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Factors Impacting on Teachers' Job Satisfaction related to Science Teaching: A Mixed Methods Study

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ABSTRACT: Science teachers' job satisfaction is identified as a major factor that affects the quality of a science program. This research investigated to what extent a science program supports science teachers in terms of curriculum materials or extracurricular activities. It also examined the relationships among schools' curriculum support, the number of science teachers, and the levels of their job satisfaction. Qualitative data consisted of 50 interviews with principals from 50 high schools in Texas. Quantitative data related to 385 surveys collected from science teachers working at these schools. Analysis of the data revealed that the large schools offered more curriculum support materials to science teachers than the small ones. Teachers' job satisfaction was not related to the number of science teachers and school size. New teachers indicated their needs for emotional support from mentors, administrators and parents related to their concerns and challenges in reducing their job dissatisfaction. Further implications for future research and practitioners were discussed.

KEY WORDS: Mixed methods, science teacher, job satisfaction, curriculum support

INTRODUCTION

Teacher shortage in K-12 science classrooms in the United States has been increasing (National Science Board, 2008) and science education is one of the disciplines that suffers most. In 2003, the National Centre for Education Statistic (NCES) reported teaching vacancy rates for 80% of the public secondary schools. Of these, 56% were for science teaching (Strizek, Pittsonberger, Riordan, Lyter, & Orlofsky, 2006). The lack of qualified science teachers affects the quality of science teaching activities as well as student learning. Thus, it is important to examine factors that affect teacher shortage in K-12 science classrooms in the U.S.

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Job satisfaction can be a critical issue affecting teacher shortage. Approximately 40% of science teachers were considering retirement or changing careers because of job dissatisfaction (National Science Teachers Association, 2000). Happier teachers and students are related to teachers' job satisfaction (Russel, Williams & Gleason-Gomez, 2010; Tillman & Tillman, 2008). Therefore, it is necessary to examine science teachers' job satisfaction level and the interplay between their job satisfaction and factors affecting it.

Teacher shortage in K-12 system indicates that science teachers have low job satisfaction. Considering the low retention of science teachers and the financial cost to recruit new teachers in science programs, a need exists to investigate how to retain qualified science teachers by considering possible ways that may contribute to increasing science teachers' job satisfaction in K-12 system (National Science Board, 2008). However, there are still relatively few studies involving how schools increase science teachers' job satisfaction.

LITERATURE REVIEW

Job satisfaction

Job satisfaction is the degree to which individuals feel positively or negatively about their jobs. Researchers define job satisfaction as an individual's positive and/or negative attitudes and feeling toward his/her profession (Sunal, Sunal, & Yasin, 2011; House, 1981). Job satisfaction refers to how well a job offers fulfillment of a need or want. Consequently, an individual's job satisfaction affects his/her productivity in the workplace. Thus, the importance of employee job satisfaction has been prominent topics among managers and supervisors of profit and non-profit organizations.

Many studies focused on identifying sources of teachers' job satisfaction and dissatisfaction (Huysman, 2008; Klassen, Foster, Rajani, & Bowman, 2009; Russell, Williams, & Gleason-Gomez, 2010; Schwarz et al., 2008; Stockard et al., 2004; Tickle, Chang, & Kim, 2011). Researchers found that factors such as salary, student-teacher relationships, work pressure, cultural difference among people, distance from community, and administrative support are strongly related to the degree of teachers' job satisfaction (Buckley, Schneider, & Shang, 2005; Mitchell, Ortiz, & Mitchell, 1987; Klassen et al., 2009; Tickle et al., 2011; Tillman & Tillman, 2008; Watson, 2006). These factors play a significant role in influencing teacher performance as well as the quality of teaching. Thus, it is important to examine how these factors are associated with increasing or decreasing the levels of teachers' job satisfaction in schools.

The lack of support from school administrators, available laboratory supplies, and low pay are negative factors decreasing teachers' job satisfaction. Job satisfaction decreases as they experience some problems related to student misbehaviours, workload, relationships with colleagues and administrators, salary, and career growth (Norton & Kelly, 1997; Shann, 1998). The levels of teachers' job satisfaction decrease as they are dissatisfied with their workload and working conditions (Loeb, Daling-Hammond, & Luczak, 2005; Ingersoll, 2006; Klassen et al., 2009). Educational quality is largely related to teacher job satisfaction. The more teachers are happier, the better they teach (Hean & Garrett, 2001). Thus, we need to maximize teacher satisfaction with sustained efforts to improve teacher working conditions. The more we help teachers become more effective, the more we contribute to increasing student learning and achievement.

A further factor negatively affecting teachers' job satisfaction is the low level of salaries. Compared to other professions such as computer programmers, nurses, and public accounting professionals, the teaching profession is a relatively low-paying profession (National Education Association, 2015; National Science Board, 2008). More than 30% of new teachers left the profession within five years due to low salaries (Daling-Hammond, 2013). The low level of salaries was related to their job dissatisfaction (Liu, 2007; Loeb et al., 2005; Ingersoll, 2006). Low-pay had negatively influenced on teachers' decision to leave or stay in teaching (Borman & Dowling, 2008; Donaldson & Johnson, 2010). As teacher's satisfaction with their salary increase, their intention to leave the teaching profession may decrease.

Researchers suggested that one solution to retain science teachers is to offer them financial compensation such as competitive salaries, additional stipends, and monetary prizes (Hanushek, Kain, & Rivkin, 2004; Kelley & Finnigan, 2004). According to the report by National Centre for Educational Statistics (1996), teacher retention increases as compensation increases. Teachers with lower salaries tend to leave teaching than their higher paid counterparts (Texas Education Agency, 1995). The size of the school district often plays an important role in both the recruitment and retention of teachers. Smaller schools often provide teachers with the state's base pay schedule. In contrast, larger school districts provide them with more attractive recruitment and retention packages (Murnane, Singer, Willett, Kemple, & Olsen, 1991).

Curriculum Materials and Administrative Support

Science teachers' job satisfaction increases and their turnover decreases as schools' instrumental support increases. A report from the Texas Center for Educational Research (2000) showed that schools having lower teacher turnover rates had administrators who offered curriculum materials and supplies to teachers in a consistent, timely, and inclusive manner. Researchers found that providing adequate materials to teachers was an important factor that increased the levels of teachers' job satisfaction. Schools' support regarding curriculum materials reduces teacher stress while making them feel happy and satisfied with their jobs (House, 1981; Singer, et al., 2000).

High school science teachers need to use specialized equipment such as safety goggles and laboratory aprons as well as tools such as levers, chemicals, balances, microscopes, and weights. In addition, they need to be prepared to use these by acquiring competence in techniques and materials. Technology plays an important role in science education. Researchers emphasized the benefits of integrating technology into science classrooms (Chang, Quintana, & Krajick, 2010). Technology supported learning environment enables teachers to provide students with student-centred learning opportunities. In this sense, Hakverdi-Can and Sonmez (2012) emphasize that science teachers need to improve their competence levels and increase their tendency to use techniques in their classrooms. They need to be able to choose appropriate educational materials and technology used for engaging students in scientific practices and activities, inside and outside the classroom (Singer et al., 2000). In addition, they need to create an effective learning environment that helps students develop knowledge and understanding of scientific ideas by providing students with technology supported inquiry-based learning environment. Thus, they need to improve their ability and competence in integrating technology into teaching through ongoing professional development and workshops.

Another factor related to the levels of teachers' job satisfaction is an administrator's support for student discipline problems, instructional methods, and curriculum materials. In 2008, the National Science Board reported that schools' supportive environment is one of the significant social factors that affect teacher retention rates. For instance, teachers who rate their administrator as undependable, inconsistent, and unskilled in supporting teachers indicate that they like to leave the teaching profession (Russell et al., 2010). The findings by Tickle et al. (2011) also support the notion that the lack of administrative support is an important factor that decreases the levels of teachers' job satisfaction.

The administrator's effective support plays an important role in increasing teachers' commitment to the teaching profession. Research has shown that an administrator's support to teachers can reduce teacher stress and increase teachers' job satisfaction while reducing turnover rates (McCarthy, Lambert, Crowe, & McCarthy 2010). Findings by Littrell, Billingsley and Cross (1994) using House's (1981) four types of supports (i.e., emotional, instrumental, informational, and appraisal) related to teacher job satisfaction indicate that levels of teachers' job satisfaction are high as administrators offered both emotional and informational supports to teachers. Teachers indicate that the emotional support from administrators help them reduce teacher stress as well as increase the levels of commitment to teaching.

Measuring science program support for teachers can be used as a tool to gain a better understanding of the relationship between science teachers' job satisfaction and their reasons for leaving the teaching profession. Previous studies on teacher job satisfaction find that school size is an important factor that influenced teachers' attitude towards their profession (Cotton, 1997, Gregonnry, 1992). For instance, teachers in small schools have more positive attitude towards their work and administrators than those in large schools (Gregory, 1992). However, very little research has examined how teacher support materials relate to the levels of science teachers' job satisfaction. Thus, this study addressed this gap by investigating high school science teachers' job satisfaction in Texas by means of qualitative and quantitative data. It examines the relationship between teachers' job satisfaction and the levels of schools' support for curriculum materials or extracurricular activities.

The following research questions guided this study:

a. What is the relationship between a school's curriculum materials or extracurricular activities support and the school size?
b. What is the relationship between a school's curriculum materials support and the levels of teachers' job satisfaction?
c. What is the relationship between the number of science teachers and the levels of their job satisfaction?

METHOD

Research design

A convergent parallel mixed methods design was used. The convergent design consists of two distinct phases, in which qualitative and quantitative data were collected in parallel, analysed separately and then merged (Creswell & Plano Clark, 2011).

Data Collection

The existing qualitative and quantitative data sets obtained by the researchers of Policy Research Initiative in Science Education (PRISE) were used to answer the research questions. The PRISE funded by NSF is a research project launched in 2005 to investigate issues of teacher quality and teacher retention among Texas high school science teachers. The PRISE research group used a modified random stratification sampling procedure to identify a scientific sample of 50 high schools to represent the

1,333 schools in Texas. They typically provide students with high school science courses such as physical science, biology, and chemistry.

The PRISE research group used a conceptual framework and literature as a guide to develop a survey to assess science teachers' job satisfaction in their workplace.

1. The PRISE research group collected surveys from 385 science teachers in the 50 sample schools regarding the levels of engagement in professional development activity and job satisfaction.
2. They held face-to-face interviews with 50 principals regarding the recruitment, induction, renewal, and retention of high school science teachers.
3. They held face-to-face interviews with science teachers regarding the science program, and then had telephone interviews with science teachers with more than three years of teaching experience who were in their first year at the school.
4. They held telephone interviews with novice teachers in their first three years of science teaching and their mentors.

The above information was based on *the PRISE Policy Briefs* published in October 2009 by the Policy Research Initiative Research Group at Texas A&M University, Department of Teaching, Learning, and Culture, College Station, TX 77843-4232, funded by the National Science Foundation, Grant ESI-044567. The permission to use this data was granted by the PI of the PRISE research project.

Data Selection

The sample of 50 high schools consisted of 385 science teachers. Female participants were 51.5% and male participants were 48.5%. However, 13 science teachers did not provide information about their gender. The majority of science teachers were White-Americans (69.4%). The ratios of minority teachers were Asian/Pacific American (2.1%), African American (4.9 %), Hispanic American (18.4%) and American Indian (.3%). There was only one American Indian science teacher. However, nineteen science teachers did not provide information about their ethnicity. Participants' mean age was 45.4 years (SD = 11.8), ranging from 26 to 72 years. The average of participants' teaching years in science education was 11.3 years (SD = 10.2). The overall average in the current school district was 5.9 years (SD = 7.2), and the average in the current school was 6.5 years (SD = 7.1).

The survey, titled the *Master Reference of PRISE Teacher Level Data Elements*, consisted of 109 items designed to assess

1. their educational and career background (teaching experience, college degree etc.),
2. teacher demography (certification, gender, subject area, age etc.),
3. their leadership and professional development,
4. their collaboration with others,
5. their job satisfaction level, and
6. their mentoring experience in training new teachers.

Participants indicated their responses by selecting a value on the Likert scale, ranging from very dissatisfied (1) to very satisfied (4).

The principal interviews were conducted based on 17 questions to examine the function of SP in schools. The interview questions were divided into six categories:

1. Questions for asking general organization of the schools' SP (meeting, leadership etc.),
2. Decision making process on organization of the school's SP,
3. Teacher support (professional development, materials, extracurricular activities etc.)
4. The role of SP in implementing science curriculum,
5. Whether they encourage teachers to use the National standards (scientific inquiry, nature of science etc.) and
6. Encourage students to pursue careers in science.

All interviews were audiotaped and then transcribed by the PRISE researchers.

Six items from the qualitative data were chosen to check what type of curriculum materials or extracurricular activities science teachers were able to use:

1. What role does the Science Program have in implementing the school's science curriculum?
2. Does the Science Program have a process by which extra science-related resources for teachers are chosen and purchased?
3. To what extent does your Science Program encourage teachers to use inquiry-based instructional methods?
4. To what extent does the SP encourage science teachers to integrate laboratory experiences into their curricula?
5. To what extent does the Science Program encourage science teachers to provide students with personally relevant learning experiences within the school's walls?
6. Can you tell me about the ways that your Science Program encourages students to think about science in relation to their personal interests?

Based on the qualitative data, schools were categorized according to the degree of schools' support in providing curriculum materials.

Eight items (i.e., age, years of experience in current school, ethnicity, gender, degree, and total years of teaching experience, school ID, and science certification) from the quantitative data were used to examine teachers' demographic information and educational backgrounds. Another eight items (see Table 1) from the data were analysed to examine the levels of science teachers' job satisfaction regarding curriculum materials support.

Instrumentation

From the PRISE interview data with science teachers, 10 questions directly related to curriculum materials or extracurricular activities were selected to make a checklist. To validate the checklist, we asked two experts in science education program at Texas A&M University. The checklist was modified based on their comments.

The weighed scale checklist was finalized based on the average scores of two experts and two authors and then used to analyse the selected qualitative data. According to the checklist, ten items were classified into four categories in a weighed scale (a) the least important, (b) not very important, (c) sort of important, and (d) the most important. Each item was scored as 1, 4, 7, and 10 respectively. Two items were categorized into a 'the least important' group, three items into a 'not very important' group, three items into a 'sort of important' group, and two items into a 'the most important' group. Table 1 represents the weighted scaled checklist showing the rate of each item.

Table 1 The weighted scaled checklist to make content analysis on the qualitative data

Curriculum materials or extracurricular activities	The rate of each item
Science related sources	7
Curricular reform	4
Lesson sharing system	7
Professional development	7
Laboratory environment and equipment	10
Science related experience within the classroom	10
Field trips	4
Science competition	1
Science club	1
Independent student research	4

Based on the checklist, interview data was analysed in terms of what kinds of curriculum materials they provide to science teachers while classifying 50 schools into four categories (see Table 2). The four categories of curriculum support groups were very good, good, fair, and poor. Scores ranged from 55 to 0. On this scale, 0-14 scores were categorized as a 'poor support' group, 15-28 scores were categorized into a 'fair support' group, and 29-42 scores were categorized into a 'good support' group.

Last, 43-55 scores were categorized into a 'very good support' group. School identification number was given to each school based on the University Interscholastic League (UIL) classification, which separates the schools in regions, and then further separates the regions into districts for various contests (Ivey, Hollas & Stuessy, 2009). The developed instruments (i.e., the checklist and school categories based on the presence of curriculum materials or extra curricula activities) enabled us to obtain data that indicate the level of school support for science teachers in terms of curriculum materials or extra curricula activities.

Data Analysis

ANOVA was used to identify the relationship between the level of school support for curriculum materials and extra curricula activities and the levels of science teachers' satisfaction. In addition, a job satisfaction score for each school was computed, based on the school categorization described in the qualitative part. The correlation analysis was undertaken by using statistical software SPSS 19 to examine how the number of science teachers at high schools affects the levels of their job satisfaction. The Cronbach's alpha value for eight job satisfaction items was 0.8, above the desired for a high level of reliability coefficient of 0.7 (Pallant, 2009).

FINDINGS

Descriptive Analysis

Before testing our research questions, we conducted a correlation analysis between the number of science teachers at schools and their job satisfaction to examine whether the number of science teachers at schools affected the levels of teachers' job satisfaction. The results of correlation test showed that four groups had a heterogeneous distribution in the number of science teachers. Teachers' job satisfaction at schools was negatively correlated with the number of teachers at schools (Pearson's $r = -0.38$ and $p < 0.05$). Teachers working in large schools were less satisfied with their teaching profession than those who were working in small schools.

Table 2 presents school categories according the levels of schools' support for science curriculum materials or extra curricula activities. Table 2 shows 7 schools were in the 'very good support' group (66 teachers), 18 in the 'good support' group (174 teachers), 14 schools were in the 'fair support' group (104 teachers) and 11 eleven schools in the 'poor support' group (41 teachers).

Table 2 School categories according to schools' curriculum materials or extracurricular activities support

Categories	School ID
Poor support	1, 2, 4, 9, 10, 12, 15, 18, 28, 29, and 35
Fair support	3, 5, 6, 11, 20, 21, 22, 26, 30, 38, 40, 41, 44, and 50
Good support	7, 8, 13, 14, 16, 17, 19, 23, 24, 27, 33, 36, 42, 43, 45, 47, 48, and 49
Very good support	25, 31, 32, 34, 37, 39, and 46

These results indicated that large schools appeared in the 'very good support' group had more science teachers than small schools appearing in the 'poor support' group. It meant that the large schools offered more curriculum materials to science teachers than the small schools. Consequently, the size of school was an important factor that influenced the level of curriculum support materials for science teachers.

Comparative Analysis

The study mainly hypothesized that supporting science teachers in terms of curriculum materials and extra curricula activities is a significant predictor related to the levels of science teachers' job satisfaction. Table 3 displays the results of schools' curriculum materials support according to school size.

Table 3 Schools' curriculum materials support according to school size

				95% CI	
	n	M	SD	LL	UL
Poor support	11	2.92	.34	2.99	3.48
Fair support	14	3.05	.27	2.88	3.26
Good support	18	3.07	.33	2.75	3.09
Very good support	7	3.23	.36	2.80	3.30
Total	50	3.05	.34	2.95	3.15

An Analysis of Variance (ANOVA) showed there was no statistically significant difference between science teachers' job satisfaction and curriculum materials support ($F = 2.04$, $df = 3$, $p = .12$).

Another ANOVA test was conducted to examine the relationship between the number of science teachers and their job satisfaction. This showed there was a significant difference between groups (F = 19.3, df = 3, *p*<.01). A post-hoc Tukey's test revealed that the difference in means among the four groups was statistically significant. Table 4 presents the levels of teachers' job satisfaction according to schools' support for curriculum materials or extracurricular activities.

Table 4 Teachers' job satisfaction according to schools' curriculum support

				95% CI	
	n	M	SD	LL	UL
Poor support	41	2.98	.33	2.92	3.13
Fair support	104	3.20	.30	2.97	3.09
Good support	174	3.48	.28	2.76	2.85
Very good support	66	3.96	.28	2.97	3.11
Total	385	3.41	.31	2.89	2.96

As indicated in Table 4, science teachers who were at the 'poor support' group were least satisfied with their teaching profession among other groups (M = 2.98, SD = .28). Teachers working at the 'very good support' group were most satisfied with their teaching profession (M = 3.96, SD = .28). These results indicated that the curriculum materials support was an important factor related to the levels of teachers' job satisfaction. The large schools offered more curriculum materials support to science teachers than the small ones did.

During the interviews, new teachers (i.e., under three years teaching experience) from the 'very good support' schools expressed that they were stressful due to time constraints. Although they had enough resources, they did not have enough time to prepare for laboratory activities. Thus, they often felt unprepared to teach classes. In addition, they indicated their needs of emotional support from mentors, administrators, and parents for their concerns and challenges in reducing their job dissatisfaction. These results confirmed that both curriculum materials support and the emotional support to science teachers are important factors positively related to the levels of teachers' job satisfaction.

Laboratory activities play an important role in science teaching and learning. They are the essence of science that enables students to engage in problem centered learning tasks (Wheatley, 1991). The Texas state standards require science teachers to integrate laboratory activities into at least 40% of their curriculum (Texas Education Agency, 1996). During the interviews, science teachers from the small schools stated that they had difficulty in following the state standards due to the lack of laboratory facilitates to use, enough time to integrate laboratory activities into teaching. They pointed out that they did not have enough time to prepare for laboratory activities. For instance, according to physics teachers from the large schools, they have two preparation periods out of eight class periods as the school follows the American Association of Physics Teachers (AAPT) standards. They indicated that it usually took more time to conduct and prepare for laboratory activities than they expected. In addition, they often had to share laboratory facilities with other teachers. Thus, they had to divide students into two groups and then conducted the same experiment twice. Consequently, it made them feel frustrated and unprepared for teaching.

DISCUSSION AND CONCLUSION

This study aimed to answer three research questions. The first research question asked: What is the relationship between schools' curriculum materials or extracurricular activities support and school size? As indicated in Table 1 and Table 2, the large schools in our sample offered more curriculum materials or extracurricular activities to science teachers than the small ones did. This result showed that the levels of curriculum materials support to science teachers were related to school size. Teachers working at the large schools indicated that they were more satisfied with their jobs than those who were working in small ones. The more schools provided teachers with opportunities such as field trip, laboratory facilities, professional development, technological materials, or science related opportunities for students, the more the levels of science teachers job satisfaction increased. It indicated that schools' curriculum materials or extracurricular support for teachers played a significant role to increase their job satisfaction. Consistent with the previous studies, the results of this study demonstrates that schools' curriculum materials or extracurricular activities support is positively to school size (House 1981, Singer et al., 2000).

It should be noted that only seven out of the 50 schools provided the 'very good support' to science teachers. Science teachers at these schools were the most satisfied teacher with their teaching profession among the participants (M = 3.23). This result supports the findings of previous research: There is a significant positive relationship between the levels of teachers' job satisfaction and schools' curriculum materials support (Bogler, 2001; Littrell et al., 1994; Tickle et al. 2011; Russell et al., 2010). In sum, the levels of curriculum materials support by schools can be used as an indicator that is positively related to the levels of science teachers' job satisfaction.

The second research question asked: What is the relationship between schools' curriculum materials support and the levels of teachers' job satisfaction? The ANOVA result showed that there was no significant difference between schools' curriculum materials or extracurricular support and the levels of teachers' job satisfaction. It indicated there were other factors that negatively affected job satisfaction. It should be noted that teachers from the 'poor support' schools were least satisfied with their jobs among the participants. Regarding the levels of teachers' job satisfaction, the interview data showed that the majority of teachers were overwhelmed by workloads such as unnecessary administrative duties and excessive meetings. They indicated the necessity of reducing teacher workload that is unrelated to educate students and increasing salaries for unpaid working hours. In this regard, we suggest that a high school principal needs to be a more effective administrator while encouraging science teachers to support each other regarding classroom practices as well as to share potential pitfalls and modifications of lessons.

The third research question asked: What is the relationship between the number of science teachers and the levels of their job satisfaction? The ANOVA result showed that there was a significant difference between the number of school teachers and the levels of teachers' job satisfaction. This result indicated that the more the number of science teachers increased, the more the levels of their job dissatisfaction increased. During the interviews, the majority of new teachers less than three years among the participants indicated that their needs for emotional support from mentors, administrators, and parents for their concerns and challenges in reducing their stress. This result supports the findings of previous studies: school's supportive environment is an important factor that is related to teachers' job satisfaction (Tickle et al., 2011; Russell et al., 2010; Singer et al., 2000). In this regard, we suggest that policy makers and practitioners need to focus on promoting teachers' job satisfaction by improving their working environments through the support from administrators, teacher leaders, and parents.

IMPLICATIONS

Based on the analysis of our quantitative and qualitative data, we suggest the following four things to increase science teachers' job satisfaction and their retention rates in Texas. First, we emphasize the necessity of increasing the levels of teachers' job satisfaction in the small schools by providing more curriculum materials or extracurricular activities to teachers as well as providing more professional development opportunities in which they can learn how to integrate laboratory activities into their teaching.

Second, school administrators need to build cooperative relationships among all teachers and parents to increase new teachers' job satisfaction.

Without building the cooperative relationship among them, it is difficult to increase teacher retention rates. They also need to provide science teachers with technical assistants responsible for managing laboratory activities to reduce their workload. If there are technical assistants, science teachers will be able to focus on preparing for their teaching rather than cleaning laboratory facilities (Lindner, Kubat, & Consortium of the Comenius Network SciCamp, 2014). They need to spend their time in observing other science teachers' teaching by sharing ideas and materials with their colleagues. Especially, classroom observations will help new teachers overcome their isolation and improve their teaching skills.

Third, science teachers need to have more professional development opportunities. On-going professional development provides science teachers with many opportunities to improve their teaching skills, to collaborate with colleagues, and to learn how to implement new technologies into their teaching (Valdmann, Holbrook, & Rannikmäe, 2012; Yoon et al., 2007). In this regard, school administrators need to increase the budget for teacher professional development.

Last, based on our findings, we suggest that future studies need to examine other factors such as unpaid hours of work grading testing and evaluation standards, cultural differences, and communication with parents that may have influenced the levels of science teachers' job satisfaction. Investigating these factors will enable us to have a better understanding regarding the issue of science teacher shortage. Knowing science teachers' needs based on various factors will help science researchers and experts propose appropriate strategies that can enhance teachers' commitment to the teaching profession and may increase their job satisfaction. Additionally, it will aid school administrators in deciding whether they need to improve what types of working conditions among safe environments, collegial cooperation, parental involvement, administrative leadership, sufficient learning resources, or student problems.

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