

**Determination of Cognitive Models about Sequences and Series of the Elementary Mathematics Prospective Teachers**

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**Abstract**

In this study, 3rd grade elementary school mathematics education students' cognitive models about sequences and series were determined. In the study, there was a comparison between students' cognitive models and real scientific models. In the study, the data were gathered from the semi-structured interviews with 10 students and visualizations were obtained during these interviews. At the end of the study, results indicated that students have similar cognitive models about the series, sequences and their properties. However, students' responses during the interviews are not appropriate when the scientific models were considered. In addition, some students were able neither to construct cognitive models nor to make a comment about sequences and series.

**Keywords:** model, cognitive model, mathematical model. sequences, series

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### **Extended Abstract**

#### **Purpose**

When the literature is examined, it is observed that there are not enough studies on mental model in mathematics instruction in Turkey. In addition to this, the difficulty index of sequences and series unit in the studies conducted on mathematics subjects ranks among the top, and students have difficulty in understanding sequences and series subjects in the conducted studies. In this scope, determination of students' mental models on sequences and series subjects has driven us to carry out this research. In this study, 3rd grade elementary school mathematics education students' cognitive models about sequences and series were determined.

#### **Method**

Case study method – which is included in the qualitative research design and which is used in the studies that are performed in order to define and see the details that constitute a situation, develop probable explanations related to a situation and evaluate a situation – has been used in this study that has been carried out to determine the mental models about sequence and series concepts. Case study is known as the method in which one or more situations, environments, programs, social groups or interconnected systems are deeply examined. The participants of the study are composed of 10 voluntary students who were in their third year in the Department of Elementary Mathematics in Atatürk University in 2009-2010 academic year and who took Analysis-III course in which sequences and series subjects were featured. In the study, the data were gathered from the semi-structured interviews with 10 students and visualizations were obtained during these interviews. In this study, semi-structured interview type has been chosen since it gives a chance to guide the interviewee to other open-ended questions based on the reactions that he/she will give during the interview. Throughout the interviews, an environment has been formed, which would allow the students to give their answers to the asked questions by thinking comfortably and calmly. Thus, the aim has been for the interviewed students to explain what they want and think just the way it is by making them feel comfortable. The objective of this study has been explained to each student at the beginning of the interviews. The interviews have been made in parallel with the interview form and lasted approximately 40-45 minutes for each student. In the conducted interviews, the answers given by the students have been transcribed and noted down. The interviews, which have been made with the students to determine mental models, have been evaluated with descriptive analysis method.

#### **Results**

At the end of the study, results indicated that students have similar cognitive models about the series, sequences and their properties. However, students' responses during the interviews are not appropriate when the scientific models were considered. In addition, some students were able neither to construct cognitive models nor to make a comment about models.

#### **Discussion**

The quality of the mental models formed by the students has an important place as an indication of whether or not the concepts have been understood and whether or not the information has been structured. To have knowledge about the mental models – which are utilized or possessed since they help us understand why students' misconceptions or alternative concepts resist change – is important for instruction activities to succeed.

#### **Conclusion**

To know students' mental models belonging to the concept and compare those with the literature before performing instruction about a concept are presented as the recommendations of the study. Models belonging to the mathematical concepts that lie in students' minds must be determined in the following studies, and instruction must be performed by taking these into account.

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