MATHEMATICS TEACHING EFFICACY: DOES HAVING EXPERIENCE REALLY MATTERS?

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Abstract

The purpose of this study is to investigate the changes in prospective middle school mathematics teachers’ mathematics teaching efficacy belief during their enrollment in teacher education program and at the end of their first year and the second year employment as a teacher. A longitudinal survey design was used in order to collect data from 30 prospective middle school mathematics teachers before they graduated from teacher education program, at the end of their first year employment and at the end of their second year of employment as a teacher. Findings indicated that mathematics teaching efficacy of the prospective teachers decreased at the end of their first year of teaching but increased at the end of their second year of teaching.

Keywords: Self-efficacy, mathematics teaching efficacy, prospective middle school mathematics teachers.

1 INTRODUCTION

Self-efficacy is defined as “beliefs in one’s capabilities to organize and execute the course of action required to produce given attainments” [1]. People who are efficacious set objectives to achieve and resist when faced with difficulties. Bandura stated that self-efficacy influence how people think, feel, behave and motivate themselves [2]. Strong sense of efficacy supports individuals’ well-being and accomplishment even they face with obstacles. Teacher self-efficacy, an adapted version of self-efficacy in teaching context [3] is related to teachers’ belief in their ability to teach mathematics (personal efficacy) and their belief that students’ learning can be influenced by effective teaching. Therefore, two key components are emphasized in teaching efficacy, which are beliefs about teachers’ ability to bring about actions and the potential influence of these actions on student learning. Tschannen-Moran and Woolfolk Hoy stated that teacher efficacy is an important determinant for teachers’ persistence, enthusiasm, commitment, and instructional decisions [4]. In addition, teacher efficacy is reported to be related to student achievement [5,6], motivation [7], and efficacy [8]. Therefore, teacher efficacy is clearly an important construct in the field of education. The studies related to teacher efficacy are mostly focused on developing scales for measuring teacher efficacy [4,9], examining the predictors of teacher efficacy [10], exploring the relationship between teacher efficacy and teacher knowledge [11], and investigating the effect of department and years spent in program on teacher efficacy [12]. While these studies elaborated on important aspects of self efficacy, investigation of the development of efficacy-belief is also important to investigate since it is hard to change well-established belief systems [13]. Thus, conducting longitudinal studies is eminent to see the changes in self-efficacy across time [10,14,15]. There are some longitudinal studies conducted in order to investigate the changes in teacher efficacy over time (i.e. during the teacher training programs and/or after graduating from these programs) in the related literature [13,14,16]. To begin with, Palmer examined the changes in preservice primary teachers’ science teaching self-efficacy before and after a science method course and reported that the course had a positive influence on efficacy beliefs of the preservice teachers [16]. In another longitudinal study, Woolfolk Hoy assessed the efficacy of preservice and novice primary school teachers at the beginning of teacher preparation program, at the end of student teaching and after their first year of employment as a teacher and found that while efficacy increased during teacher preparation it decreased with actual experience as a novice teacher [13]. Similarly, İşiksal-Bostan investigated prospective middle school mathematics teachers’ (PMMT) efficacy belief during their enrollment in teacher education program and at the end of their first year of employment as a teacher and found that while PMMTs’ teaching efficacy increased during teacher education program it decreased during their first year as a teacher [14]. As a continuation of her work, the aim of this longitudinal study was to investigate prospective middle school mathematics teachers’ efficacy belief at the end of teacher education program and in the following two years of their working careers as a teacher. Thus, following research question guided the present study:
1 How does prospective middle school mathematics teachers’ mathematics teaching efficacy belief change during their enrollment in teacher education program and at the end of their first year and the second year employment as a teacher?

2 METHODOLOGY

In order to answer research question, a longitudinal survey design was used. Data were collected from 30 prospective mathematics teachers enrolled in Elementary Mathematics Teacher Education program at a large public university in Ankara, Turkey. More specifically the first data were collected from PMMT (prospective middle school mathematics teachers) before they graduated from teacher education program (Time 1). Then, the second data set were collected at the end of their first year employment as a teacher (Time 2). Last data set were collected at the end of their second year of employment as a teacher (Time 3). In order to evaluate mathematics self-efficacy of participants, Mathematics Teaching Efficacy Belief Instrument (MTEBI) [9] was used. The MTEBI consists of two sub-dimensions namely personal mathematics teaching efficacy (PMTE) and mathematics teaching outcome expectancy (MTOE). The PMTE dimension is related to teachers’ perceptions of their ability to teach mathematics. “I will continually find better ways to teach mathematics” and “I know how to teach mathematics concepts effectively” are two examples for the personal mathematics teaching efficacy dimension. The second dimension of the scale which is outcome expectancy is related to teachers’ perception that teacher action will translate into student learning. “When the mathematics grades of students improve, it is often due to their teacher having found a more effective teaching approach” and “When a low-achieving child progresses in mathematics it is usually due to extra attention given by the teacher” are two examples from the scale related to the outcome expectancy. The MTEBI is a five point Likert type instrument consisted of responses ranging from strongly agree to strongly disagree. The scale was translated and adapted for the Turkish students by Cakiroglu [17]. Cronbach’s alphas were calculated for the total scale and sub dimensions separately. More specifically, Cronbach’s alphas were calculated for Time 1, Time 2, and Time 3 for the MTEBI as a whole and for the self-efficacy and outcome expectancy subscales respectively. The calculated Cronbach’s Alpha values were ranged between .79 and .82 which are considered as high for the social sciences.

3 RESULTS

In order to answer research question, descriptive statistics regarding mean difference across time intervals were calculated. Then, in order to test the significance of findings, one-way repeated ANOVAs were conducted for overall efficacy, personal mathematics teaching efficacy, and mathematics teaching outcome expectancy respectively. Before conducting inferential analysis, normality, independence, and sphericity assumptions were checked. Findings showed that the total mathematics teaching efficacy scores differed significantly between the time periods (p=.01). As can be seen from Figure 1, total efficacy score decreased significantly (p=.01) from Time 1 (M= 85.8, SD= 7.4) to Time 2 (M= 81.2, SD= 7.4). Participants’ efficacy scores started to increase after Time 2 and created significant difference (p=.01) between Time 2 and Time 3 (M= 84.7, SD= 5.9). Findings revealed that there was no significance difference in mean scores between Time 1 and Time 3 (p=.5).

Figure 1. Total efficacy score with respect to time interval.
In addition to the overall efficacy scores, one-way repeated measures of ANOVA was conducted to analyze participants’ self-efficacy scores and outcome expectancy scores separately over time periods. According to the findings, mean self-efficacy scores differed significantly over time periods ($p=.01$). More specifically, participants’ self-efficacy scores decreased significantly ($p=.01$) from Time 1 ($M=56, SD=5.3$) to Time 2 ($M=53.1, SD=5.1$). However, self-efficacy scores increased significantly ($p=.0$) at the end of Time period 3 ($M=55.9, SD=4.4$). In addition, there was no significant mean difference was detected between Time 1 and Time 3 ($p=.8$).

![Figure 2. Self-efficacy score with respect to time interval.](image)

Similarly, findings revealed that outcome expectancy scores differed significantly between time periods ($p=.1$). Follow-up post-hoc test showed that there was a significant ($p=.04$) decrease from Time 1 ($M=29.8, SD=4.2$) to Time 2 ($M=28.06, SD=3.7$). However, there was no significant mean difference between Time 2 and Time 3 ($p=.22$) and between Time 1 and Time 3 ($M=28.8, SD=4.2$, $p=.25$).

![Figure 3. Outcome expectancy score with respect to time interval.](image)

4 CONCLUSIONS

Findings revealed that teachers’ efficacy belief decreased significantly after their graduation from teacher education program. More specifically, even they had higher efficacy scores when they enrolled in teacher education program those scores decreased at the end of their first year of employment as a teacher. This finding is consistent with the study of Woolfolk Hoy [13], in which she reported an increase in preservice primary school teachers’ teaching efficacy during teacher preparation but a decrease in teaching efficacy as novice teachers. However, what is new in the light
of the results of this study is that the situation was interestingly reversed and teachers' efficacy scores increased significantly at the end of their second year of employment as a teacher. When the first data set were collected participants were very close to their graduation. In other words, they had completed method and teaching practice course in which they had many opportunities to prepare activities for middle school students, observe students and their mentor teachers. Thus, those engagements could have positively influenced their efficacy beliefs [14,16,18]. In other words, those experiences could positively affect prospective teachers' ability to teach mathematics effectively and their belief that students' learning can be influenced by effective teaching. However, findings revealed that there was a sharp decrease in teachers' efficacy score after their recruitment as a teacher. It is deduced that when novice teachers confronted with complexities and realities of actual teaching, they may lose their confidence in their ability to teach mathematics effectively and their belief that students learning can be influenced by effective teaching [19]. Interestingly, novice teachers' efficacy belief increased at the end of their second year of employment as a teacher. Better classroom experiences [20], improved communication with students, parents, and administrators, being familiar with the content being taught might be the factors that support that increase. Further qualitative research studies could be conducted to investigate the factors that support or inhibit teachers' teaching efficacy belief during their enrollment in teacher education programs or during their employment as a teacher.

REFERENCES


