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A study on mathematical literacy self-efficacy beliefs of prospective teachers

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Abstract

The purpose of this study is to determine the prospective teachers' self-efficacy beliefs about mathematical literacy, and examine these beliefs in terms of some variables. The survey was conducted among 140 prospective mathematics and physics teachers. Data is collected by personal information forms developed by the researchers and "Mathematics Literacy Self-Efficacy Scale" which was developed by Özgen and Bindak (2008). Findings show that prospective teachers' self-efficacy beliefs about mathematical literacy are below the average. Although physics prospective teachers' self-efficacy beliefs about mathematical literacy are higher than mathematics prospective teachers the difference is not statistically significant.

Keywords: Mathematics literacy, teacher education, prospective teachers, self efficacy;

1. Introduction

Organization for economic co-operation and development (PIAAC, 2009) indicated that with national economies facing growing unemployment as the new century ends its first decade, the issues of human capital development rise in importance. In a series of studies in the 1990s, the OECD, Statistics Canada, and Educational Testing Service demonstrated the importance of literacy skills for the effective functioning of labor markets and for the economic success and social advancement of both individuals and societies.

A mathematically literate citizen realizes how quickly change is taking place and the consequent need to be open to lifelong learning. Adapting to these changes in a creative, flexible and practical way is a necessary condition for successful citizenship. The skills learned at school will probably not be sufficient to serve the needs of citizens for the majority of their adult life. Programme for International Student Assessment (PISA) defines mathematical literacy as an individual's capacity to identify and understand the role that mathematics plays in the world, to make well-founded judgments and to use and engage with mathematics in ways that meet the needs of that individual's life as a constructive, concerned and reflective citizen (OECD, 2006).

Bandura, (1986) defined self-efficacy as an individual's judgment of their capacity to organize and execute the courses of action required to attain designated types of performances. And students with high self-efficacy join the activities more willingly, work harder and may be insistent.

The debate on teacher education has gained special importance, as teacher quality is more and more being identified as decisive to student outcomes. Research shows that most effective way to raise educational quality is to modify initial teacher education and recruitment, and to develop the means to train teachers that are already in-service; indeed, teacher education has a significant impact on teachers' behaviours and teaching skills, and on the student outcomes (Musset,

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2010). Karakus and Akbulut (2010) indicated that individuals constitute their self-efficacy beliefs according to their past experiments. Moreover, self-efficacy beliefs are crucial to teaching, because they influence teachers' teaching experiment and teacher-student interaction. In this respect, teachers' education programs are very important for forming pre-service teachers' self-efficacy beliefs.

An examination of the literature shows that the studies often focus on mathematics self-efficacy beliefs (Cakiroglu & Isiksal, 2009; Isiksal, 2005; Isiksal, & Cakiroglu, 2006; Kahle, 2008; Karakus & Akbulut, 2010; Umay, 2001) or mathematical literacy levels (Doyle, 2007; Graven & Venkat, 2008; Guzel & Berberoglu, 2010; Tekin & Tekin, 2004). Differently the purpose of this study is to investigate prospective teachers' self-efficacy beliefs about mathematical literacy. Within this context, the following three research questions are addressed:

- 1-What is the level of prospective teachers' self-efficacy beliefs about mathematical literacy?
- 2-Do prospective teachers' self-efficacy beliefs about mathematical literacy differ according to the department?
- 3-Do prospective teachers' self-efficacy beliefs about mathematical literacy differ according to gender?

2. Method

2.1. Participants

The study was conducted in the academic year of 2010-2011 at Istanbul University in Turkey. Participants were 140 prospective mathematics and physics teachers attending master programs without thesis in the field of secondary education. These are the students who graduated from Faculty of Sciences and study only content lessons during their education. They attend to this program in order to take pedagogical content lessons to be a secondary school teacher.

2.2. Data Collection

As a means of data collection; personal information forms developed by the researcher and "Mathematics Literacy Self-Efficacy Scale" which was developed by Özgen and Bindak (2008) was used. Math Literacy Self-Efficacy Scale is made up of 25 matters as a five point Likert scale. Some of the matters are positive while some are negative. The range of the inventory score is between 25 and 125.

2.3. Data Analysis

A descriptive survey research design was employed in this study. During the analysis arithmetic means and standard deviations of the mathematical literacy self-efficacy beliefs level scores are calculated. T-test and variance analysis are applied in order to find whether the differences between the arithmetic means are relevant or not. And the limit for the relevance in the statistic analysis is accepted as $p < .05$.

3. Results

Table 1 shows standard deviations and the means of prospective teachers' mathematical literacy self-efficacy beliefs scores.

Table 1. Means and standard deviations of prospective teachers' mathematical literacy self-efficacy beliefs scores

| N | \bar{x} | SS |
|-----|-----------|-------|
| 140 | 73.25 | 11.09 |

As shown in Table 1 mathematical literacy self-efficacy beliefs scores ($\bar{x} = 73.25$) of prospective teachers indicate that their beliefs are below the medium level.

Findings of sub-problem 'Do the self-efficacy beliefs of prospective teachers towards mathematics literacy differ according to the department?' is shown in Table 2.

Table 2. t-test results of prospective teachers' mathematical literacy self-efficacy beliefs according to their departments

| Departments | N | \bar{x} | SS | t | p |
|-------------|----|-----------|-------|------|------|
| Mathematics | 59 | 71.35 | 13.45 | 1.74 | 0.08 |
| Physics | 81 | 74.64 | 8.84 | | |

It is clear that self efficacy beliefs of prospective teachers towards mathematics literacy do not differ according to the department ($p > 0.05$). The fact that averages are so close to each other, couldn't let the differences to be seen statistically. But prospective teachers in both departments are below the average in terms of mathematical literacy self efficacy beliefs.

Findings of sub-problem 'Do the self-efficacy beliefs of prospective teachers towards mathematics literacy differ according to the gender?' are shown in Table 3.

Table 3. t-test results of prospective teachers' mathematical literacy self-efficacy beliefs according to gender

| Gender | N | \bar{x} | SS | t | p |
|--------|----|-----------|-------|------|------|
| Female | 96 | 74.03 | 9.19 | 1.14 | 0.25 |
| Male | 43 | 71.62 | 14.54 | | |

When mathematical literacy self-efficacy beliefs of prospective mathematics and physics teachers are examined in line with gender no considerable difference has been observed.

4. Conclusion and Discussion

Findings of the research show that mathematical literacy self-efficacy beliefs of prospective mathematics and physics teachers are below the average. These students are the persons who have not chosen to be teachers at the beginning of their graduate studies. This may be the reason of low mathematical literacy self-efficacy belief score.

It has been defined by Ozgen (2011) that high school students have medium level belief in their mathematics literacy self efficacy. Prospective teachers were expected higher mathematical literacy self-efficacy beliefs than high school students.

Prospective teachers' mathematics literacy self efficacy beliefs do not differ according to the department. Although there was not statistically meaningful difference of prospective teachers mathematical literacy self efficacy beliefs' according to department, mean scores of prospective physics teachers are higher than prospective mathematics teachers.

When mathematical literacy self-efficacy beliefs of prospective mathematics and physics teachers are examined in line with gender no considerable difference has been observed.

Self-efficacy is an important part of shaping students' lives so it is essential for teachers and educators to foster positive self-efficacy in their classrooms. Understanding prospective teachers' mathematical literacy efficacy beliefs while they are students is crucial to ensuring that new teachers will succeed in their practice. In conclusion, it can be said that both prospective mathematics and physics teachers need some assistance in order to get rise in their mathematical literacy self-efficacy beliefs.

Since most of the studies concerned with mathematics self-efficacy beliefs it is thought that it would not be truthful to compare results with mathematical literacy self efficacy levels.

Future research may focus on the factors influencing mathematical literacy efficacy beliefs of prospective teachers. Additionally, similar studies with elementary mathematics education students, in-service mathematics teachers and prospective teachers in other universities can facilitate more generalizable results.

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