

Readings In Cooperative Learning For Undergraduate Mathematics

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Integrating Dynamic Mathematics Software into Cooperative Learning Environments in Mathematics

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ABSTRACT

The aim of this study was to evaluate the implementation of the cooperative learning model supported with dynamic mathematics software (DMS), that is a reflection of constructivist learning theory in the classroom environment, in the teaching of mathematics. For this purpose, a workshop was conducted with the volunteer teachers on the implementation of the cooperative learning model supported with DMS. Dynamic materials and worksheets suitable for quadratic functions and sequences topics were developed. The effect of implementing the cooperative learning model supported with DMS in the teaching of the quadratic functions and sequences topics on student performance as well as students' views about the model were examined. The study was carried out using an embedded design. The study group consisted of 61 high school students. A quadratic functions knowledge test, a sequences knowledge test, and an open-ended questionnaire were used as data collection tools. The Mann-Whitney test and dependent *t*-test were used for the analysis of quantitative data, while content and descriptive analyses were used for the analysis of qualitative data. As a result of analysis of the data, it was found that the model had a positive effect on student achievement. Moreover, the following students' views were identified: the model enabled better understanding, it visualized and concretized the course, and it created a pleasant and enjoyable learning environment.

Keywords

Dynamic mathematics software, Cooperative learning, GeoGebra, Mathematics learning and teaching

Introduction

Social changes have triggered rapid development. Information and communication technologies (ICTs) have affected human life and have resulted in new opportunities to emerge and new information to be created. These innovations require perspectives and expectations towards mathematics, the use of mathematics in different ways and a review of mathematics instruction. In line with these changes and developments, new problems have occurred in our life each passing day and individuals who have realized the importance and value of mathematics and who have developed their power of thinking are needed more than ever (Turkish Ministry of National Education [TMoNE], 2013). However, as mathematics is more abstract and difficult (Herzig, 2002) when compared to other disciplines (Diens, 1971; Frenkel, 2013; Sarana & Clements, 2009), it results in difficulties in the teaching and learning of mathematics (Yenilmez & Avcu, 2009).

As most mathematics concepts are abstract, they cause difficulties in the teaching and learning processes. Functions are one of the most important concepts which are difficult to learn, resulting in misconceptions (Ural, 2006) and play both a central and connective role among mathematics topics (Selden & Selden, 1992). As a result of the close relationship between functions and mathematical thinking, the active use of functional thinking for solving problems in different disciplines (Bayazit & Aksoy, 2013), the important role of learning functions and graphs in understanding mathematics (Kutluca & Baki, 2013) and the difficulties while learning the topic are increasing more and more. Quadratic functions and graphs are special and important states of functions and they are the basic principles of functions for secondary school students (Even, 1990). However, it is known that students have difficulty with quadratic functions and graphs just like with functions (Kutluca & Baki, 2009; Sajak, 2003; Tatar, Okur, & Tuna, 2008; Zarkis, Liljedahl, & Gadowsky, 2003). After the functions topic is taught in the 9th grade in the secondary school mathematics curriculum, students again encounter quadratic functions and graphs in the 10th grade in Turkey. Similarly, in 11th grade, there are topics which mainly involve functions. The sequences topic which is linked to the functions topic is one of the main topics in which students have difficulty in understanding in the 11th grade in Turkey (Akgün & Duru, 2007; Durmus, 2004; Tatar, Okur, & Tuna, 2008).

Functions, quadratic functions and graphs, sequences, numbers and algebra are generally among the difficult topics to learn. Students continue to meet these topics in the numbers and algebra learning domain of the curriculum in the mathematics courses taught in their undergraduate studies, particularly relating to the

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