Educational Sciences: Theory & Practice - 13(4) • 2449-2453

www.edam.com.tr/estp
DOI: 10.12738/estp.2013.4.1853

Prospective Science Teachers' Self-efficacy Beliefs about Teaching Science between 6-8 Terms and the Opinions on These Beliefs

Fatma ÖNEN[a]
Marmara University

Gülfem MUŞLU KAYGISIZ[b]
Hasan Kolyoncu University

Abstract

The formal educational institutions and the society have an important function in acquiring a sense of self-efficacy. Teachers play a role in the formal educational process. The purpose of the study is to examine prospective science teachers' self-efficacy belief level in the 6th to 8th terms and the differences in this process. This survey model study was applied in the spring semester of 2009-2010,the fall and spring semesters of the academic year 2010-2011. 40 prospective science teachers, from Marmara University Primary Science Education Department, participated in the study for three semesters. The data was collected by science teaching self-efficacy belief scale, interview questions and video recordings. The data of the scale was analyzed with paired sampled t-test and the descriptive statistical technique. Interview questions were analyzed by open-coding, and the results were interpreted in tables. According to the findings, participants' self-efficacious for science teaching is usually "good"; and it is determined from this context they found themselves quite efficient to teach science. Besides, prospective science teachers have a positive attitude towards the lessons which offer opportunity to practice. The practical lessons are highly significant for the prospective science teachers' self-efficacy beliefs.

Key Words

Science Education Self-efficacy Belief, Personal Self-efficacy in Science Teaching, Result Expectation in Science Teaching, Prospective Teacher, Science Education.

Human behavior depends on the people's self-consciousness of their capacity rather than their ability to do things (Kurbanoğlu, 2004). Thus, the difference between having ability and using it properly in different situations is related to self-efficacy. Self-efficacy came into prominence when Bandura (1986) put forward that behaviors are related to confidence. Being conscious about one's self-efficacy and developing this ability enable people to work more effectively and efficiently (Özgen & Bindak, 2008), to endeavor and spend more time on their work (Akkoyunlu & Orhan, 2003), to accomplish results faster (Izgar & Dilmaç, 2008) and to work more productively and easily when faced with challenging tasks (Yılmaz, Yılmaz, & Türk, 2010). Although every teacher encounters similar problems, some of them have more positive attitudes towards these obstacles (Çapri & Kan, 2006). It is thought that this may be related to the teachers' self-efficacy.

a **Fatma ÖNEN, Ph.D.,** is currently a doctor of Elementary Science Education. Her research interests include nature of science, teaching methods. *Correspondence:* Dr. Fatma ÖNEN, Marmara University, Faculty of Education, Elementary Science Education Department, Göztepe Campus, 34722, Kadıköy, Istanbul, Turkey. Email: fatma.onen@marmara.edu.tr, fatma_onen@hotmail.com Phone: +90 216 345 9090/369.

b Gülfem MUŞLU KAYGISIZ, Ph.D., is currently an assistant professor of Elementary Science Education. Contact: Hasan Kalyoncu University, Faculty of Education, Havaalanı Yolu Üzeri 8. Km., Şahinbey, Gaziantep, Turkey. Email: gulfem.muslu@hku.edu.tr.

Teachers' perception of self-efficacy regarding science teaching is related to their beliefs about their ability to teach science effectively and efficiently, and their ability to increase students' success (Akbaş & Çelikkaleli, 2006). Science lessons have a crucial role in the development of self-efficacy (Çoban & Sanalan, 2002).

Research has shown that teachers with high self-efficacy use various teaching strategies (Koray, 2003; Riggs & Enochs, 1990), develop teaching materials considering individual differences (Yılmaz & Çimen, 2008) and develop their teaching experiences (Brand & Wilkins, 2007; Pajares, 1992; Smylie, 1988 as cited in Pajares, 1996). This situation affects students' achievement and motivation significantly (Martin, 2006). Many studies related to teacher self-efficacy can be found in Turkey (Akkoyunlu, Orhan, & Umay, 2005; Aktağ & Walter, 2005; Aydın & Boz, 2010; Azar, 2010; Bozdoğan & Öztürk, 2008; Çapri & Çelikkaleli, 2008; Çelikkaleli & Akbaş, 2007; Dede, 2008; Ekinci Vural & Hamurcu, 2008; Erdem, Yılmaz, & Akkoyunlu, 2008; Meriç & Ersoy, 2007; Üredi & Üredi, 2006; Yenilmez & Kakmacı, 2008) and it is seen that research on science teaching and self-efficacy focus on different descriptive variables (Çoban & Sanalan, 2002; Önen & Öztuna, 2005; Üredi & Üredi, 2006).

It is vitally important to find out and apply the approaches, observing them that increase teacher self-efficacy since it has an important role in student success (Cantrell, Young & Moore, 2003; Chester & Beaudin, 1996; Gibson & Dembo, 1984; Karaduman & Emrahoğlu, 2011; Özdemir, 2008; Öztürk, 2008; Tschannen-Moran, Woolfolk Hoy, & Hoy, 1998). And teachers who have high elf-efficacy, use student-centered approaches (Graham, Harris, Fink, & MacArthur, 2001; Wertheim & Leyser, 2002). Therefore, it may be important to study pre-service science education teachers' (who are in their 6-8th terms in which they take many pedagogical classes) perceptions on their self-efficacy, how their beliefs change during this period and what kind of factors affect it in depth.)

Research Questions

The aim of this study is to find out the 6-8th term pre-service teachers' perceptions and views of self-efficacy regarding teaching science. The research questions are:

1. What are the pre-service teachers' perceptions of self-efficacy regarding teaching science before their 6th term?
2. What are the pre-service teachers' perceptions of self-efficacy regarding teaching science after their 6th term?
3. What are the pre-service teachers' perceptions of self-efficacy regarding teaching science after their 7th term?
4. What are the pre-service teachers' perceptions of self-efficacy regarding teaching science after their 8th term?
5. Is there difference between the self-efficacy beliefs of pre-service teachers' in the 6-8th terms?
6. According to the pre-service teachers, what kinds of factors affect self-efficacy?

Method

Survey and random model approaches are used in this study. Forty primary science education students in their third year participated in this study. The students were randomly chosen from a state university in Istanbul in 2009-2010 Spring and 2010-2011 Spring and Fall terms. The participants were 10 male 30 female students aging between 20-24.

Data Collection

Two different data collection tools were used in the study. Table 1 below summarizes how and when these tools were used:

Table 1.
Data Collection Tools

Terms	Applied Time	Data Collection Tools
2009–2010 spring(6.term)	Before the term	STEBI
	After the term	STEBI - interview
2010–2011fall (7.term)	After the term	STEBI- interview
2010–2011 Spring(8.term)	After the term	STEBI - interview

Science Teaching Efficacy Beliefs Instrument and Interview Questions: STEBI is used to collect data in the study. STEBI is developed by Riggs and Enochs (1990) and was translated to Turkish by Özkan, Tekkaya, and Çakıroğlu (2002). It is a 5-point likert scale questionnaire consisting of 23 items. It consists of two subscales: the first subscale, personal science teaching efficacy belief, consists of 13 items; and the second subscale, science teaching outcome expectancy, consists of 10 items.

At the beginning of the study, pre-service teachers were classified into 3 groups (high, average and low) depending on the answers they gave to STEBI. Afterwards, two pre-service teachers from each group were chosen and interviewed after each term. The purpose of the interviews was to find out the teacher candidates' beliefs of self-efficacy and what kinds of factors affect it. In the interviews, 11 open-ended questions were asked to the teacher candidates. 5 of the questions were prepared by considering the items in STEBI and 6 of the questions were prepared by examining the course content and thinking about the factors that may affect their beliefs on self-efficacy. For the validity of the questions (Ercan & Kan, 2004), the views of 3 experts on science education were asked and necessary changes were made in the pilot study. Six pre-service science teachers participated the interviews.

Data Analysis

The data was analyzed descriptively in SPSS. For the analysis of the questionnaire, Paired sampled t-test was applied. Interviews were analyzed by doing content analysis and open coding technique. To be reliable, a third researcher also analyzed the data.

Reliability of the Study

The reliability of the questionnaire was found .85 (Denizoğlu, 2008). In this study, the cronbach alpha was found .846. The consistency of the coders was determined with correspondence percent, which was determined as 84% and if the results are higher than 80% is reliable (Kabapınar, 2003). The statements on which coders were not agreed were not included in the study.

Results

The results of the study indicate that STEBI subscales and item-total correlations were high in the first four research questions. The fifth research question of the study was to find out whether the perceptions on the self-efficacy of the pre-service teachers change between 6-8th terms. The results of the t-test show that there is not a significant difference between the perceptions of the pre-service teachers (t: 1,708, *p*: 0.95).The results of the subscales also show that there is not a significant difference between the 6^{th} and 8^{th} terms: Personal science teaching efficacy belief (t: 1.850, *p*: .072), science teaching outcome expectancy (t: 1,191, *p*: 0.241).

The perceptions of pre-service teachers' on self-efficacy were tried to be gathered in the interviews. In the interviews, all the pre-service teachers stated that they believe they will be good teachers. They also stated that the training and practice they had had helped them to acquire the necessary teaching methods and techniques. The teachers mentioned that to create a good atmosphere for teaching science, the classes should be enriched with various teaching materials.

According to the teacher candidates, pedagogy and teaching practicum classes were the most fruitful ones since they gave them a chance to improve. Yet, the teachers also stated that after taking Teaching Practicum I class, they discovered that they are not sufficient in preparing lesson plans and area studies. Moreover, some pre-service teachers complained that they could not get enough feedback from their professors during the teaching practicum.

Discussion

According to the results obtained from the questionnaire and the interviews, it is seen that regardless of their year at university, pre-service teachers' self-efficacy levels were high. This result is consistent with some researches (Aksu, 2008; Evans, 2010). Whereas, this result is not consistent with literature (Fettahlıoğlu, Güven, İnce Aka, Sert Çıbık, & Aydoğdu, 2011). This may be related to the student profiles and what grade they are in at university. It is also found in the study that there is not a significant correlation between self-efficacy and whether the students chose their majors deliberately. This result is also inconsistent with literature that Gerçek, Yılmaz, Köseoğlu, and Soran (2006), Aslan and Uluçınar Sağır (2008), Saracaloğlu and Yenice (2009), Hevedanlı and Ekici (2009) found there is a correlation between self-efficacy and teachers' willingness to choose their departments. It can be predicted that the inconsistency in the current study may be related to the high self-efficacy levels of the pre-service teachers participated in the study.

Although the participants have a high level of self-efficacy, they stated that they lack some area studies knowledge; which shows that there are some shortcomings in science education. This is consistent with literature that Özkan et al. (2002) found similar results. Interview results also show that pre-service teachers think that pedagogy classes are very beneficial for them. Küçükyılmaz and Duban (2006); Önen, Macaroğlu, and Gürdal

(2004) also point out the importance of these classes. Some of the studies show that there is a positive correlation between the self-efficacy level of students and the years spent at university (Aslan & Uluçınar Sağır, 2008; Chester & Beaudin, 1996; Önen & Öztuna, 2005; Yaman, Cansüngü Koray, & Altunçekiç, 2004). However, different results were obtained in this study. This may be due to pre-service teachers' seeing themselves competent enough in teaching science.

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