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CONGRUENCY-SIMILARITY TEACHING THROUGH CREATIVE DRAMA IN MATHEMATICS TEACHING

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ABSTRACT
Geometric models and geometric samples take an important place in mathematics teaching (Sherard, 1981). In mathematics teaching, students gain permanent acquisitions thanks to discovering and generalizing by introducing geometric shapes and by making students grasp them. One of the main objectives of geometry teaching is to be able to explain geometric shapes' congruency and similarity by comparing them. Congruency and similarity of triangles is among the subjects which has been studied on since the beginning of geometry, it is as old as geometry itself (Baykul, 2009). Lots of teaching methods can be used in teaching the congruency and similarity situations of triangles. Students best learn this subject through exploration. Creative drama, one of the contemporary teaching methods, allows student to explore. Geometry teaching through creative drama, a teaching method, is the main focus of this study. In the study, creative drama practices were carried out aiming at two acquisitions pertaining to geometry learning area congruency and similarity sub learning area in 7th grade mathematics subject. In the study, the purpose is to put forward the applicability of creative drama in mathematics teaching. The study is a private case work and, workshop plan and an assessment form composed of 4 open-ended questions, which were developed by the researcher, were used as data collection tools. Descriptive analysis method was used in the analysis of the data. The practices were carried out with 41 students attending Samsun Gazi Primary School in the second term of 2012-2013 academic year. Within the scope of the practices, 21 students treated the subject via creative drama practices, while the other 20 students treated the subject via traditional method. In consequence of the application, it became apparent that the students in the creative drama group could better understand the processes of forming congruency and similar polygon, deriving polygon, forming a polygon similar to a polygon than the traditonal group. As a result, it was concluded that it is positive for the acquisitions pertaining to congruency and similarity sub learning area to be provided via creative drama.
Keywords: Creative Drama, Geometry Teaching, Mathematics Education, Mathematics Teaching.

1. INTRODUCTION

Today, one of the methods of learning-teaching and practise that starts from the unity of human and that aims simultaneously to improve the needs to know (wisdom), to hear (conscience and aesthetics) and to act (motion), which are common abilities of human, is "drama in education" (Akar Vural and Sommers, 2011; p.1). Educational studies of drama is gradually gaining wide currency as a teaching method in each step of formal training, mass education and during the lessons (San, 1991).

Creative drama is an activity that is improved by games in the course of education and thanks to its this property, it is the vital part of education (Üstündağ, 1994; quoted by Üstündağ, 2009; p.25). Its use as a method in educational programs in recent years attract attention (Üstündağ, 2009). Creative drama is state of actions, extemporisations and animations which the participants produce by relying on their own creative inventions, genuine thoughts and knowledge (San, 1998).

The fundamental objectives of the fields of drama and creative drama in education are to improve the fields of affective and psychomotor behaviours (Adıgüzel, 2013; p.53). Creative drama is a teaching method which can be used in many fields (Fulford et. al., 2001). Thanks to various animations in the process of education, including students in the daily life by placing them in the center is the basis of the method of creative drama. Permanent learnings occur in the process in which students actively take part and in which they use their sense organs.

Creative drama offers children the chance to explore themselves through the lives of fictional "others" in asafe space that enables mistakes to be made and learned from (Jindal-Sanpe et. al., 2011). Creative drama has an important place in the curriculums due to the traditional education's being insufficient and due to its putting individual in the center. Student's being active in the process of constructivist education is fundamental.

Field of geometry learning has a significant place in the elementary mathematics curriculum. It is required that various practices be included in the educational plans in order to enhance the success in geometry teaching (Swafford and others., 1997). It is necessary that students actively take part in the practices to be arranged in particular.

Geometric models and geometric samples have important roles in mathematics teaching (Sherard, 1981). To understand a mathematical definition, to make a hypothesis and to prove it, to visualize and to solve the problems are fundamental in mathematics teaching (Jones, Mooney and Harries, 2002). The fundamental of mathematics is to find a solution to the problems by understanding mathematics. It is necessary that in the solution of educational process, various teaching methods be included in the process. Geometry teaching through creative drama, which is a teaching method, forms the basis of this study.

2.Methods

Case study was used in the research. Case study allows one to determine what an event, a fact or individual's certain feature is and to make deep analysis (Gay, 2000). In this research, applicability of the method of creative drama in mathematics subject was examined in detail.

2.1.Study Group

The research was conducted with 42 students studying at 7th grade İlkadım Primary School in the second term in Samsun in the academic year of 2012-2013. Within the scope of implementation, 21 students were taught the subject through creative drama practices, while the other 21 students completed the process via traditional method.

2.2.Data Collection Tools

In the research, an evaluation form, which was arranged by the researcher and is made up of 4 open-ended questions, was used as data collection tool.
In the study, primarily interviews were carried out with the 7th grade mathematics teachers of primary school and the subjects which the students had difficulty in learning and understanding geometry were investigated. In consequence of the interviews carried out, it was determined that the students had difficulty in learning and understanding congruency and similarity. To that end, open-ended questions pertaining to congruency and similarity were arranged. 12 open-ended questions aiming at the subject of congruency and similarity were written. In the research, the evaluation of 4 open-ended questions were included.

At the end of the creative drama practices, the students were asked open-ended questions and the answers provided were analyzed. The research carried out is aiming at the applicability of creative drama and teaching of "congruency" and "similarity" in mathematics teaching. Before the creative drama practices, the open-ended questions arranged by the researcher were submitted to 5 persons who are experts on their branches and their approval that the questions are appropriate for the aim of the research were obtained.

2.3.Analysis of the Data

The method of descriptive analysis was employed in the analysis of the data. Descriptive analysis is an analysis that makes it possible for the research questions to be organized according to the themes they

produce, which allows for the quotations conspicuously reflecting the views of the individuals interviewed or observed, and which enables the findings obtained to be interpreted (Yıldırım and Şimşek, 2003).

In the study, creative drama practices were carried out aiming at the acquisition pertaining to congruency and similarity sub-learning field of geometry-learning field in the elementary education of 7th grade mathematics subject. The acquisitions are provided below.

1- The acquisitions determine whether the polygons are correspondent or not by comparing them and find correspondent polygons to a polygon.
2- The acquisitions determine whether the polygons are similar or not by comparing them and find similar polygons to a polygon.

At the end of the creative drama practices, an evaluation form of 4 open-ended questions were applied to all of the students. The qualitative data derived from the open-ended questions were encoded, and their percent and frequency values were obtained. Application of the workshop devoted to method of creative drama was conducted at four course hours.

3.Findings

The findings pertaining to the open-ended questions applied within scope of the research were presented below.

3.1.The Open-ended Questions Pertaining to Congruency and Similarity Learning Field and The Findings

The findings aiming at the four open-ended questions were included below. Each of the findings covers the tables including the students' expressions regarding creative drama and traditional teaching method.

Question-1. Draw a equilateral triangle on the dotted paper given below. Derive four equilateral triangles within the equilateral triangle you draw. Are there congruency and similarity in the triangles you derived? Explain.
The answers provided by the creative drama students are given in Table-1.

Table-1. Percentage-Frequency Distribution of Answres of Creative Drama Students

The Answers Pertaining to the State of Congruency and Similarity between the Triangles	Number of Students	Percentage Distribution
All the triangles are similar.	3	%14
The triangles are cookie-cutter.	3	%14
Congruences are at the same time similar, but similar ones are not congruences.	4	%19
The angles of big triangle and small triangle and their sizes are different.	5	%24
Those failing to form the shape.	6	%29
Total number of the students.	21	%100

Table-1 proves that the students participating in the creative drama practices know the congruency and similarity features in deriving polygon from equilateral triangle. In the creative drama practices, students made animations with tangram pieces. The answers the students provided are the terms they used in warm-ups and animations in the course of creative drama.
The table pertaining to the percentage-frequency distribution of the answers the students taught through traditional method provided for the first question is presented below.

Table-2. Percentage-Frequency Distribution of Answres of student group of traditional method

The Answers Pertaining to the State of Congruency and Similarity between the Triangles	Number of Students	Percentage Distribution
All the triangles are congruent and similar to each other.	5	%24
Cornet and edge numbers are equal to each other.	3	%14
Those failing to form the shape.	13	%62
Total number of the students.	21	%100

When the Table-2 is examined, the fact that at the end of the traditonal teaching method, 62% of the students failed to form the shape attracts the attention. It appears that the students listed only the features of congruence and similarity but failed to explain the state of congruence-similarity in the polygon.

Question-2. Draw a rectangle on the dotted paper given below, and draw polygons congruent to the rectangle you draw. Write the features of congruent polygons.
The answers the creative drama students gave are provided below.

Table-3. Percentage –Frequency Distributions of the Answers of Creative Drama Students

Forming Congruent Polygon	Number of Students	Percentage Distribution
They are congruent because they have same size.	6	%28
Similar polygons may be formed while forming congruent polygons.	4	%19
The proportion of congruent polygons to each other is 1.	2	%10
Their corners, edge numbers, shapes and angles are the same of each other.	5	%24
Those giving wrong answers.	4	%19
Total number of students	21	%100

Table-3 expresses the students' views on forming congruent polygons. It is understood from the percentage distribution that students correctly performed the drawing of a polygon congruent to a polygon.

The table pertaining to the percentage-frequency distribution of the answers the students taught via traditionsl teaching method is presented below.

Table-4. Percentage –Frequency Distributions of the Answers of Students Group of Traditional Method

Forming Congruent Polygon	Number of Students	Percentage Distribution
Polygon whose edge lengths and sizes are equal is formed.	7	%33
Polygon whose sizes of internal and exterior angles are equal to each other is formed.	2	%10
Those failing to form the shape.	12	%57
Total number of students.	21	%100

Table-4, it appears that the students failed to create (57%) congruent polygon in the course of the traditional teaching period. In addition, it was concluded that they could not answer the congruent and similarity features of the rectangle they drew but they listed their features pertaining their angles and

sizes. In the traditional method, the teacher used the school book. It was observed that the students had difficulty in the question about forming the congruent polygon.

Question-3. Draw a trapezium on the dotted paper given below. Create polygons similar to the trapezium you draw. Write the features of similar polygons.
The answers the creative drama students gave are provided in Table-5.

Table-5. Percentage –Frequency Distributions of the Answers of Student Group of Creative Drama

Deriving similar polygon	Number of students	Percentage Distribution
Polygons whose sizes and edge lengths and are different is formed.	7	%33
Dimensions of polygons are different.	6	%29
Their reciprocal edges are equally proportioned.	3	%14
Those giving wrong answers	5	%24
Total number of students.	21	%100

The above table shows that the students can form polygon similar to the trapezium drown. The student group of creative drama listed the different dimensions and features of the trapezium and clearly performed the drawings. Forming similar polygon and being able to list the features by using the trapezium reveal the efficiency of the teaching method provided.
The answers provided by the student group of traditional method are given in Table-6.

Table-6. Percentage-Frequency Distribution of Answres of Student Group of Traditional Method

Deriving Similar Polygon	Number of Students	Percentage Distribution
They were contracted at a certain rate.	7	%33
Its shape is same but its size is different.	4	%19
Those failing to form similar polygon.	10	%48
Total number of Students	21	%100

Table-6 shows that the students had difficulty (48%) in drawing trapezium. At the stage of deriving similar polygon, students' views that their shape is same but sizes are different (19%) and their expressions that they are contracted at a certain rate (33%) are positive. It becomes apparent that the students expressed limited number of opinions.

Question-4. Draw 3 triangles, which are similar to each other but at different positions, on the dotted paper given below. Draw polygons congruent to the triangles you draw.
The answers the creative drama students gave are provided below.

Table-7. Percentage –Frequency Distributions of the Answers of Creative Drama Students to the Fourth Question

Creating Polygon Congruent to a Polygon	Number of Students	Percentage Distribution
We use the same geometric shape.	4	%19
A geometric shape whose positions and shapes are different.	8	%38
Congruent polygon, whose dimensions are different only, is formed.	3	%14

Those giving wrong answer	6	%29
Total number of the students	21	%100

It becomes clear that the students participating in the creative drama practices are able to create a polygon congruent to a polygon. At the stage of forming polygon, Table-7, where the properties of using geometric shape (19%), position and shape (38%) and their dimensions (14%) were listed, is seen. However, it was determined that even though some of the students can draw triangles which are similar to each other but at different positions, they could not draw polygons congruent to these triangles.

The answers provided by the student group of traditional method are given in Table-8.

Table-8. Percentage-Frequency Distribution of the Answers of Student Group of Traditional Method to the Fourth Question

Creating Polygon Congruent to a Polygon	Number of Students	Percentage Distribution
Those drawing triangles only at different positions	10	%48
Those giving wrong answers	11	%52
Total number of the Students	21	%100

It is observed that 52% of the students, to whome traditional teaching was applied, made mistake in drawing triangle similar to each other but at different positions. It is seen in Table-8 that 48% of the students was able to draw triangles only similar to each other and at different positions, yet failing to create congruent poygon.

4.Result and Conclusion

As a result of the research, it was understood that the students in the creative drama group could learn the concepts of congruency and similarity between the triangles, could create congruent and similar polygons, could derive polygons and the stages of forming polugon similar to a polygon better than the traditional group students. As a result, it can be said that the fact that the acquirements pertaining to congruency and similarity sub-learning field is given through creative drama method is positive.

In the literature, there are a number of studies indicating similar results about the effectiveness of creative drama based instruction in the literature (Debreli, 2011; Duatepe, 2004; Duatepe ve Ubuz, 2004; Ersoy, 2013; Jeong Wee, 2009; Kariuki & Humphrey, 2006; Karakelle, 2009, Karapınarlı, 2007, Kayhan, 2004; Omnievski, 1999; Özsoy, 2003; Saab,1987; Sözer, 2006).These studies showedthe effectiveness of creative drama based instruction on understanding of mathematics lessons.

Saab (1987) states that while teaching mathematics, some elements of drama method such as individual's playing a part and employing music are used. Saab, in his research, employed the activities that will facilitate remembering and remaining in mind instead of dramatic set up to be included in a drama-based lesson. The research shows parallelism with our study.

Duatepe and Ubuz (2004), gave place to development and practice of lesson plans aiming at using creative drama in teaching and learning of geometry subjects in teaching drama-based geometry. With this lesson, it was concluded that the students explore the figure/shape which the dotes equidistant from a dot on the plane form, distinguish the area which the circle separated, compare the dotes given in the internal and external areas of a circle with the radius with their distances to the center and could link the circle with the ring (daire). In the study carried out too, it was significant to teach the subject of

geometry through creative drama workshop plan. Kayhan (2004) and Karapınarlı (2007), put forward that creative drama method in teaching mathematics has positive effects in the students' learning levels and retention levels. Jeong Wee (2009), focused on the fact that the practices conducted with the experts in field of creative drama increased the sense of responsibility, that the student is at the center of learning and that the leader of drama is important. In the research carried out too, the author is expert on the field of creative drama. The workshop plan written by the author in the research was prepared and applied by the author. Thus, the workshops conducted by the person expert on his field allow the process to be completed ideally.

Debreli (2011), put forward that the teaching based on creative drama is meaningful and stated that students show better performance, they actively participated in the lessons and it allowed for working in cooperation and for self-awareness. Creative drama has an important place in the education of students (Jindal-Sanpe et. al., 2011). In this research, the method of creative drama employed in mathematics teaching created a positive effect on the students. As the result of creative drama method, it became apparent that the concepts of congruency and similarity of triangles were better understood, and the stages of forming and deriving congruent and similar polygons actualized.

5.Suggestions

Karakelle (2009) points out that there is a substantial increase in the fluency and flexibility scores of the students participating in the process of creative drama. Students' creative thinking skills can also be tested in the practices of creative drama.

This research was arranged aiming at two acquisitions pertaining to geometry teaching field congruency and similarity sub-learning field, the applications aiming at other acquisitions can also be made. More outlasting creative drama studies can be made with the Elementary 7th grade students. The subject of creative drama can be included in the curriculum of the all levels of elementary education.

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