

Job Satisfaction of High School Science Teachers: Prevalence and Association with Teacher Retention

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Abstract

In many U. S. states, policy related to teacher job satisfaction and retention has not paralleled reform for student achievement. A study of 385 secondary science teachers, situated in one U. S. state's high school system, reveals the relationships between teachers' job satisfaction with working conditions and retention at both profession and school levels. Frequency analysis suggests that large proportions of teachers are satisfied with occupational choice and professional colleagues whereas fewer teachers are satisfied with school facilities, equipment and support for informal science. However, risk analysis suggests no statistically significant associations between teacher satisfaction and profession retention. These results suggest the need for additional research into multivariate relationships between teachers' job satisfaction and retention.

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Introduction

Maintaining qualified and effective teachers in the classroom is a key factor in the successful science education of high school students (Ronfeldt, 2012). With shortages of science teachers predicted in all states (U.S. Department of Education, 2013), increased recruitment of teachers seems imperative. However, some researchers suggest retention is the major contributor to the shortfall of qualified science teachers in high schools (Ingersoll, 2003; Ingersoll & Perda, 2010). As a result, policy designed to increase teacher retention has drawn recent attention (Allensworth, Ponisciak, & Mazzeo, 2009; Ingersoll, 2001; Ronfeldt, 2012).

Policy designed to increase retention is commonly based on the assumption that teachers will stay in the profession or at a given school when satisfied with both their job and associated conditions (Spear, Gould, & Lee, 2000). This conclusion has been

supported by studies suggesting that satisfaction with working conditions produces a positive influence on teachers' retention (Kearney, 2008). The current study presents conclusions based on levels of science teachers' satisfaction with occupational choice and working conditions. Additionally, risk analysis is used to examine associations between teachers' satisfaction with school working conditions and retention.

Teacher Retention

The retention of teachers has been a focus of education reform policy for more than a quarter century (Macdonald, 1999; Ronfeldt, 2012; Taylor & Bogotch, 1994). Studies have focused on various factors related to teacher retention. In a review of literature before passage of the No Child Left Behind Act (NCLBA), MacDonald (1999) found that many retention studies focused on school factors related to salary, working conditions, instructional support, and career opportunities. Since passage of the NCLBA similar areas of research are still under consideration. For example, Kardos, Johnson, Peske, Kauffman, and Liu (2001) identified professional culture as an important factor in the retention of novice teachers. Ronfeldt (2012) discovered pre-service teachers who learn to teach in "difficult-to-staff" field settings have lower retention rates than peers placed in less difficult settings. Finally, Gilpin (2011) concluded wages have a significant effect on inexperienced teachers leaving the profession but no significant effect on experienced teachers leaving the job.

Understanding retention is particularly important when considering the economic and educational impact of teachers. Each year school administrators must identify, recruit, and employ teachers to replace those who either move to another school or leave the profession (Ingersoll, 2001). According to some estimates, up to one-third of the 3.2 million teachers in the U. S. in 2009 were "baby boomers" and would leave the profession within five years (Duncan, 2009). Furthermore, recent trends suggest that 50% of replacement teachers will themselves leave the profession within five years (Watlinton, Shockley, Guglielmino, & Felsher, 2010). With forecasting studies indicating increased student enrollment in United States (U.S.) schools (Feng, 2005), a crisis in the supply of qualified teachers is imminent. In response, policymakers at all organization levels (i.e., national, state, and local) have introduced reform policy to create better working conditions to positively influence the retention of current and future teachers (Adamson & Darling-Hammond, 2012; Feiman-Nemser, 2001; National Commission on Teaching and America's Future, 1997). This study seeks to address the question of whether these policies are having an effect on science teacher retention.

Job Satisfaction

Current estimates place the cost of public K-12 education in the U.S. at \$500 billion per annum. The cost for science education in the state from which the current teachers under study reside has been estimated at \$1 billion per annum. The majority of these costs go to support teacher salary, school maintenance, and new school construction. These numbers suggest that policymakers use economic policy to positively influence teacher retention (Kolbe & Strunk, 2012).

Research examining the relationship between teacher salary, job satisfaction and retention has contributed confounding results (Bishay, 1996; Butt et al., 2005; Guarino, Santibanez, & Daley, 2006; Weiqi, 1997). While some studies indicate salary influences teacher satisfaction (Hughes, 2012), other studies show little effect (Ondrich et al., 2008). Many researchers have concluded that the main source of job satisfaction for teachers does not originate from salary, but from interpersonal relationships that teachers experience with administrators, other teachers, and students (Butt et al., 2005; Maele & Houtte, 2012). Additionally, teachers' satisfaction with school working conditions has been shown to influence both job satisfaction and retention (Borman & Dowling, 2008; Mont & Rees, 1996; Weiss, 2003).

Researchers have studied job satisfaction in multiple fields, including human resource management (Brief & Weiss, 2002), public policy (Quarstein, McAfee, & Glassman, 1992), medicine (Scott, Gravelle, Simeons, Bojke, & Sibbald, 2006) and education (Hean & Garrett, 2001). Although lacking a formal definition, many researchers define job satisfaction as an affective reaction to a job (Butt et al., 2005). Weiss (2002) suggested that individuals form attitudes of job satisfaction and dissatisfaction through a combination of internal cognitive processes and external actions. Spear et al. (2000) concluded that sources of teacher job satisfaction included working with students, the cerebral challenge of the profession, and a sense of classroom autonomy. Further, they describe workload, salary, and professional status as sources of dissatisfaction. These conclusions suggest that working conditions for teachers are more likely to contribute towards job satisfaction than job dissatisfaction.

Risk Analysis

Although widely used in the medical research, risk analysis is less common in educational research. However, the use of relative risk analysis fits well with the American Psychological Association call for increased reporting of effect sizes and confidence intervals (American Psychological Association, 2010). Since risk analysis results from medical studies are commonly reported to the general public, risk analysis from education studies should provide a more familiar and intuitive means for reporting results of research (Stacey & Steinle, 2005).

Job Characteristics Model

This study describes high school science teachers' job satisfaction as a function of satisfaction with professional choice and school working conditions. In order to place the results in context, the Job Characteristics Model (JCM; Hackman & Oldham, 1976), a common job satisfaction model, was used. Hackman and Oldham proposed the JCM as a framework for studying how particular job characteristics influence the job satisfaction of individuals (See Figure 1). The JCM proposes five core job characteristics (skill variety, task significance, task importance, autonomy, and feedback) that influence three psychological states (experienced meaningfulness, experienced responsibility, and knowledge of actual results). The combination of these job characteristics and psychological states in turn influence a person's job satisfaction.

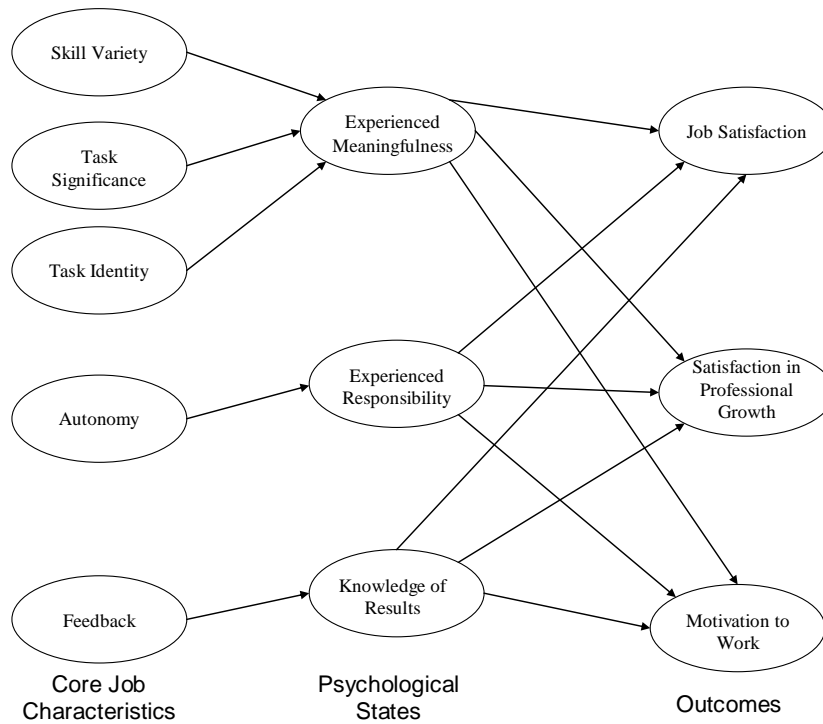


FIGURE 1. *Hackman and Oldham's Job Characteristics Model.*

The work environment is a complex system, consisting of interactions between supervisors, co-workers, and inanimate objects (Brief & Weiss, 2002). For science teachers, these organizational components equate to school administrators, fellow teachers, and classroom materials (Hean & Garrett, 2001). In this study, the JCM is used as a framework to illustrate the association of organizational components (personnel and materials) with teachers' job satisfaction. For example, Figure 1 illustrates the association between task significance and experienced meaningfulness. This feeling of meaningfulness is believed to be associated with job satisfaction. For the purposes of this study, teachers were asked to assess levels of satisfaction with the five core job characteristics within the JCM.

Purpose of Study and Research Questions

The purpose of this study is to first assess the prevalence of high school science teachers' satisfaction with school working conditions. The second purpose is to examine the associative relationships between science teachers' satisfaction with school working conditions and retention. Specifically, this study provides evidence to answer the following questions:

Research Question 1: What is the prevalence of science teacher satisfaction with specific school working conditions?

Research Question 2: Do science teachers differ in levels of satisfaction by mobility status?

Research Question 3: What are the associations between science teachers' attitudes and decisions to remain at their current school?

Research Question 4: What are the associations between science teachers' attitudes and decisions to remain within the profession?

Method

This study used a stratified random sampling design to obtain a sample of 385 science teachers. After inclusion in the sample, teachers were asked to complete survey instruments to determine teachers' participation in professional activities and satisfaction with working conditions (Table 1). Teacher retention was determined using data collected from a state education agency. Frequency and relative risk statistics were used in data analysis.

TABLE 1

Datasets in the PRISE Teacher Database

Dataset name	Archived data
School context	Size, minority status, region, and grades served by teacher's school
Activity	Participation status of teachers in professional activities
Job satisfaction	Satisfaction of teachers with school environment
Certification	Certification(s) possessed by teachers
Schedule	Classes taught by teachers
Teacher context	Demographic data describing teachers
Retention	Retention status of teachers

Sample

The teacher sample was selected using a stratified random sampling design. In the first stage of the design, public high schools within a U.S. state were stratified using two explicit variables (size and minority student enrollment proportion) and one implicit variable (geographic area within the state). This stage resulted in a sample of 50 high schools to represent all high schools in the state's school system. Administrators from each school were contacted through either phone or during a face-to-face meeting. From the original 50 schools, 39 school administrators chose to participate in the study. Replacement schools (n=11) from the original sampling frames were identified and administrators were subsequently contacted. Each replacement schools' administrator agreed to participate in the study. In the second stage of the sampling design, all teachers

responsible for teaching at least one state defined science course within each sampled school were selected for participation.

A total of 385 science teachers were selected within the 50 schools. Data collection began in early spring and continued until summer of the same year. Imputation of non-response teacher data (n=42) was done using used modal values within schools. The final operational sample consisted of 385 teachers from 50 schools. Table 2 presents the final return rates for the teacher sample used in this study.

TABLE 2

Teacher survey return rates

School sample status	Total teacher sample	Total surveys returned	Return rate (%)
Original (n=39)	316	280	88.6
Replacement (n=11)	69	63	91.3
Total	385	343	89.1

Measures

A two-stage process was used to develop a survey instrument to measure teachers' professional actions and attitudes. The instrument is a 20-item questionnaire that identifies teachers' participation in professional activities and levels of satisfaction with school working conditions. Results from an analysis of the 385 science teacher's responses suggest the instrument is valid (Cronbach's alpha = 0.86).

Teacher Attitude Regarding School Working Conditions. Teachers were asked to declare satisfaction with each of 14 school attributes on a four-point Likert scale with the following choices: (1) "Very Dissatisfied," (2) "Dissatisfied," (3) "Satisfied," and (4) "Very Satisfied." During analysis in the current study, each response was re-coded as "Satisfied" = 1 (original response of 3 or 4) or "Dissatisfied" = 2 (original response of 1 or 2). Table 3 provides the list of working condition items on the instrument.

TABLE 3

Job satisfaction items from the survey instrument

Job satisfaction item	Variable name
How satisfied are you with your choice of profession?	Q7
How much do you agree with the following statement: Improving student achievement in science is a team effort at my school.	Q8
How satisfied are you with the level of collegiality and cooperation with other teachers at your school?	Q9
How satisfied are you with the contribution of your schools science program to student development?	Q10
How satisfied are you with ability make decisions regarding instructional methods?	Q11

How satisfied are you with school support for informal science activities?	Q12
How satisfied are you with science specific PD options at your school?	Q13
How satisfied are you with school support for PD?	Q14
How satisfied are you with your schools science laboratory facilities?	Q15
How satisfied are you with your schools science laboratory equipment?	Q16
How satisfied are you with recognition from your school for your teaching efforts?	Q17
How satisfied are you with current teaching assignment?	Q18
How would you rate your personal safety at your school?	Q19
How satisfied are you with administrative communication at your school?	Q20

Teacher Retention Status. Career trajectory data for each teacher was obtained from a state education agency. The trajectory data was used to classify the retention status of each science teacher identified in the sample. Teachers were classified as (a) Stayer, if the teacher was at the same school during the year following the study, (b) Mover, if the teacher was in a different school within the state between the same two school years, and (c) Leaver, if the teacher was not listed in the public school data base during year after the study. Table 4 provides the distribution of the sampled teachers according to retention status.

TABLE 4

Frequency distribution of teachers classified as leaver, mover, and stayer (n=385)

Teacher mobility status	Frequency	Percentage (%)	Cum. (%)	Percentage
Leaver	53	13.8		13.8
Mover	41	10.6		24.4
Stayer	291	75.6		100.0
Total	385	100.0		

Analytic Approach

Two analytic approaches, frequency and relative risk (RR) were used to analyze teacher response data. All analyses and figures were completed using SPSS statistical software, release 19.0.

Frequency analysis. Frequency analysis is a primary analysis technique useful for identifying or estimating typical values of variables, checking assumptions for statistical tests, and determining data quality. In this study, frequency analysis was used to estimate the probability of teacher satisfaction for each of the school working conditions in Table 3. Probability rates within different teacher categories (Stayer, Mover, Leaver) were also estimated using frequency analysis.

Relative risk. The relative risk (RR) describes the likelihood of an event occurring in the presence of a given factor, with the likelihood of the same event occurring in the absence of the same factor. In this study, the retention category of a teacher (Stayer, Mover, Leaver) was compared to the level of satisfaction for each of the 14 school working conditions in Table 3. Calculation of the RR statistic requires creation of a 2X2 matrix to categorize each study subject within one of four matrix cells (See Figure 2). As a specific example from this study, Table 5 shows the breakdown of all 385 science teacher responses with respect to satisfaction or dissatisfaction with administrative communication.

The RR statistic and corresponding confidence interval are calculated using equations described by Agresti (2006). Equation 1, below, describes the likelihood of a teacher being retained when describing themselves as satisfied with a specific school condition. Equation 2 describes the 95% CI for the RR statistic. For the purposes of this study, we assumed no significant relationship when a 95% CI for the RR of a specific school condition encompassed 1.00.

$$RR = [a / (a+b)] / [c / (c+d)] \quad (1)$$

$$95\% \text{ CI} = \ln(RR) \pm 1.96 * S.E._{\ln(RR)} \quad (2)$$

FIGURE 2. A 2X2 matrix describing how data are categorized for calculating the relative risk statistic in this study.

	Retained?		Total
	Yes	No	
Satisfied with given working condition?			
Yes	A (satisfied stayers or movers)	b (satisfied leavers)	a + b
No	C (dissatisfied stayers or movers)	d (dissatisfied leavers)	c + d
Total	a + c	b + d	a + b + c + d

Results

This study describes the relationship between high school science teachers' job satisfaction and the decision to either remain in the teaching profession or leave a school for another teaching position. We used analytic techniques (i.e., frequency analysis and risk analysis) commonly used in the social sciences to address four separate research questions. We present the results of our analysis in four sections. These four sections correspond to the four research questions that guided our study.

Research Question 1: What is the prevalence of science teacher satisfaction with specific school working conditions? Figure 3 displays the proportion of science teachers (n=385) satisfied with 14 different school conditions. The results in Figure 3 indicate that large proportions (greater than 90%) of science teachers are satisfied with occupational choice. This is consistent with the result that more than three out of four sampled teachers remained at their respective schools and almost nine out of ten teachers stayed in the profession (see Table 4). In addition, large proportions (greater than 80%) of teachers indicated satisfaction with fellow teachers and administrators. These results are consistent with the JCM, which posits that job satisfaction is associated with interpersonal relationships. By contrast, smaller proportions (less than 60%) of teachers indicated satisfaction with school support for informal science activities, laboratory facilities, or laboratory equipment.

TABLE 5

The cross distribution of satisfaction with administrative communication by school retention status for 385 Texas high school science teachers.

Satisfied with administrative communication	Retained at a school		Total
	Yes	No	
Yes	236	69	305
No	55	25	80
Total	291	94	385

Research Question 2: Do science teachers differ in levels of satisfaction by mobility status? Figure 4 shows the proportions of science teachers, described as Stayers, Movers, and Leavers, who are satisfied with 14 different school working conditions. These results suggest that, across the three retention categories, differences in teacher satisfaction with working conditions do occur. For example, Proportion values for Leavers in Figure 4 mirrored those of Stayers more closely than Movers. Additionally, for 8 of the 14 working conditions, the proportion of Movers expressing satisfaction was lower than both Stayers and Leavers. These eight conditions include: improving student achievement is a team effort, cooperation and collegiality, school support in PD, science specific PD options, recognition from school for teaching efforts, science program contribution to development of students, school laboratory facilities and school laboratory equipment.

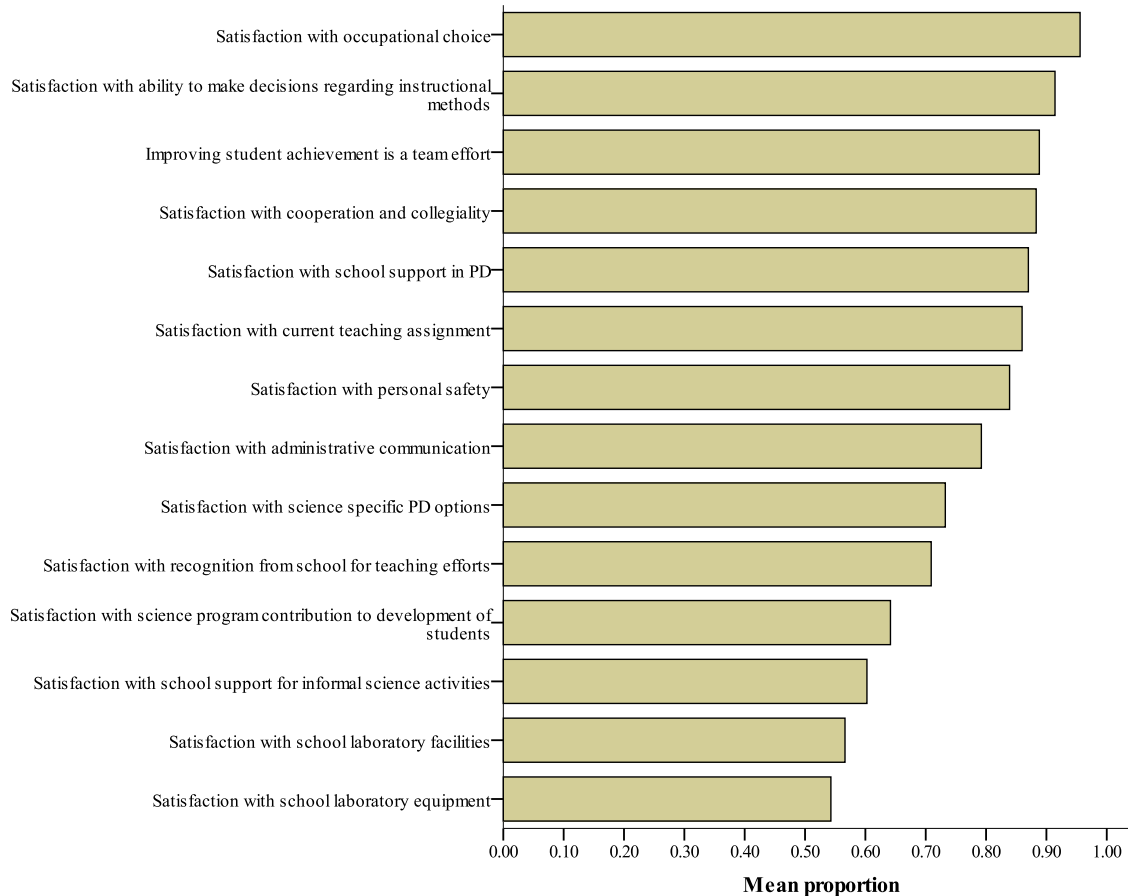


FIGURE 3. *The mean proportion of teachers (n=385) indicating some level of satisfaction with a school working condition.*

Research Question 3: What are the associations between science teachers' attitudes and decisions to remain at their current school? Figure 5 shows the RR values describing the likelihood for science teachers to be retained at a school when satisfied with a given working condition. The majority of the values in Figure 5, 12 out of 14 (86%), have values close to 1.00 and 95% CI encompassing 1.00. This suggests no associative relationship between the majority of working conditions and retention. However, teachers who are satisfied with the ability to make decisions regarding instructional methods are 15% less likely to stay at a school. By contrast, teachers satisfied with administrative communication are 15% more likely to be retained.

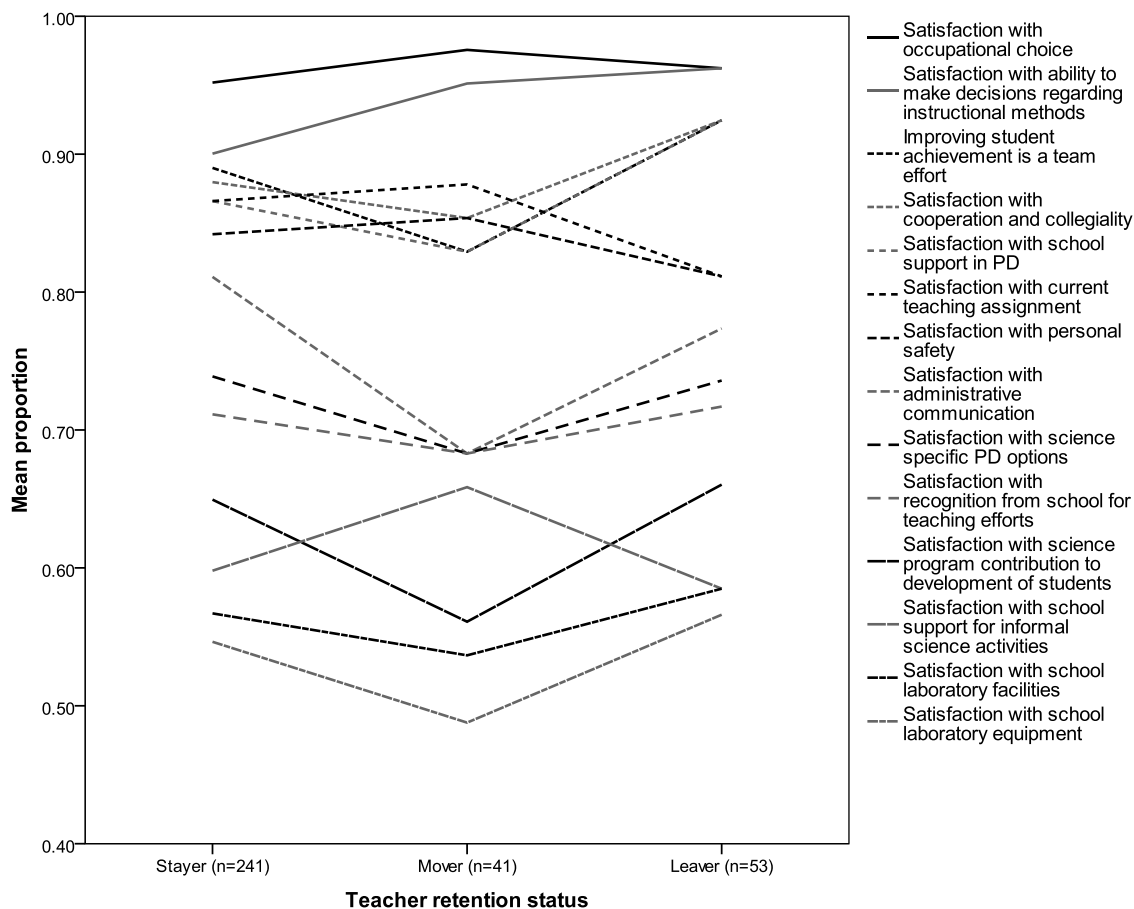


FIGURE 4. The mean proportion of teachers, by retention status, indicating satisfaction with their schools' working conditions.

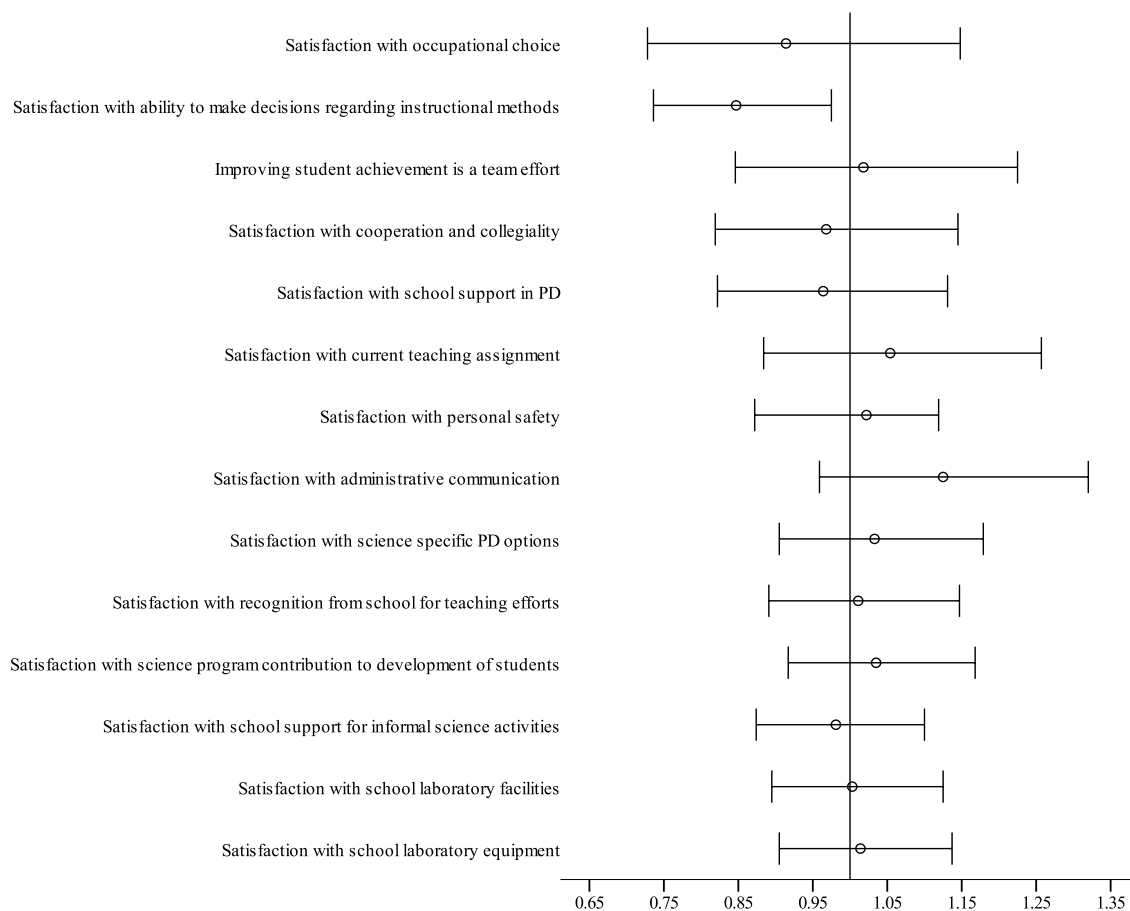


FIGURE 5. Using the Risk statistic to describe the likelihood of teachers being retained by their school when indicating satisfaction with their schools' working conditions. A risk value greater than 1.00 indicates satisfied teachers are more likely to be retained by their school. Conversely, a value less than 1.00 indicates satisfied teachers are more likely to not be retained by their school.

Research Question 4: What are the associations between science teachers' attitudes and decisions to remain within the profession? Figure 6 shows the RR values describing the likelihood of science teachers who are satisfied with school working conditions staying in the profession. No values showed statistically significant associations between satisfaction and professional retention. Closer examination reveals that science teachers satisfied with (a) their ability to make decisions regarding instructional methods, (b) improving student achievement at their school is a team effort, (c) cooperation and collegiality among teachers at their school, and (d) school support in PD are less likely to remain in the profession. This seemingly counterintuitive result is addressed in the discussion for research question 4.

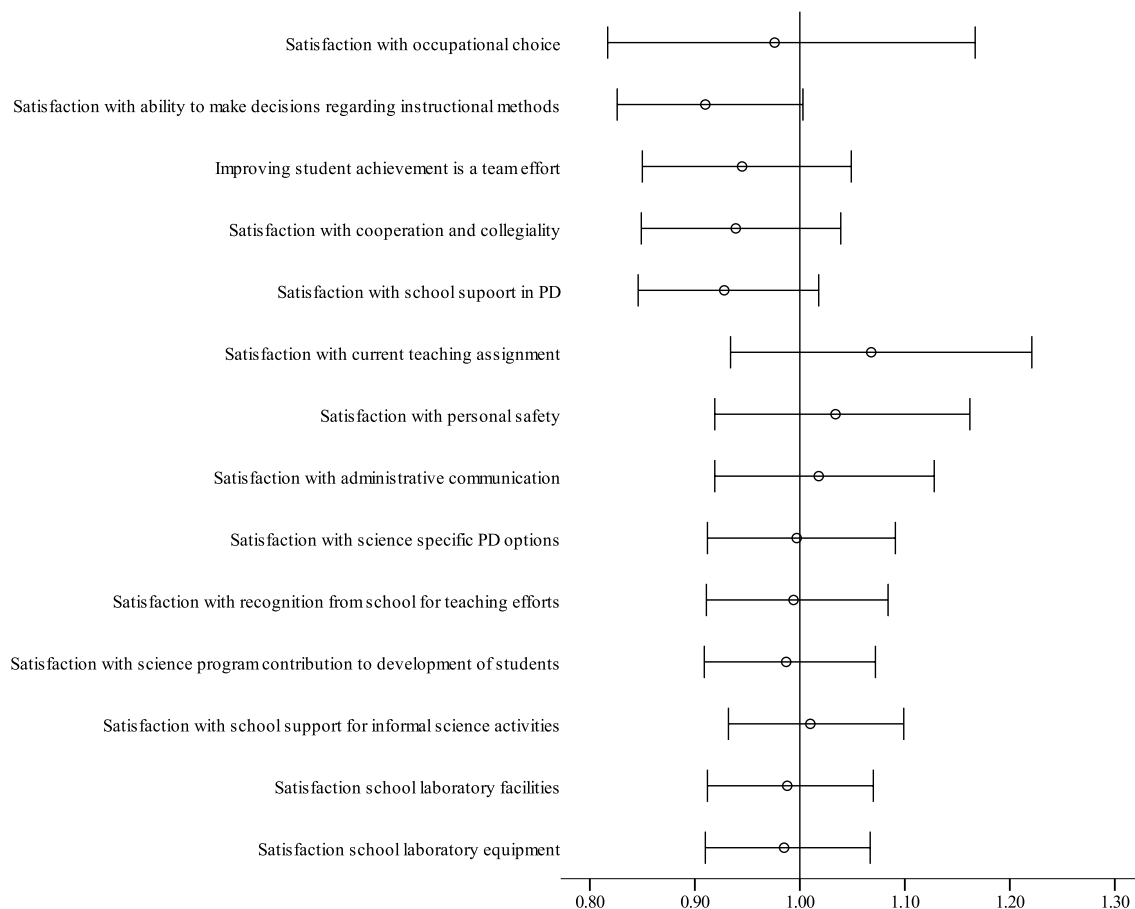


FIGURE 6. Using the Risk statistic to describe the likelihood of teachers being retained in the profession when indicating satisfaction with their schools' working conditions. A risk value greater than 1.00 indicates satisfied teachers are more likely to be retained in the profession. Conversely, a value less than 1.00 indicates satisfied teachers are more likely to not be retained in the profession.

Discussion

This study was conducted to describe the relationship between high school science teachers' job satisfaction and the decision to stay in the profession, stay at a particular school, or leave the profession altogether. The analyses presented in this study increase our knowledge regarding science teachers' attitudes about occupational choice and working conditions as well as the relationships between those attitudes and retention. We present the discussion in four sections. The four sections correspond to the four questions that guided our study.

Research Question 1: What is the prevalence of science teacher satisfaction with specific school working conditions?

The results from the frequency analyses revealed that science teachers do not have uniform attitudes about job satisfaction. For example, more than 80% of the science teachers in the study indicated satisfaction with both occupational choice and colleagues. This finding indicates that the majority of science teachers are satisfied with the routine of teaching and interactions with colleagues. However, teachers indicated less satisfaction with administrative communication, science PD options, and recognition for teaching efforts. For these school conditions only 66% – 80% of teachers indicated satisfaction. This finding suggests that the feeling of satisfaction wanes as influences from outside the classroom intervene. Finally, 50%-66% of teachers were least satisfied with science program contributions to the development of students, support for informal science, and science facilities and equipment. We conclude that these factors are all program related and that the current condition of science programs in many schools is negatively associated with teachers' job satisfaction.

Overall, these results suggest that science teachers are generally satisfied with occupational choice and professional colleagues. Feelings of satisfaction begin to diminish as teachers think about administration, lack of continuing education opportunities, and facilities and equipment. As a result of these findings, we conclude that future reform policy should focus on (a) increasing communication between administration and faculty, (b) improving science programs, (c) upgrading facilities and equipment, and (d) increasing support for informal science.

Research Question 2: Do science teachers differ in levels of satisfaction by mobility status?

Results from frequency analyses indicated a difference between the attitudes of Stayers, Movers, and Leavers in regards to occupational choice and school working conditions. However, the mean proportion of science teachers satisfied with their occupational choice and working conditions is most similar between Stayers and Leavers. This finding suggests that teachers who choose to leave the profession entirely often have similar levels of satisfaction as those teachers who choose to stay. Equally interesting is the finding that Movers have the lowest proportions of satisfaction in nine of the 14 items on the satisfaction survey. This result suggests that dissatisfaction does not necessarily lead science teachers to leave the profession entirely, but rather to move between schools. Taken together, these results suggest that teachers' satisfaction with working conditions is associated with school-level retention but not necessarily with professional retention. If science teachers are satisfied with occupational choice and working conditions, this may influence decisions to remain in current schools but not in the profession.

Research Question 3: What are the associations between science teachers' attitudes and decisions to remain at their current school?

The results of relative risk analyses indicated that science teachers' satisfaction with administrative communication is positively associated (i.e., more likely to stay) with the decision to remain at a school. In contrast, the results indicated that teachers' satisfaction with occupational choice and the ability to make decisions regarding

instructional methods are negatively associated (i.e., less likely to stay) with the decision to remain at a school. These results suggest that reform policy supporting and promoting communication between teachers and administrators may play a role in the retention of science teachers at a particular school. However, these results also suggest that classroom autonomy may not be as important in the retention of science teachers as previously thought.

Research Question 4: What are the associations between science teachers' attitudes and decisions to remain within the profession?

The results of risk analyses indicate no statistically significant associations between science teachers' satisfaction and the decision to remain in the teaching profession. These results suggest that reform policy intended to change the working conditions of schools, although very important and necessary, are not likely to be associated with science teacher retention in the profession. Regardless, schools have an obligation to provide both a comfortable working environment for teachers and an environment conducive to student learning, regardless of influence on teacher retention.

As mentioned in the Results section, one result from our analysis suggests that satisfaction with (a) ability to make decisions regarding instructional methods, (b) improving student achievement at their school is a team effort, (c) cooperation and collegiality among teachers at their school, and (d) school support in PD are not associated with teachers who remain in the profession. While worthy of further study, these results may be associated with retirement rather than early professional attrition. Additionally, these results may be associated with large numbers of early career and late career teachers' attitudes skewing data results.

Conclusions and Limitations

In conclusion, although risk analyses failed to substantiate significant associative links between retention of science teachers and satisfaction with occupational choice or specific working conditions, the frequency results provide three points for further consideration. First, has current policy reform in science education (e.g., National Research Council, 2006) been institutionalized in schools? Second, have minimum standards for the facilities and equipment used in teaching science been reviewed and amended as necessary within both the profession and schools? Finally, do schools review and amend policy concerning student involvement in informal science activities? Each of these points provides areas for future research into the role of the high school environment on science teachers' job satisfaction and retention.

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