

Perceived Peer Support and Personal Science Teaching Efficacy Beliefs of Preservice Elementary Teachers

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ABSTRACT

112 preservice elementary teachers' perceived peer support levels in a teacher education classroom and their personal science teaching efficacy (PSTE) beliefs were investigated. A significant portion of the participants expressed receiving very low academic and social support from their peers. Based on the results from the multiple regression analysis, perceived peer support scores have been concluded to be a significant predictor of the PSTE scores. Similar to the results from previous studies on PSTE beliefs, perceived peer support level was found to be impacted not by participants' gender, but by their high-school major area. Parallel to the previous studies, comparing the PSTE scores by high school major area, preservice teachers with science majors have been found to perceive higher peer support, compared to non-science majors. The significant positive correlation between the perceived peer support and PSTE scores supports Bandura's theory that social environment is an important source of self-efficacy beliefs.

Key Words: Perceived Peer Support; Personal Science Teaching Efficacy; Preservice Elementary Teacher; High-School Major

INTRODUCTION

Previous research on elementary student attitudes concludes that elementary teachers are the most important single influence on students' attitudes toward a subject area (Üstüner, Demirtaş, & Cömert, 2009), such as science (Akgün, 2009; Cox & Carpenter, 1989). However, failings within elementary teacher education programs with respect to science preparation have been widely documented in the literature. It has been repeatedly cited that preservice elementary teachers' negative beliefs about science had resulted in a science anxiety, poor attitudes toward science, and lack of confidence to help students involve in scientific activities (Bleicher, 2006; Carrier, 2009; Gunning & Mensah, 2011; Jarrett, 1999; Plourde, 2002; Sarıkaya, Cakiroglu, &



Tekkaya, 2005; Shrigley, 1974). Similarly, many elementary teachers are reported to dislike and fail to understand science (Davis & Smithey, 2009; Levitt, 2001; Ramey-Gassert & Schroyer, 1992; Tosun, 2000).

These findings from the research on elementary teachers' science teaching incompetence urge that a successful generation of elementary students in science requires increasing the quality of elementary science teacher education programs. However, this does not merely depend on increasing the number of science content courses that teacher candidates take in college, because it is well documented that increasing the amount of science content has surprisingly little effect on preservice teachers' confidence to teach (Appleton, 1995; Cox & Carpenter, 1989; Morrell & Carroll, 2003; Palmer, 2001, 2006). It has been also reported that besides the subject matter knowledge, teacher efficacy beliefs and attitudes toward science have significant effects on the quality of classroom science instruction (Cantrell, Young, & Moore, 2003; Jarrett, 1999; Ramey-Gassert & Schroyer, 1992; Riggs, 1991).

The founder of social cognitive theory, Bandura (1997), used the concept of *reciprocal determinism* to explain that the personal factors, environmental factors, and people behaviors influence each other. Bandura argued that social environment impacts the *self-efficacy* beliefs of individuals to achieve a task. Self-efficacy was defined as "the beliefs in one's capability to organize and execute the courses of action required to produce given attainments" (p.3). Bandura (1977) hypothesized that "Efficacy expectation is a major determinant of people's choice of activities, how much effort they will expend, and how long they will sustain effort in dealing with stressful situations" (p. 194). Consistent with this hypothesis, numerous researchers concluded that high self-efficacy beliefs positively influence teachers' instructional methods, and therefore the quality of classroom instruction (Cantrell et al., 2003; Çakıroğlu & Işıksal, 2009; Ramey-Gassert & Schroyer, 1992; Riggs, 1991).

Following Bandura's (1977) definitions, Ashton and Webb (1986) defined two types of teaching efficacy; personal teaching efficacy and outcome teaching efficacy. Since the efficacy beliefs are accepted to be context and subject matter dependent, definitions have been extended to specific subject areas. In the area of science teaching, two forms of efficacy beliefs are defined; personal science teaching efficacy (PSTE) and science teaching outcome expectancy (STOE). PSTE – or science teaching self-efficacy – is a person's belief in his or her ability to teach science effectively and STOE is the belief that effective teaching will have a positive effect on student learning (Cantrell et al., 2003; Moore & Watson, 1999).

Bandura (1977, 1997) described four sources for the perceived efficacy beliefs. First and the main source is the interpreted result of one's previous performance or the *mastery experiences* because these experiences provide the authentic evidence that one can succeed in a desired task. A second source of perceived efficacy is the *vicarious experiences* generated by observing another individual while performing a task that is relevant to the observer's perceived goals. *Social persuasion* is the third source of efficacy beliefs which is received from others such as the verbal judgments. The fourth and final source of efficacy is the *physiological and emotional states* such as anxiety, stress, and mood states.

Although modern education focuses on a student-centered approach rather than a teacher-centered instruction and peer interactions in classroom activities are documented to positively impact teaching self-efficacy beliefs (Bleicher, 2009; Britton & Anderson, 2010; Cox & Carpenter, 1989; Moore & Watson, 1999; Ramey-Gassert & Shroyer, 1992), peer-interactions in preservice teacher classrooms are usually ignored (Johnson & Johnson, 1985). As summation of their meta-analysis of over a thousand studies dating back to the nineteenth century, Johnson and Johnson concluded that peer interactions in cooperative environments maximize both the

academic and social skills; however, it is most often underrated by teacher educators, because “peer influences have been viewed by teachers as encouraging off-task, disruptive behavior in the classroom” (p. 22).

Based on the Bandura’s (1997) classification of the sources of self-efficacy beliefs and findings from the related literature, it is clear that peer support would have an enduring effect on the perceived efficacy beliefs about teaching a subject, such as science. Efficacy beliefs may be raised if sufficient peer support is received on the personal capabilities. This argument is supported by the research findings, where peer interactions are documented to be a significant factor impacting teacher candidates’ beliefs about their personal skills (Brand & Wilkins, 2007; Dinsmore & Wenger, 2006; Seifert & Mandzuk, 2006). For example, after a study with 484 undergraduate students, Moran and Gonyea (2003) reported that peer interactions contributed to the student-faculty interaction, student involvement, and quality of students’ effort more than the students initially expected. Similarly, Pleacha (2002) conducted a study with 7440 college freshman from 115 institutions and confirmed the findings of Pasceralle (1985) that peer interaction is positively related to students’ academic self-confidence. Using preservice elementary teachers’ written reflections during a science methods course, Brand and Wilkins (2007) concluded that “While mastery experiences and vicarious experiences were major factors, the validation from the classroom atmosphere was also reported to impact preservice teachers’ teaching self-efficacy, causing them to approach problem situations positively and confidently.” (p. 310). Based on the findings in favor of peer interactions, Britton and Anderson (2010) recommended that peer coaching can be integrated into preservice teacher education curricula.

Compared to a growing number of research on preservice elementary teachers’ self-efficacy beliefs about science, the lack of data about the impact of different sources of perceived efficacy beliefs – especially the sources related to the classroom environment – does not allow us fully understand the nature of self-efficacy beliefs. Also, there is very little number of studies investigating the peer support levels of Turkish preservice elementary teachers, and more importantly explaining the interplay between the levels of peer support and teaching efficacy beliefs. Thus, this study will contribute to the literature not only by investigating the perceived peer support and PSTE levels of Turkish preservice elementary teachers’, but also investigating the relationship between these variables. For these reasons, the data from this study would provide original findings about this significant, but usually ignored phenomenon. The research questions investigated in this study are:

- What is the level of perceived peer support among preservice elementary teachers?
- Do perceived peer support levels of preservice elementary teachers differ with gender and/or high-school major?
- Do PSTE beliefs of preservice elementary teachers differ with gender, high-school major and/or perceived peer support?

METHODOLOGY

a) Participants

The sample consisted of 112 preservice elementary teachers (46 females and 66 males) from three classrooms of a central-Anatolian university. All participants were juniors in their third year of a four-year undergraduate program and were cohorts for the past three years. The age range was 19-30 (median=21). Since elementary education undergraduate programs are open for students with both science and non-science high-school majors, participants are also grouped

according to their high-school majors. Sixty-five of the participants had science major in high school, whereas 47 of them had non-science majors. All participants had taken the same science content and pedagogical college courses required by their program before the senior year and were enrolled in a science methods course during the study.

b) Data Collection Instruments

To measure the perceived peer support and science teaching self-efficacy belief scores, the Classroom Life Instrument (Johnson, Johnson, & Anderson, 1983) and the Science Teaching Efficacy Belief Instrument (STEBI-B) (Enochs & Riggs, 1990) were administered at the end of the science methods II course semester. The Classroom Life Instrument (CLI) was originally designed as a 59-item survey consisting of 12 factors to assess students' relationships with peers and teachers and their attitudes toward social interdependence. Among the 59 items, 4 items were about student academic support and 5 items were about student social support. Since the purpose of this study was to investigate the levels of peer support, these 9 items related to student support factors have been selected from the original CLI. The respondents were asked to rate each item on a 5-point Likert scale of "1: Completely false, 2: False much of the time, 3: Sometimes true and sometimes false, 4: True much of the time, 5: Completely true". The score range for the CLI is 9-45, and the higher the score, the higher the perceived peer support. The internal reliability alpha coefficients were reported to be .67 for the student academic support factor and .78 for the student personal support factor (Johnson et al., 1983).

STEBI-B is a widely used instrument to assess self-efficacy beliefs of pre-service teachers regarding science instruction in schools. The instrument consists of two subsets; personal science teaching efficacy (PSTE) and science teaching outcome expectancy (STOE). PSTE beliefs refer to the extent that teachers believe they have the capacity to positively affect students' achievement and STOE beliefs refer that student learning can be influenced by effective teaching. Since the goal in this study is to investigate the relationship between the peer support and personal efficacy beliefs, only the PSTE scale of the STEBI-B instrument was administered to the participants. PSTE consists of 13 items (5 positive-worded and 8 negative-worded), each to be rated by the respondent on a one (strongly disagree) to five (strongly agree) rating scale. When participants' survey scores are calculated, the item scores are reflected (5=1, 4=2, 3=3, 2=4, 1=5) for the negative-worded items. The score range for the PSTE subset is 13-65, and the higher the score, the higher the level of PSTE. The internal reliability alpha coefficient of the PSTE scale of the STEBI-B was calculated to be .90 (Enochs & Riggs, 1990).

The shortened versions of the CLI and the PSTE scale of the STEBI-B were translated into Turkish by the author and a Turkish graduate student majoring in elementary science education at an American university. Turkish versions of the surveys were then back-translated into English with the help of another Turkish graduate student majoring in secondary science education at the same American university. Examination of the original versions and the back-translated versions by these experts indicated that the Turkish translations of the surveys were parallel to the original surveys.

To explore the structural validity of the Turkish versions of the CLI and the PSTE scale of the STEBI-B, exploratory factor analyses have been run. Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy values are found to be .85 for the CLI and .87 for the PSTE scale. Along with the significant results of the Bartlett's Test of Sphericity ($p < .001$) for both analyses, the data from the sample of this study are concluded to be appropriate for conducting factor analyses (Pallant, 2007).

Since the CLI items belonged to two factors in the original survey, an exploratory factor analysis has been conducted to explore whether the data from this study's sample for the selected 9 items contributed to different factors. The factor analysis data indicated that the selected 9 items contributed not to two separate factors of student academic and personal support, but to a single factor with a minimum factor loading of .46. This factor is named as *perceived peer support*, which comprises both the academic and social support provided from the peers. On the other hand, the factor analysis data revealed that all PSTE items had factor loadings higher than .37 for the Turkish version of the STEBI-B. These single factors were found to explain 47% of the variance in the CLI scores and 36% of the variance in the PSTE scores. The Cronbach's α coefficients for the Turkish versions of the surveys were found to be 0.86 for the CLI and 0.84 for the PSTE. Based on these data, Turkish translations of the surveys are considered to be valid and reliable instruments to measure Turkish participants' beliefs about peer support and PSTE.

c) Data Analysis Methods

Before deciding on the statistical methods for investigating the research questions, the normality assumptions for the data distributions are tested. Statistically insignificant results of the Shapiro-Wilk normality tests ($p > .05$) confirmed that the CLI and PSTE scores can be considered normally distributed and parametric statistical methods can be used.

To investigate the first and second research problems, firstly descriptive statistical measures (percentages, means, and standard deviations) are reported for the whole sample and for the subgroups that are formed by the levels of the independent variables. A 2x2 factorial analysis of variance (ANOVA) test is used to investigate possible effects of gender, high-school major, and the interaction of these two variables on the CLI scores. The homogeneity of the variances assumption for the factorial ANOVA has been checked with the Levene's test. Statistically insignificant result of the Levene's test ($p = .66$) indicated that this assumption is not violated. Partial eta-squared (η^2) effect sizes are calculated to explore the practical significance of the main effects and the interaction effect.

To investigate the third research problem, a multiple regression analysis is conducted with the dependent variable of PSTE scores and the independent variables of gender, high-school major, and CLI scores. The Pearson correlation coefficient between the participants' PSTE and CLI scores is also calculated. The significance alpha level was used .05 for all statistical tests.

FINDINGS

The percentages for the participants' responses to the CLI items are reported in Table 1. When the percentages are reported in Table 1, the "completely true" and "true much of the time" options are combined under "Agree" category, and the "completely false" and "false much of the time" options are combined under "Disagree" category. The percentages for the neutral option are not reported.

The percentages in Table 1 clearly indicate that, although the participants were together for the past three years in the same classroom, the peer support levels are very low both academically and socially. Compared to a single item with an agreement percentage of higher than 50% (item 5), the majority of participants expressed that their peers did not care about their feelings (item 1) or how much they learned in the classroom (item 6). Agreement percentages were higher than disagreement percentages for only two of the items (items 2 and 5), but still a significant amount of participants disagreed with these items.

Table 1. Percentages of Participants' Responses to the CLI Items

| <i>CLI Items</i> | <i>Percentage</i> | |
|---|-------------------|-----------------|
| | <i>Agree</i> | <i>Disagree</i> |
| In this class, other students; | | |
| 1. care about my feelings. | %7 | %61 |
| 2. think it is important to be my friend. | %38 | %22 |
| 3. want me to do my best schoolwork. | %17 | %50 |
| 4. like to help me learn. | %29 | %39 |
| 5. like me the way I am. | %51 | %16 |
| 6. care about how much I learn. | %10 | %65 |
| 7. want me to come to class every day. | %24 | %47 |
| 8. like me as much as they like others. | %24 | %40 |
| 9. really care about me. | %27 | %34 |

The CLI scores of participants, according to their gender and high-school majors, are summarized in Table 2. A comparison of the cell means according to gender and high-school major reveals that (a) regardless of their high-school major, males and females have very close CLI scores, (b) regardless of gender, science majors have higher CLI mean scores than their non-science majored peers, and (c) regardless of being in any subgroup, the mean CLI scores are only just above the half of the maximum CLI score ($45/2=22.5$). In fact, male non-science majors have a mean value of 22.10, which is even lower than half of the maximum score.

Table 2. Participants' Mean CLI Scores by their Gender and High-School Major Area

| | <i>Science Major</i> | | | <i>Non-Science Major</i> | | | <i>Total</i> | | |
|---------------|----------------------|----------|----------|--------------------------|----------|----------|--------------|----------|----------|
| | <i>Mean</i> | <i>s</i> | <i>n</i> | <i>Mean</i> | <i>s</i> | <i>n</i> | <i>Mean</i> | <i>s</i> | <i>n</i> |
| Female | 26.87 | 6.12 | 23 | 22.57 | 6.48 | 23 | 24.72 | 6.60 | 46 |
| Male | 26.42 | 6.72 | 24 | 22.10 | 7.30 | 42 | 23.67 | 7.35 | 66 |
| Total | 26.64 | 6.37 | 47 | 22.26 | 6.98 | 65 | 24.10 | 7.04 | 112 |

The factorial ANOVA results showed that the interaction effect (gender*high-school major) [$F(1, 108) = 0.001; p = .99$] and the gender main effect [$F(1, 108) = 0.12; p = .73$] on the CLI scores were statistically insignificant. The significant result for the high-school major area [$F(1, 108) = 10.60; p = .002; \eta^2 = .09$] suggests that science major participants expressed significantly higher perceived peer support scores than their non-science major peers. Also, the partial eta-squared effect size value indicates that the high-school major area has a medium-size effect (Pallant, 2007) on the CLI scores.

The PSTE scores of participants according to their gender and high-school majors are summarized in Table 3. A comparison of the cell means according to gender and high-school major reveals that compared to the differences due to gender, the differences due to high-school major are greater

Table 3. Participants' Mean PSTE Scores by their Gender and High-School Major Area

| | <u>Science Major</u> | | <u>Non-Science Major</u> | | <u>Total</u> | |
|---------------|----------------------|------|--------------------------|------|--------------|------|
| | Mean | s | Mean | s | Mean | s |
| Female | 51.3 | 5.68 | 49.9 | 4.19 | 50.6 | 5.02 |
| Male | 52.5 | 5.76 | 46.5 | 7.85 | 48.6 | 7.71 |
| Total | 51.9 | 5.69 | 47.6 | 7.01 | 49.4 | 6.80 |

To assess the ability of the gender, high-school major, and CLI scores to predict the PSTE scores, a multiple regression model was used. The statistically significant ANOVA result [$F(3, 105) = 7.44; p < .001$] showed that this regression model provided a statistically significant multiple correlation coefficient ($R = .42; Adjusted R^2 = .15$). The results of the multiple regression analysis indicated that both high-school major ($beta = 0.217; p = .02$) and the CLI scores ($beta = 0.274; p < .01$) are significant predictors of the PSTE scores, whereas gender ($beta = 0.087; p = .34$) is not a significant predictor.

Based on the comparison of the standardized beta coefficient values of the high-school major and the CLI scores, CLI scores are concluded to be a better predictor of the PSTE scores. The significant Pearson correlation coefficient ($r = .35; p < .001$) between the participants' CLI and PSTE scores indicates that there is a positive mid-sized correlation between the perceived peer support and PSTE beliefs of preservice teachers.

DISCUSSION and CONCLUSIONS

The results for the first research problem seem to be a worrisome finding for Turkish teacher educators. From the percentages of the responses to the CLI items, more than half of the participants reported that they did not receive sufficient academic or personal support from their classmates. These findings show that although they were taking the same classes as cohorts for three years, participants seriously lacked in providing support to their peers. Compared to findings for similar samples of preservice teachers from American Universities (Bursal, 2007; Dinsmore & Wenger, 2006; Seifert & Mandzuk, 2006), where a majority of participants expressed receiving high level of peer support, Turkish preservice teachers seem to lack exchanging positive peer support among class members.

The second research problem was about the impact of two independent variables on the CLI scores. The interaction effect of the gender*high-school major area and the main effect of gender have both been found as statistically insignificant. This finding is consistent with previous literature that Turkish university students' perceived peer support levels (Öktem & Yardımcı, 2010) and communication skills (Baykara Pehlivan, 2005) do not differ by gender. Combined with the findings from the first research question, one can conclude that both female and male preservice teachers in the sample received similar low levels of peer support. Unlike the gender variable, a significant difference due to high-school major area was observed in the CLI scores. Preservice teachers with science majors have been found to have significantly higher CLI scores than their non-science major peers. Therefore science majors in the sample perceived a higher level of peer support compared to their non-science major peers.

The reasons of this significant difference in the CLI scores, due to high-school major, may be a result of various reasons. An important finding in the literature (Bursal, 2010) cites that preservice elementary teachers with a science high-school major feel more confident to teach elementary mathematics and science than their non-science major peers, because of their relatively strong background in these areas. This argument is consistent with Sarıkaya et al.'s

(2005) conclusion that science knowledge level is a significant predictor of the PSTE beliefs. Since high-school major was found to be a significant indicator of teaching self-efficacy beliefs, it is not surprising that it has a significant impact on teacher candidates' perceived peer support levels. According to Bandura's (1997) definitions, self-efficacy beliefs are influenced by the positive or negative support of the social environment. Preservice teachers with high teaching self-efficacy beliefs are likely to be the ones, who received higher peer support than those with lower self-efficacy beliefs.

The third research problem was investigated to clarify the results of the second research problem. As discussed above, the conclusion for the second research problem was that the higher CLI scores of the science majors -compared to non-science majors- may be due to the significant differences in these groups' teaching self-efficacy beliefs. Therefore, a multiple regression model was designed with the PSTE scores as the dependent variable and gender, high-school major, and the CLI scores as the independent variables. Consistent with the results of the second research problem, while high-school major area and CLI scores were found to be significant predictors of the PSTE scores, no significant difference due to gender has been detected in the PSTE scores. The insignificant result for the gender is consistent with the related recent literature that there might be different factors – other than gender – that may rather have a greater effect on teacher candidates' beliefs (Akbaş & Çelikkaleli, 2006; Bursal, 2010; Demirtaş, Cömert, & Özer, 2011; Karaduman & Emrahoğlu, 2011; Osborne, Simon, & Collins, 2003; Yaman, Cansüngü, & Altunçekiç, 2004).

The comparison of the beta regression coefficients from the regression analysis indicated that the CLI score was the best predictor among other independent variables of this study to predict the PSTE cores. This finding suggests that perceived peer support and personal science teaching efficacy beliefs are significantly related, which is consistent with the previous literature reporting that peer support is a significant contributor to students' self-confidence (Brand & Wilkins, 2007; Britton & Anderson, 2010; Dinsmore & Wenger, 2006; Moran & Gonyea, 2003; Osborne et al., 2003; Pleacha, 2002; Seifert & Mandzuk, 2006). This conclusion also supports Bandura's (1997) theory that social environment is an important source of self-efficacy beliefs and therefore, teacher candidates receiving higher peer support tend to have stronger teaching self-efficacy beliefs.

SUGGESTIONS

As teacher educators, our common goal is to prepare highly-qualified teacher candidates, both academically and socially. However, the findings of this study underline the fact that current Turkish teacher education programs do not help teacher candidates enhance their social skills and interact with their classmates as much as they should.

As Bandura (1997) recommended, a significant source of self-efficacy beliefs is the support we receive from our social environment. In a classroom, the main sources of this support are the teacher and the classmates. This study shows that we are far behind the desired level of providing peer support to preservice elementary teachers. To be able to overcome this serious trouble, teacher educators should always consider designing cooperative environments for their students and also preparing opportunities for sharing the support among peers during the college courses. For example, college classrooms should be designed in a way that, instead of sitting on fixed tables, students would be able to work in different groups and interact with their peers. Also, instead of traditional group tasks where cooperation is not built well, cooperative group tasks can be used to enhance the positive interdependence of students. However, these actions should not

stay merely in the classrooms. The campus facilities, such as dorms and cafeterias where students spend most of their times, can be reorganized to increase the peer interaction of students.

This study included the peer side of the classroom support, but it can be inferred from the results of this study that the support of university professors also impacts preservice teachers' teaching self-efficacy beliefs. Therefore, to be able to shed more light on this problematic phenomenon, new studies can be designed to investigate the level and impact of academic and social support that university professors provide to teacher candidates.

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