

Determining the Views of Prospective Mathematics Teachers about Proving

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Abstract: The aim of the present research is to determine the opinions of prospective mathematics teachers about proving. The research sample of the study is composed of 151 prospective teachers who study in the third (n= 75) and fourth grades (n= 76) in the Department of Elementary Mathematics Teaching in Erzurum Ataturk University. The data of the present research were obtained through the Proof Opinion Questionnaire. The findings indicate that prospective teachers do not have fully-formed opinions on the topic of proof.

Key Words: Mathematical Proof, Prospective Teachers, Mathematics Education

Introduction

Mathematics is an abstract science by nature (Altun, 2002). Since mathematical information is abstract, it must be verified through proofs. In school mathematics, when students prove mathematical equations they also learn that knowing the most recent form of the formulae is not sufficient; they have to explain their calculations with reasons. From this aspect, proof is an important component of both mathematics and mathematics education (Güven, Çelik & Karataş, 2005).

Axioms, definitions, hypotheses, theorems and the proofs of the theorems are indispensable components of mathematics. They form the basis of mathematics as a scientific discipline (Heinze&Reiss, 2003). Although advanced mathematics courses, particularly at universities, are based on these concepts, the students studying advanced mathematics at university have difficulty in making mathematical proof (Almeida, 2000; Recio & Godino, 2001; Jones, 2000).

One of the most important functions of education systems is to ensure that students develop skills in reasoning. As the reasoning skills of students develop, they simultaneously gain the cognitive skills within the higher levels of the Bloom taxonomy (Fitzgerald, 1996). Therefore, the preparation of suitable activities for mathematical reasoning forms the core of mathematics education, in order for students to develop their reasoning skills from the first years of their educational lives (NCTM, 2000; Stylianides, Stylianides & Philippou, 2007; Schoenfeld, 1994).

While the meaning and the importance of proving in mathematics and mathematics education rapidly increase, the reasoning ability of mathematics teachers and prospective teachers, who will raise students who may become mathematicians in the future, and their opinions and related perceptions, will be of great importance (Moralı *et al.*, 2006). In order to configure their courses effectively, mathematics teachers should know the origins of the concepts they present and on which mathematical information or principle they are based. Hence, they should be equipped with the ability to conduct exercises in mathematical reasoning.

The aim of the present research is to determine the opinions of prospective mathematics teachers about proving. The present research is of value, as the opinions expressed by prospective teachers will constitute the first step in identifying and addressing any potential problems regarding the future teaching of reasoning skills.

Method

The sample of the present research consists of 151 prospective teachers who study in the third (n= 75) and fourth grades (n= 76) in the Department of Elementary Mathematics Teaching in Erzurum Ataturk University.

A five-point Likert scale, which was prepared by Almeida (2000) and developed and adapted to Turkish by Moralı *et al.* (2006), was used to assess the opinions of the prospective mathematics teachers on the issue of proving. Answer options ranged between “completely agree” and “completely disagree”. In the study of Moralı *et al.* (2006), reliability calculation conducted with the study group for the scale was determined as 0.80, in this study the result was found as 0.82.

Findings

In the assessment of the questionnaire on the opinions of prospective mathematics teachers about proving, the score of 3.5 or more was regarded as a high and desirable score for each item. Accordingly, the opinions of those who receive a total score of 70 ($3.5 \times 20 = 70$) or more are desirable. Similarly, a score of 2.5

or less for each item is regarded low, the opinions of those who receive 60 points or less ($2.5 \times 20 = 60$) are not considered desirable. Those who scored a total between 61 and 71 are included in the “indecisive” group.

The opinions of the prospective mathematics teachers about proving are given in Table 1, below.

	Positive Opinion	Indecisive	Negative Opinion	Total
f(%)	70(46,3)	54(35,7)	27(17,8)	151(100)

Table 1: Percentages and Frequencies of the Opinions of Prospective Mathematics Teachers about Proving.

Table 1 shows that approximately 46% of the participants scored 70 points or more in total; approximately 18% scored 60 points or less; and approximately 36% of participants were classed as “indecisive”. The results indicate that the number of prospective teachers who expressed positive opinions about proof is higher than those who expressed indecisive and negative opinions about proof.

Conclusions

The findings of the present research show that approximately 46% of prospective teachers expressed positive opinions about proving, 36% were indecisive, and 18% expressed negative opinions. These data further demonstrate that the prospective teachers did not completely comprehend the importance of proving, which is a fundamental component of mathematics education. This result is similar to the findings reported by Morali *et al.* (2006).

When many items in the scale used in the present research are examined, it is seen that the indecisiveness about the questions asked might mean that the conceptualization of mathematical logic reasoning is not at the desired level. Accordingly, it can be said that the proving related conceptualization levels of approximately one third of the prospective mathematics teachers are not at the desired levels.

Suggestions

There is increasing interest in proof within primary and secondary education. Therefore, prospective mathematics teachers should be sufficiently educated so that they can develop proof-based mathematics activities. The efficiency of mathematics education can be increased by revealing the discovering instinct of students carrying out such activities.

Given that prospective teachers have learned hundreds of mathematical theorems and their proofs during their teacher-training, rote learning should be avoided. To this end, activities should be developed that allow prospective teachers to internalize proof. This process will be more useful when these activities are prepared by both prospective teachers and academics.

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