leisure. It is possible that these factors also contributed to and influenced individual teacher answers to their personal interpretation of job satisfaction.

CHAPTER VI

DISCUSSION AND CONCLUSIONS

Science teacher attrition is likely one of the most crucial concerns facing the United States K-12 education system in that attrition has a direct impact on teacher supply as well as teacher quality. Studies have shown that almost half of the teaching professionals in the U.S. leave the field altogether within their first five years of teaching (National Commission on Teaching and America's Future, 2003). In order to attract and retain the most qualified teachers in the nation, many districts and states have increased salaries and other financial incentives (Hirsch, Koppich, Knapp, 2001), implemented professional development or induction programs (Darling-Hammond, 2003; Jacob & Lefgren, 2004), and improved working conditions (Hirsch, 2005). Predicting which of these initiatives will have the greatest impact on teacher attrition requires a better understanding of each initiative as well as an intense examination of those initiatives within our current teaching population. Science teachers are of particular concern because much of what you see in your everyday life today in the U.S. (health, education, defense, transportation, agriculture, communication, and jobs) is the product of investments made in the education of engineers and scientists. Science teacher retention is important to preserve the prosperity upon which this nation was founded. Essentially, what we have as a nation is strongly related to the past investments we have made in science and technology (National Academy of Sciences, 2007). Without that, we risk losing our global position in the economy and the promise of our future.

The purpose of the three papers in this dissertation was to investigate working condition factors as potentially impacting teacher job satisfaction and retention in high school science classrooms across the state of Texas so that school officials and policy makers could use that knowledge to actively influence and address morale and attrition. Research indicated if these factors could be identified and addressed, teacher job satisfaction and teacher retention could potentially increase (Haberman, 2005; Holloway, 2000; Inman & Marlow, 2004). The conceptual framework posited in Chapter II indicated both direct and indirect effects of teacher working conditions on job satisfaction and teacher retention. The framework suggested that better working conditions translated to increased job satisfaction and increased teacher retention for science teachers.

Limitations

This study examined several variables that are applicable to teacher working conditions, job satisfaction, and the attrition process. However, due to limitations with data, many other potential variables could not be included in this study. These variables include quality of professional development experiences, opportunities for promotion, perceptions of job security, and attitudes about teacher and school accountability and high-stakes testing in general. While the exploratory studies reported here indicate interesting results in many ways, I would recommend that future scholars expand their working conditions variables to include a more exhaustive list. Future studies that include these additional variables to provide a more complete portrait of high school science teacher working conditions within the teacher professional continuum.

Summary of Findings

Chapter III focused on the development of the working conditions rubric and descriptive statistics of working conditions scores categorized by teacher type, school size, and school type. The factor analysis indicated that seven distinct factors were underlying high school science teacher working conditions. The original factor structure proposed in this study was retained and the working rubric adjusted to indicate the structure revealed through the factor analysis. A normal distribution was evident for the working conditions scores for high school science teachers in the current study, thus substantiating the data was adequately suited for parametric statistical analyses. Although the differences among the medians of the working condition scores in this study were not statistically significant, patterns emerged among the groups. Findings from this study suggest (a) science teachers from small schools experience tougher working conditions than teachers from both medium and large schools; (b) veteran science teachers experience tougher working conditions than both induction and mid-career science teachers; and (c) science teachers from lower minority schools experience tougher working conditions than science teachers from higher minority schools.

Chapter IV focused on the relationship between high school science teachers' working condition scores and job satisfaction scores. Like current research in the field, this study found working conditions had a significant relationship with job satisfaction (Loeb, et al., 2005; Ingersoll, 2001). This relationship was modeled in the conceptual framework, with working conditions having a direct effect on job satisfaction. However, the findings of this current study contradict traditional beliefs that assume more difficult working conditions have a negative effect on job satisfaction. Findings from this study suggest that (a) science teachers from small schools experience tougher working conditions and are more satisfied with their jobs; (b) veteran science teachers experience tougher working conditions and are more satisfied with their jobs; and (c) science teachers from lower minority schools experience tougher working conditions and are more satisfied with their jobs. In short, according to this research, if you are an administrator and you are seeking to be in an environment where teachers are most satisfied, you should choose a small school with a lower minority student enrollment proportion and science teachers who are veterans.

Chapter V focused on the relationship between high school science teachers' school size, school type (MSEP), teacher type, working condition scores, job satisfaction scores, and retention status. This research found no significant difference in working condition scores for "stayers" and "non-stayers," no matter their level of experience, school size, or school type. In addition, the model presented in this chapter accounted for only 35% of the variance in teacher retention, thus leaving a large portion of the variance unexplained. Although several variables were highly correlated with one another, they failed to provide a complete portrait of working conditions as it relates to job satisfaction and retention. As shown in the conceptual framework, teachers' experience levels had a direct relationship with working conditions and teacher retention status. School size had a direct relationship with working conditions and job satisfaction. School type had a direct relationship with working conditions and job satisfaction, while working conditions had a direct relationship with job satisfaction.

The second part of Chapter V focused on how to best distinguish "stayers" and "non-stayers" using the variables of teacher type (induction, mid-career, veteran), school size (small, medium, large), school type (MSEP), job satisfaction scores, and working condition scores. Teacher type was the greatest contributor discriminating between stayers and non-stayers, followed by working conditions scores, job satisfaction scores, school size, and school MSEP, respectively. In addition, I calculated a percent difference of function coefficients to determine the greatest predictor of science teacher retention status from the set of independent variables. Based on those calculations, teacher type was the best predictor of teacher retention status, followed by job satisfaction scores, school MSEP, working conditions scores, and school size. The model correctly predicted 64.3% of science teachers who were "non-stayers" and 51.0% of teachers who were classified as "stayers."

Findings from this final study reveal (a) no significant difference in working condition scores for "stayers" and "non-stayers," (b) school size and the experience level of the science teacher as significant predictors of working condition scores, (c) school size and the experience level of the science teacher as significant predictors of job satisfaction scores (d) working condition scores and job satisfaction scores as not significantly predicting science teacher retention, and (e) teacher type (beginning, mid-career, and veteran) as the only significant predictor of teacher retention. A summary of the general findings of this study are shown in Figure 21.

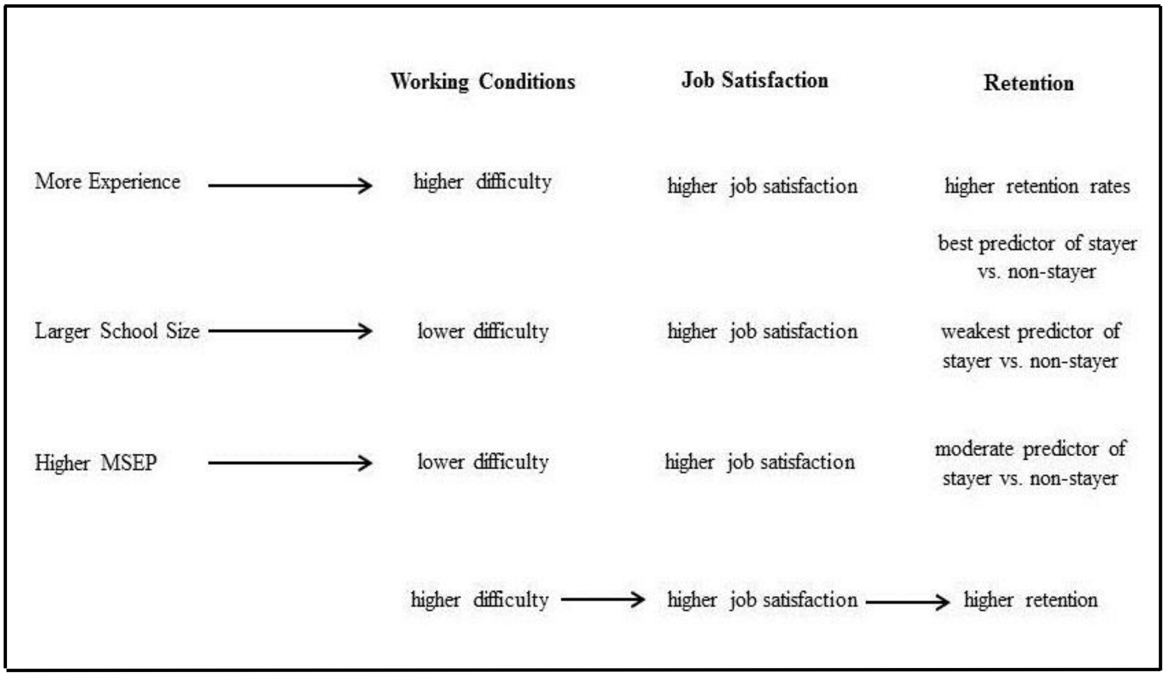

Figure 21. Summary of general findings related to teacher/school characteristics, working conditions, job satisfaction, and retention.

The findings from this research support the revision of the conceptual model presented in Chapter II. As shown in Figure 22, this model reconfigures the role of working conditions, proposing a progression from working conditions to teacher retention, through the job satisfaction variable. Note that the model indicates no direct connections between working conditions and teacher retention, as none of the findings reported here supports a direct relationship between these two variables. The new conceptual model proposes that teacher experience, school size, and school MSEP influence science teachers' directly influence working conditions and job satisfaction and indirectly influencing retention, through an ordered sequence of predeterminants as indicated in Figure 22.

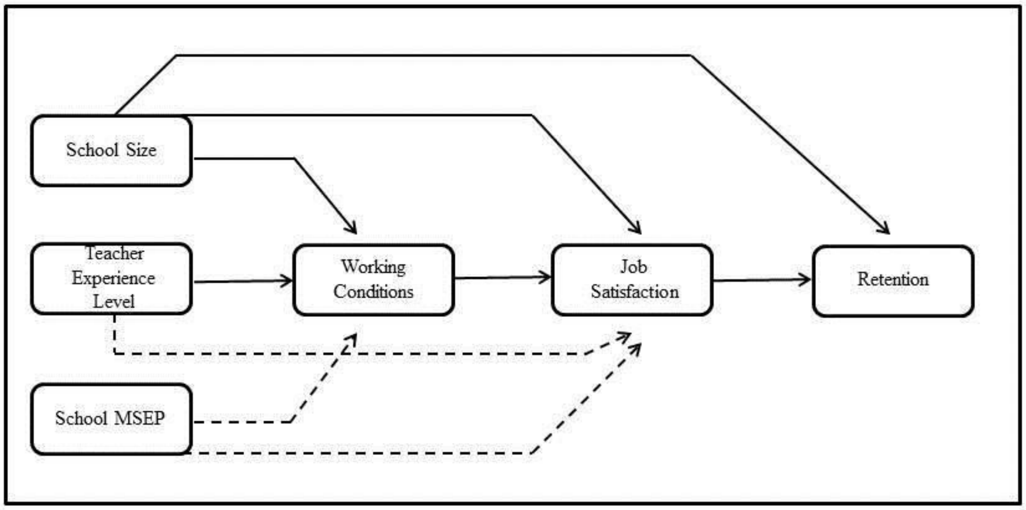

Figure 22. New model displaying the role of working conditions within a new framework based on the findings from this study.

Policy Implications and Recommendations

Implications for Educational Policy

The finding of significant effects of school size and the experience level of the science teacher on working conditions and teachers' job satisfaction has implications for educational institutions such as schools, districts, and state agencies. These findings imply that efforts to improve the working conditions and job satisfaction of science teachers may indirectly affect science teachers' retention status. These findings suggest that educational institutions examine the working conditions of science teachers more closely, particularly in the light of establishing school professional cultures that promote collegiality and interactions among teachers (i.e., the first factor identified in the working conditions rubric) and providing materials for teaching science (i.e., the second factor contributing to working conditions). Acknowledging that the factors examined in this study were limited in scope due to the availability of data, another implication of these exploratory research efforts is that education institutions examine other working conditions in addition to those included in this research. While useful in exploratory studies such as these reported here, the PRISE database did not include information about several other variables that may also be important in describing science teachers' working conditions. As PRISE data were collected before working conditions was identified as a potential factor in investigating the science teacher professional continuum in Texas schools. I would recommend that educational institutions consider other issues consistent with the educational literature on working conditions. In particular, these include issues of parental involvement, student misbehavior, principal involvement, and instructional practices. These factors, in addition to considering the variables used in these exploratory studies, should be considered in drafting policy concerning science teachers' working conditions.

Recommendations for Future Research

In January 2010, the PRISE Research Group developed a model to understand the associations among school policies, teachers, and students that produced a positive atmosphere promoting high school science in Texas (Stuessy, 2010). A successful school is much more than the individual characteristics of the school, teachers, or students. The model includes (1) school support practices of science teachers at various stages in the teacher professional continuum (i.e., teacher recruitment, induction, professional support, retention), (2) science teachers' commitment and attitudes towards the profession (i.e., professional activity, job satisfaction, and teacher retention) and (3) a students' aggregate science score calculated at the school level to include state-mandated measures of science achievement and college readiness. A 2010 policy brief (Stuessy, 2010) describes the state of Texas high school science using this model. I have resisted the temptation to insert the findings of this dissertation into the model proposed in that policy brief. At the time that the policy brief was written, my research on working conditions was not complete and actually is beyond the scope of the research proposed for this dissertation. At this point, I am comfortable in stating that we are currently planning to reevaluate the 50 schools included in the study with the additional measure of *Teacher Working Conditions,* using the rubric established in Chapter III.

This study examined several variables that are applicable to teacher working conditions, job satisfaction, and science teacher attrition. My use of extant data, which was deliberately and carefully collected for other purposes, had its advantages. PRISE data from 50 schools and 385 teachers, selected through a rigorous sampling plan, yielded findings that have generalizability to 1,333 Texas high schools. Multiple sources of data (e.g., interviews, surveys, state-maintained databases) from a wide range of schools distributed evenly throughout the state of Texas populated databases useful with all sorts of data dealing with school practices, teacher characteristics, and student achievement data. Limitations also existed, however, in that other variables as potential components of working conditions were not accumulated at the time the original data were collected. These variables include professional development quality, opportunities for promotion, perceptions of job security, and attitudes about teacher and school accountability and high-stakes testing in general. I would recommend that future scholars consider testing the revised model presented here (see Figure 22), seeking additional data sources to present a richer collection of working conditions variables. The results of the exploratory studies reported here lend support for the existence of several relationships between and among variables associated with working conditions, but I would recommend that these results be used as the foundation for future research to develop a more complete portrait of high school science teacher working conditions within the high school science teacher professional continuum.

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APPENDIX A

PRISE POLL

TEXAS POLL OF SECONDARY SCIENCE TEACHERS

1. (a) Have you formally participated in **recruiting new science teachers** since the fall of 2006? (*Please enter a check on just one line below.)*

_____ Yes (*If yes, go to question #1b)*

_____ No (*If no, go to question #2)*

(b) Please indicate all of the ways that you have formally participated in the recruitment of new science teachers. (*Please check all that apply).*

_____a. **formal interviews** at the school site

_____b. **informal visits** with perspective science teachers

_____c. **recruitment trips** outside school walls

_____d. policy meetings **specific** to science

_____e. **review job applications** for prospective science teachers

_____f. Other (*Please briefly explain)*

2. (a) Have you participated in the **induction/mentoring of new science teachers** since the fall of 2006? (*Please enter a check on just one line below.)*

_____ Yes (*If yes, go to question #2b)*

_____ No (*If no, go to question #3)*

(b) Please indicate all of the ways that you have participated in the induction/mentoring of new science teachers. (*Please check all that apply).*

_____a. assisted with orientation to school policies

_____b. assisted with classroom management

_____c. observed a new science teacher teaching a science class

_____d. modeled teaching for a new science teacher

_____e. provided a new science teacher with a science lesson

_____f. developed a science lesson with a new science teacher

_____g. performed formal mentoring duties with a new science teacher

_____h. other (*Please briefly explain)*

3. (a) Since the fall of 2006, have you **served in a leadership role**? (*Please enter a check on just one line below.)*

_____ Yes (*If yes, go to question #3b)*

_____ No (*If no, go to question #4)*

(b) Please indicate the leadership roles you have held since the fall of 2006. (*Please check all that apply).*

_____a. **Science** department chair

_____b. **Science** curriculum writer

_____c. **Science** club/organization sponsor

_____d. Mentor to a science teacher

_____e. Member of a science teacher professional organization

_____f. Presenter at a science workshop, conference, or training session

_____g. Mentor to a teacher who is not a science teacher

_____h. Subject team leader in a subject other than science

_____i. Member of a teacher professional organization that is not specifically science-related

_____j. Member of a district-level decision-making committee

_____k. Other leadership role (*Please specify below)*

4. Since the fall of 2006, in which of the following types of **professional development opportunities** have you participated? (*Please enter a check in all lines below that apply to you.)*

_____a. Strategies for teaching science content

_____b. Strategies for teaching science using technology

_____c. Strategies for teaching science using the Texas Essential Knowledge and Skills (TEKS)

_____d. Strategies for preparing students to master the Texas Assessment of Knowledge and Skills (TAKS) objectives

_____e. Strategies for teaching science to students with special needs

_____f. Strategies for the use of laboratory in teaching science

_____g. Strategies for teaching science by inquiry

_____h. None of the above

_____i. Other (*Please specify below)*

5. (a) Since the fall of 2006, in which of the following activities have you engaged that were **specific to science or science education**? (*Please enter a check in all lines below that apply to you.)*

_____a. Teacher research on innovative practice in science

_____b. Peer observations of other science teachers

_____c. Graduate studies in a science-related field

_____d. Educator study groups in science

_____e. Professional science teacher associations

_____f. Curriculum writing in science

_____g. Mentoring of science student teachers

_____h. Other (*Please specify below)*

(b) Since the fall of 2006, in which of the following **professional activities** have you engaged that were **not specific** to science? (*Please enter a check in all lines below that apply to you.)*

_____a. Teacher research on innovative practice in a content area other than science

_____b. Peer observations of teachers other than science teachers

_____c. Graduate studies in an area that is not science-related

_____d. Educator study groups in an area other than science

_____e. Teaching professional associations that are not science specific

_____f. Curriculum writing in a content other than science

_____g. Mentoring of student teachers in content areas other than science

_____h. Other (*Please specify below)*

6. In a typical semester, **how often** do **you informally meet** (that is, not during a scheduled science department meeting) **with other science teachers** at your school about issues related to classroom science teaching? *(Please enter a check on just one line below.)*

_____a. Daily

_____b. Once a week

_____c. Twice a week

_____d. Once a month

_____e. Twice a month

_____f. Once a semester

_____g. Twice a semester

_____h. Almost never

7. Overall, how satisfied are you with **your decision** to become a high school science teacher? *(Please enter a check on just one line below).*

_____a. Very satisfied

_____b. Satisfied

_____c. Dissatisfied

_____d. Very dissatisfied

8. How much do you agree with this statement: Improving student achievement in science is a **team effort** at this school? *(Please enter a check on just one line below).*

_____a. Strongly agree

_____b. Agree

_____c. Disagree

_____d. Strongly disagree

9. How satisfied are you with the **level of cooperation and collegiality** among all the teachers at this school? *(Please enter a check on just one line below).*

_____a. Very satisfied

_____b. Satisfied

_____c. Dissatisfied

_____d. Very dissatisfied

10. How satisfied are you with the way your science program contributes to the **career development of students** at this school? *(Please enter a check on just one line below).*

_____a. Very satisfied

_____b. Satisfied

_____c. Dissatisfied

_____d. Very dissatisfied

11. How satisfied are you with the **decisions you can make** about the **instructional methods** you use in your own science classroom? *(Please enter a check on just one line below).*

_____a. Very satisfied

_____b. Satisfied

_____c. Dissatisfied

_____d. Very dissatisfied

12. How satisfied are you with the support you receive from the school to have your students attend informal science activities, such as field trips, visits to museums, and off-campus activities at informal science institutions? *(Please enter a check on just one line below).*

_____a. Very satisfied

_____b. Satisfied

_____c. Dissatisfied

_____d. Very dissatisfied

13. How satisfied are you with the **options that you have** at your school for participating in science-specific professional development? *(Please enter a check on just one line below).*

_____a. Very satisfied

_____b. Satisfied

_____c. Dissatisfied

_____d. Very dissatisfied

14. How satisfied are you with the **support provided by your school** for you to participate in professional development? *(Please enter a check on just one line below).*

_____a. Very satisfied

_____b. Satisfied

_____c. Dissatisfied

_____d. Very dissatisfied

15. How satisfied are you with your **science laboratory facilities?** *(Please enter a check on just one line below).*

_____a. Very satisfied

_____b. Satisfied

_____c. Dissatisfied

_____d. Very dissatisfied

16. How satisfied are you with your **science laboratory equipment**? *(Please enter a check on just one line below).*

_____a. Very satisfied

_____b. Satisfied

_____c. Dissatisfied

_____d. Very dissatisfied

17. How satisfied are you regarding the **recognition you receive** for your science teaching efforts at this school? *(Please enter a check on just one line below).*

_____a. Very satisfied

_____b. Satisfied

_____c. Dissatisfied

_____d. Very dissatisfied

18. How satisfied are you with your current teaching assignment? *(Please enter a check on just one line below).*

_____a. Very satisfied

_____b. Satisfied

_____c. Dissatisfied

_____d. Very dissatisfied

19. How would you rate your personal level of safety at this school? *(Please enter a check on just one line below).*

_____a. Excellent personal safety

_____b. Good personal safety

_____c. Fair personal safety

_____d. Poor personal safety

20. How satisfied are you with the administrative communication you receive about expectations for your teaching in this school? *(Please enter a check on just one line below).*

_____a. Very satisfied

_____b. Satisfied

_____c. Dissatisfied

_____d. Very dissatisfied

21. Please provide your full name.

____

First *Middle* *Last* *Maiden (if applicable)*

22. Including this year (2007-2008) as one year, how long have you taught science **at this school?** *(Please enter the number of years in the box below.)*

[ ]

# of years

Source: Stuessy, C., & the PRISE Research Group. (2007). *Texas poll of secondary science teachers.* Unpublished.

APPENDIX B

WORKING CONDITIONS CATEGORY SOURCES

Working Condition Categories	**Source**
Gender	AEIS, SBEC
Race	SBEC
Level of College Degree	AEIS
Certification	SBEC
Years of Teaching Experience	AEIS, Teacher Self-Report
# of Preps	Master Schedule
Teaches TAKS Prep Course(s)	Master Schedule
Shared Conference	Master Schedule
Mentor Program	Teacher Survey
Team Planning	Master Schedule
Perception of Autonomy	Teacher Survey
Professional Development	Teacher Survey
Safety	Teacher Survey
Leadership Opportunities	Teacher Survey
Facilities	Teacher Survey
Resources	Teacher Survey
School Size	AEIS
Location	AEIS
Minority Student Enrollment Proportion	AEIS
Administrator Support	Teacher Survey

VITA

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