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LEARNING MATHEMATICS WITH CREATIVE DRAMA

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ABSTRACT

In this study, a mathematics activity that used creative drama method to teach the fifth grade standard "Expresses a position with respect to another point using direction and unit" under geometry and measurement was implemented. Twenty students attending the fifth grade of a public school participated in the study. The lesson plan involved four activities in warm-up, role-play, and evaluation stages. Activities include processes that will ensure active participation of students. The activity lasted two lesson hours. Two prospective mathematics teachers and a mathematics teacher were available in the class during the activity to observe student participation and reactions. Additionally, 10 students were interviewed to learn their views about the lesson. Comments of the observers and the responses of the students to the interview questions indicate that the lesson was successful.
Keywords: mathematics education, creative drama, geometry.

YARATICI DRAMA İLE MATEMATİK ÖĞRENİYORUM

ÖZ

Bu araştırmada, matematik beşinci sınıf geometri ve ölçme öğrenme alanında yer alan "Bir noktanın diğer bir noktaya göre konumunu yön ve birim kullanarak ifade eder." kazanımını edindirmek amacıyla yaratıcı drama yöntemi kullanılarak hazırlanan bir ders planının uygulaması yapılmıştır. Çalışmaya bir devlet okulunun beşinci sınıfında okumakta olan 20 öğrenci katılmıştır. Etkinlikte kullanılan ders planı ısınma, canlandırma ve değerlendirme bölümlerinde yer alan dört etkinlikten oluşturulmuştur. Etkinlikler öğrencilerin aktif katılımlarını sağlayacak süreçleri içermektedir. Ders planının uygulaması iki ders saati sürmüştür. Uygulama sürecinde ve sonunda öğrencilerin etkinliklere tepkilerini ve katılımlarını gözlemlemek için iki matematik öğretmen adayı ile bir matematik öğretmeni çalışma süresince sınıfta bulunmuşlardır. Aynı zamanda uygulama sonunda öğrenci görüşlerini almak için de 10 öğrenciyle görüşmeler yapılmıştır. Gözlemcilerin gözlem sonuçları ve öğrencilerin görüşme sorularına verdikleri yanıtlardan uygulamanın başarılı olduğu söylenebilir.
Anahtar kelimeler: matematik öğretimi, yaratıcı drama, geometri.

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INTRODUCTION

The organization's survival mostly depends on its ability to successfully adapt to the changes in its environment. Effective adaptation is possible with learning (Senemoğlu, 2004). Motivation is an important factor in the learning process of an individual. When a learner knows what he/she will gain at the end of the learning process and how to use it in his/her life, it positively affects his/her learning (Aşılıoğlu, 2012). Another factor important for students' conceptual learning is the teaching method used by the teacher. A teacher who successfully directs the instruction facilitates the learning process of the students (Küçükahmet, 1998).

The teaching process means guiding the students in applying the learning activities (Demirel, 2002). In the teaching process, the learning objectives and appropriate learning activities towards these objectives are planned in advance. Within this plan, the methods and techniques to support learning are also determined. According to some educators, the creative drama is one of the effective teaching methods used in the learning process (Demirel, 2002).

The creative drama can be defined as "enacting an idea, a goal that is based on a group's or group members' real life experiences, using improvising, role-playing (taking role), etc. techniques." (Adıgüzel, 2014, p.45). Creative drama activities help students to recognize and trust themselves, to respect individual differences, to develop their creativity, to gain critical thinking skills, to build cooperative working skills, to improve decision-making skills, and to gain effective communication skills (Demirel, 2002). Drama engages the individual directly with real life experiences and problems. The individual feels to use knowledge in a natural way. In any subject area, the more an individual engages in effective learning experiences, the better he or she learns (Aşılıoğlu, 2012). In such learning experiences, the individual answers the question why he/she should learn the topic being examined.

The number of research studies involving creative drama as a teaching method is quite limited in spite of the recent increase (Kayhan, 2012). One of the most important reasons for this is that creative drama is not well known by the teachers (Yıldız, 2011). Kayhan (2012) determined the studies that involved the use of drama method in mathematics lessons in Turkey. The total number of thesis, articles, and conference papers that included drama was determined as 38. Only 18 of them involved the method of creative drama. The fact that most of these studies have used experimental research methods and the results are significant in favor of the experimental group which uses creative drama suggests that this method may be an effective teaching method (Debreli, 2011; Duatepe & Ubuz, 2009; Erdoğan & Baran, 2009; Hatipoğlu, 2006; Karapınarlı, 2007; Şenol, 2011; Yenilmez & Uygan, 2010). It is observed that using the creative drama method in mathematics lessons helps to form meaningful and entertaining learning environments in which students acquire sensory and psychometric gains as well as cognitive learning (Duatepe, 2004; Özsoy, 2003; Şengül & Tükenmez, 2009; Yenilmez & Uygan, 2010). In most of the studies that involved the use of creative drama in mathematics lessons, quantitative research methods have been used and the application process of this teaching method has not been examined in detail. There is a need for qualitative research in which the processes of creative drama practices are studied.

Mathematics contains knowledge that might be difficult to acquire due to its structure. The task of a mathematics teacher is to create learning environments in which the students can construct mathematical knowledge through meaningful learning experiences. In addition to this, students should develop mathematical process skills such as connections, communication, reasoning, and problem solving as outlined in the mathematics curriculum (Ministry of National Education [MoNE], 2017). According to the constructivist theory, individuals build knowledge themselves as active participants through various experiences in the learning environment (Wheatley, 1991). Since the individual creates knowledge actively in the learning environments where creative drama method is used, this method can be used for the meaningful and permanent learning of mathematical topics.

In this paper, the application process and results of a sample lesson where creative drama is used as a teaching method are shared. It is thought that it is an exemplary application for mathematics teachers who want to use creative drama method in their lessons. In the study, it was aimed to examine what students learned from the activity both from the perspectives of the students and the observers. In addition, it was aimed to reveal the students and observers' overall evaluation of the effectiveness of the activity.

ACTIVITY IMPLEMENTATION

This study was carried out with 20 students studying in the fifth grade in one of the state middle schools located in a province center in Aegean Region. Administrative permits were obtained for the study. Students who were studying in the class in which the activity was used did not have any experience with drama during their previous education. The activities included in the study were applied in 4 hours; 2 hours of pre-application and 2 hours of actual application.

During the application of the creative drama activities, the class mathematics teacher and two prospective mathematics teachers who were studying at the 4th grade of a mathematics teacher education program and took two drama courses called "Creative Drama in Education" and "Teaching Mathematics with Drama Method" during their undergraduate education observed the lessons. The observers were asked to respond to the questions in the observer form that included four questions based on their observations during the activity. They were explained that the focus of the observation should be what students learn as a result of participating in these activities and their level of interest in activities. The observation form is given in Appendix 1.

Since the practice school does not have any halls to be used for general purposes, the drama activities were carried out in the regular classroom by pulling the student desks to the edges. Materials used in the activities were prepared by the researcher. These are the target board (given in Appendix 2) and the maps (given in Appendix 3 and 4).

Activity Preparation

A week before the application of the actual drama activities, a set of pre-application activities was designed to introduce the creative drama method to the students and to help them become familiar with the drama process. The pre-application was also useful for the researcher, who will apply the activities, to meet with the students in the classroom. For these purposes, drama activities were designed based on the standards that were taught prior to this activity. Leader (to be used instead of the teacher) met the students and briefly told them about the creative drama that they would be doing during the lesson, their responsibilities as participants, and his responsibilities as the leader. It was emphasized that during the activities the leader would instruct them what to do and they should follow these instructions. The main rules that students should be careful are emphasized: not to break character, not to speak while someone else is role-playing, and not to turn their backs to the audience during the acting process.

Then a two-hour lesson took place to address the following standards: "M.4.3.1.2. Describes relationships between length measurement units and writes them interdependently." and "M.4.3.1.3. Estimates a length that can be measured directly by the most suitable length measurement unit, and checks the prediction by measuring it." (MoNE, 2017). The lesson included warm-up, role-play, and evaluation parts. During the warm-up part of the lesson, a centimeter-meter game adapted from the camel-dwarf game, tail-grabbing game, and guess-it game were played.

During the role-play part, the students were first asked to enact a situation where a mother calls her son from the bazaar to ask for the measure of the width and length of the table, and she purchases the wrong tablecloth due to the wrong measures. The students made improvisations in pairs to enact the situation. In the second role-play activity, in which five students were involved in the performance, the students were asked to portray a situation where the people in a country seek a solution to the problem of how to measure length. These people used the king's feet as their length measurement unit, but the king has died.

During the evaluation part of the lesson, the students were divided into five groups. The leader asked each group to select a piece of paper from a pre-prepared box. In this paper, the length of three objects placed in different parts of the classroom were written. The students were asked to first guess these objects as a group, then measure the lengths of these objects, and then take the object once they were sure. The first group to reach the three objects became the victor of the game.

In these activities, it was observed that even though the students had already learnt the topics, they connected what they learned with their lives and that they proposed very creative solutions to the problems presented to them, particulary in the role-play activities. For example, a group role-played that the child took the wrong measure of the table by aligning 1 on the ruler to the starting point of the table side. Another group enacted that the child took the measures of another table, not the table that his mother asked for. The reaction of the mother was sometimes very harsh, for example, a student who played the role of the mother said "What am I going to do with this cover now? I've spent a lot of money because of you." and began to beat her son.

In the second role-play activity, the foot length of the son replacing the king was first used as a unit of measure. However, the students discussed that they should use a more permanent unit of measure. The following solutions were proposed in the groups' role-play performances: the length of the palace door, the length of the king's shoe, the meter, and the height of the king's throne. At the end of the lesson, observers and a few students were interviewed to determine the positive and negative aspects of the process.

Implementation

The actual application titled "Would you say the address?" was implemented a week after the preperation activities and took two lesson hours. These creative drama activites address the Geometry and Measurement standard "M.5.2.1.2. Expresses the position of a point with respect to another point using direction and unit." under the basic geometric concepts and drawings sub-field. The methods and techniques used were creative drama method, improvisation technique, role-playing technique, leader's role-playing technique, and buzz group technique.

The leader was welcomed with interest by the students when entering the class. Students were eager to start the lesson and asked questions such as "What will we learn today?" "Will we role-play sir?" "What games will we play?" It was observed that the students were enthusiastic about the lesson and that their motivation was high.

The lesson began with the leader's invitation of the students to the center of the classroom to form a circle. All students attended the lesson. Warm-up activities were done first.

Warm-Up Activity 1

Participants are asked to walk in the center with a moving music accompaniment and obey the leader's commands. The leader gives the following instructions:

-Go 4 steps ahead on one foot.
-Take 3 steps to the right on one foot.
-Move 2 steps back, 3 steps to the left.
-Pair with your nearest neighbour and walk together arm in arm.
-Now go ahead 3 steps with your partner on one foot.
-Take 4 steps backwards with your partner.

Participants are told to be careful not to bump into each other when they are making their movements.

Warm-Up Activity 2

Participants are asked to form a circle. They are asked to form two groups by counting one and two repeatedly. Ones form group 1 and twos form group 2. The target, previously created by the leader, is hung on a wall of the room. This target is formed by drawing circles on a sheet of A3 size paper and by assigning numbers from 1 to 20 (Appendix 2). Group 1 selects one person. The eyes of this person are closed and he/she is brought to the target at a certain distance. Group 2 members interfere with the target and the person with closed eyes by putting their bodies in various shapes. The person with closed eyes stretches the index finger of one hand forward and follows the instructions of another person from group 1 who gives appropriate instructions such as

move forward 2 steps, take 3 steps to the right to escape from the obstacles (group 2 members) as well as to receive the highest score marking on the target. The points received are recorded in the group score. The game continues with other members of the groups respectively.

Role-Play Activity

Two of the participants are voluntarily choosen to act as spies. The other students are divided into three groups. The leader says to the whole class that the two students are spies of country A and the three groups are residents of three villages in country B. The mission of the spies is to locate and save the citizens of country A detained in country B. Spies have learned that their citizens are in a certain area, but they do not know exactly where they are. They will gather information and save their citizens by doing intelligence work in that area. For this purpose, the spies will collect information by listening to what the residents speak among themselves. Then they will come together and locate the citizens by combining the information they collected.

One member from each of the three groups formed is called by the leader and given information about the detainees. He goes to his village and spreads it to other villagers. The information given to the groups are as follows.

Group 1 (Residents of the village K): The detainees are closer to the village Z than to the plane tree.
Group 2 (Residents of the village L): The detainees are at a location 7 km away from the plane tree.
Group 3 (Residents of the village Z): The detainees are at a distance of 6 km from the well.

After the members of the group look at the information given to them, the leader gives a copy of the map given in Figure 1 to each spy. The students are informed that the journeys are made vertically or horizontally, not crossed. And the role-play starts.

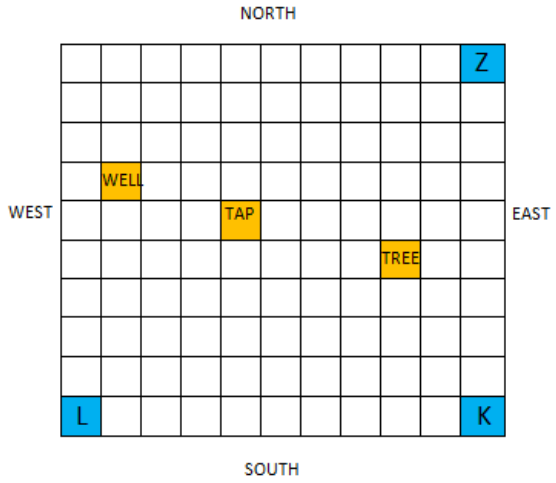

Figure 1. The Map Given to Spies

The first stage of role-play is accomplished by finding the target. How the target is located is explained on the map reflected to or drawn on the board for all students. In this part of the activity, the leader joins the role-play and supports the group discussions. For the first role-play, the regions that are 7 km away from the plane tree are shown in red color, and the regions 6 km away from the well are shown in green color as shown in Figure 2. The two zones providing both conditions are specified with a different color (black). According to the information obtained from the residents of the village K, the detainees are closer to the village Z than to the tree. For this reason, the target region sought is in the location indicated in Figure 3.

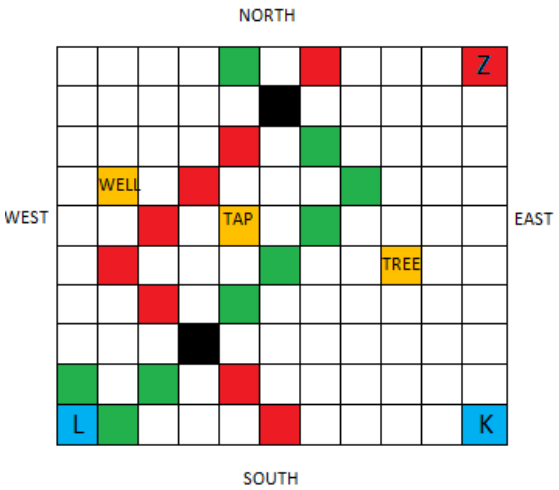

Figure 2. Problem Solving in the First Role-Play

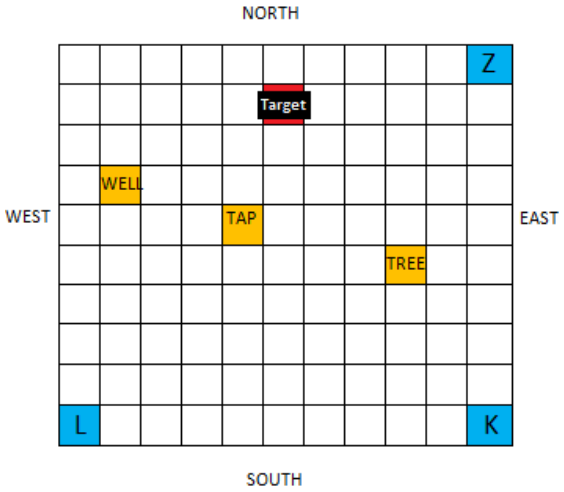

Figure 3. Target in the First Role-Play

New spies are determined to find new targets. Other students create new groups. Leader gives group names and information statements to the groups and the role-play is repeated.

The information given to the groups in the second role-play is below. The solution of the problem in the second role-play is presented in Figure 4.

Group 1 (Residents of the village K): The detainees are at a location 6 km away from the plane tree.
Group 2 (Residents of the village L): The detainees are at a location 3 km away from the well.
Group 3 (Residents of the village Z): The detainees are in the west of the tap.

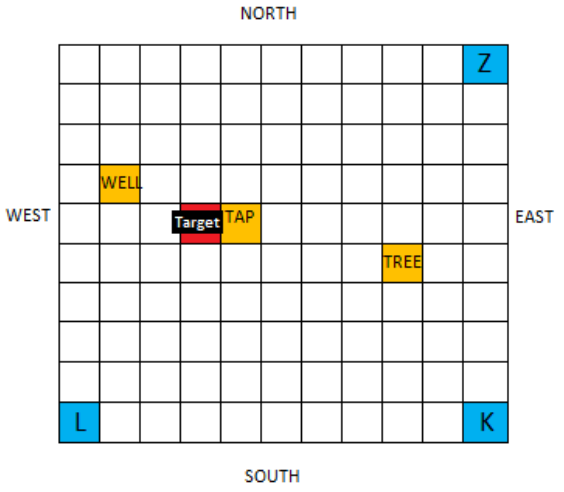

Figure 4. Target in the Second Role-Play

The information given to the groups in the third role-play is below. The solution of the problem in the third role-play is presented in Figure 5.

Group 1 (Residents of the village K): The detainees are at a location 5 km away from the well.
Group 2 (Residents of the village L): The detainees are at a location 4 km away from the plane tree.
Group 3 (Residents of the village Z): The detainees are at a distance equal to the villages L and K.

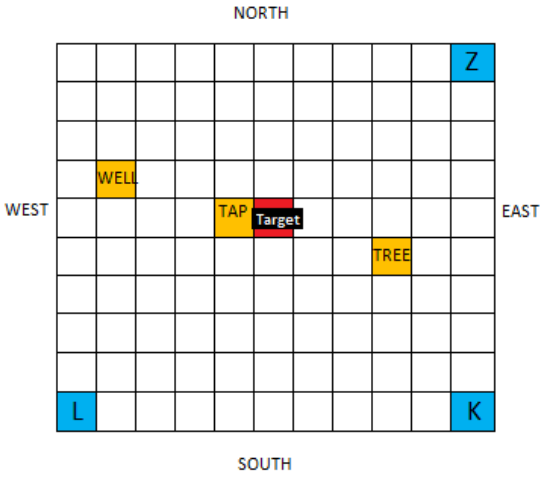

Figure 5. Target in the Third Role-Play

Intermediate Evaluation

The two spies were asked what strategy they used to locate the target. In the first role-play, they could not find the target. The leader told them that they need to first come together to confirm each information, and then draw the information on the map to determine the target. In the second role-play, the box next to the target was chosen as the target because of the misuse of an information. In the third role-play, the target was found correctly.

Evaluation Activity

The leader put up the map in Figure 6 on the classroom wall. The map should be of a size that everyone can see (given in Appendix 4). Students form half circle to see the map. Leader chooses two students and assign them the names A and B. He asks the two students to stand next to the map. These two students communicate with each other by filling in the gaps in the dialogue below according to their choices.

A: Where are we right now?
B: We are at ……..
A: I want to go to …….. Could you please tell me how to get there?
B: (Gives the directions according to the map)

The evaluation activity continues in a similar way with other students.

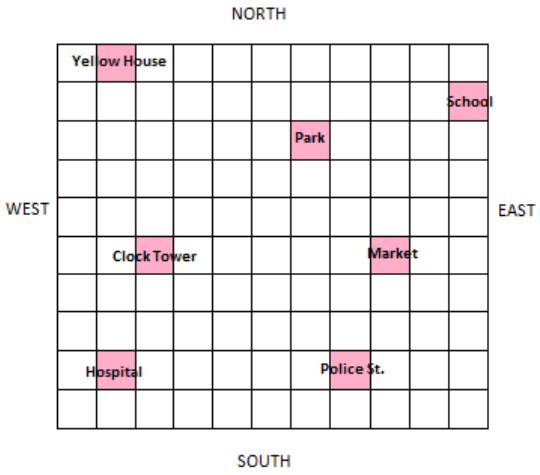

Figure 6. Map for the Evaluation Activity

CONCLUSIONS and SUGGESTIONS

Using creative drama in mathematics lessons as a method attracts a great deal of interest, especially in mathematics teachers. In particular, the question "Can mathematics be taught by role-play?" is one of the topics that teachers who have not previously experienced this method are curious about. In this study, creative drama activities that the students were interest in are described. The opinions of students and observers about the activities are shared in this section. In addition, suggestions have been made for teachers who want to use these activities in their lessons.

Observation forms completed by the observers have been examined in order to understand students' interest in the activities and what they have learned as a result of engaging in these activities. In addition, at the end of the activities, interviews were made with 10 students with 5 questions. During these interviews, students were asked to answer the following questions.

1. What did you learn in this lesson?
2. How did you feel during the lesson?
3. Would you like to have mathematics lessons done this way? Why?
4. Do you think you can learn mathematics this way? Why?
5. What did you like the most about this lesson?

The answers that students gave to the question "What did you learn in this lesson?" included "We learned how to give directions and to describe positions," "We learned to focus," "We learned to be careful," and "We learned not to speak in a loud voice." In response to the question "What did the students learn in this lesson?" an observer wrote, "... the learners acquired the skills such as problem solving, relating mathematical knowledge with real life, using the information correctly, working together, trusting each other, listening to each other as well as the gains related to the standard." Other observers gave similar responses.

The students' performance in the evaluation activity and the responses of the students, the class teacher, and the prospective teachers indicate that the learning objectives were gained by the students. Also, students' comments about gaining skills such as "attention", "focus", and "not speaking loudly", and the observers' comments about students' use of such skills as problem solving, working cooperatively, and estimation indicate the positive effects of creative drama on the learning process.

To the question "How did you feel during the lesson?" the students gave short answers like "I had fun." "I felt happy." "I was excited." To the question "How interested were the students in the activities?" the observers responded "It was obvious that they were very interested, they liked the activities and had fun while learning." "They were very good at role-play, they had a lot of fun and reasoned by using the information they learned." Based on the answers of the students and the observers, it can be said that the creative drama method worked effectively to provide the students with a learning environment that is interesting and fun.

All the students gave a yes answer to the question "Would you like to have math lessons done this way? Why?" The answer of a student is as follows.

> It is fun. I learn and have fun at the same time. I learn better since it is a game. It is really fun. If done this way, the mathematics lessons would be better. Playing games in mathematics lessons makes the lesson better, as long as it is related to mathematics.

Students' answers indicate that they enjoyed the lesson. In addition, they are aware that they have learned mathematics during the activities.

All but one of the students said "Yes" to the question "Do you think you can learn mathematics like this? Why?" The student who said no explained "Because we can not learn much by playing games." Traditional teaching methods empose a certain way for learning the school subjects, but it seems that teaching methods that require active participation, such as creative drama, can break down this pattern.

The students' answers to the question "What did you like the most about this lesson?" included "Target board game," "Catching the tail (a game played in the preperation activities)," "Theater," and "Playing games." In response to the paralel question "What did the students most like to do during the lesson?" an observer's response was "They were very pleased with the activities as long as they were involved. Some students were not paying attention but when they were involved, they participated. They are very interested in game-based activities." Another observer wrote "They had a lot of fun with the activity that required problem solving. They were particularly interested in the target board game."

Student comments show that they enjoyed the lessons very much, especially the games they were successful in. Playing games is the kind of activity that children love most. Creative drama provides a learning environment in which the students entertain and learn at the same time by playing games (Duatepe, 2004; Yenilmez & Uygan, 2010). This has also been observed in the current activities.

To the question "What are your thoughts about the lesson based on your observations?" an observer responded "Even though the classroom environment was not appropriate, students have learned something from the activities. I wish we could have done the lesson in a more suitable environment outside the classroom. It would have been even more instructive." Another observer recorded "I observed that students' prejudices toward mathematics would be reduced by such activities. I think mathematics does not consist of boring procedures and it should not be learned only for exams. Such activities might motivate students to learn mathematics." The comments of the mathematics teacher is as follows:

> Despite the fact that the students were very interested in the activities, I noticed that some students were sometimes uninterested. I think that such methods will be of interest in mathematics lessons. Some students in the "target board" game were not paying attention while waiting for their turn. The activity would have been more interesting if it was implemented simultaneously in parallel groups. There were students who did not watch the acting groups. They concentrated on discussing their own role-play.

The observers' answers based on their lesson observations indicate that there are some shortcomings in the lesson plan. The most emphasized factor was the physical environment. It was mentioned above that this is an uncontrollable variable. The fact that the preperation activities were done before the actual practice showed that the students understood and applied some rules of creative drama. However, the full implementation of creative drama activities will be possible with some behaviors that will be gained over time. For example, behaviors such as breaking the role, playing a role, not returning their back to the audience, and silently watching the acting groups may be achieved over time. On the other hand, adaptations can be made so that all students are assigned to a role during the activities. For example, groups can play the game simultaneously by preparing multiple targets in the target board game.

Mathematical topics to be addressed in the creative drama activities can be selected from real life situations or can be selected in relation to metaxis which is the state between real life and fictional life (Adıgüzel, 2014). In future, the teachers may adapt the activity to the contexts such as finding a treasure or locating the city library.

The researcher taught this lesson because of the lack of training of the mathematics teacher on creative drama method. Instead, the mathematics teacher's practice could lead to much better results. Because the teacher knows the class and the students more closely. The teacher can give instructions and make choices more consciously. In future applications of these activities, it is recommended that the lesson is taught by mathematics teachers trained in creative drama. For this reason, the teachers should be encouraged to participate in seminars and professional development programs, especially the ones supported by MoNE.

Designing creative drama activities in mathematics lessons requires both creative drama knowledge and subject matter knowledge. Many other activities of creative drama can be adapted to mathematics. For this, mathematics teachers need to learn and embrace creative drama as a method. One of the reasons why mathematics teachers do not use this method is that there are not enough sample lesson plans (Yıldız, 2011). Both the teachers and mathematics educators should work hard in this area to increase the number of effective drama lesson plans that can be used in mathematics lessons.

In the creative drama method, the students actively participate in the activities and move around. Particularly in games if the room is inappropriate, accidents and injuries may occur. In order for creative drama activities to take place effectively, it is necessary to build appropriate halls (classes) within schools.

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Appendix 1

Observation Form

1. How interested were the students in the activities?

2. What did the students most like to do during the lesson?

3. What did the students learn in this lesson?

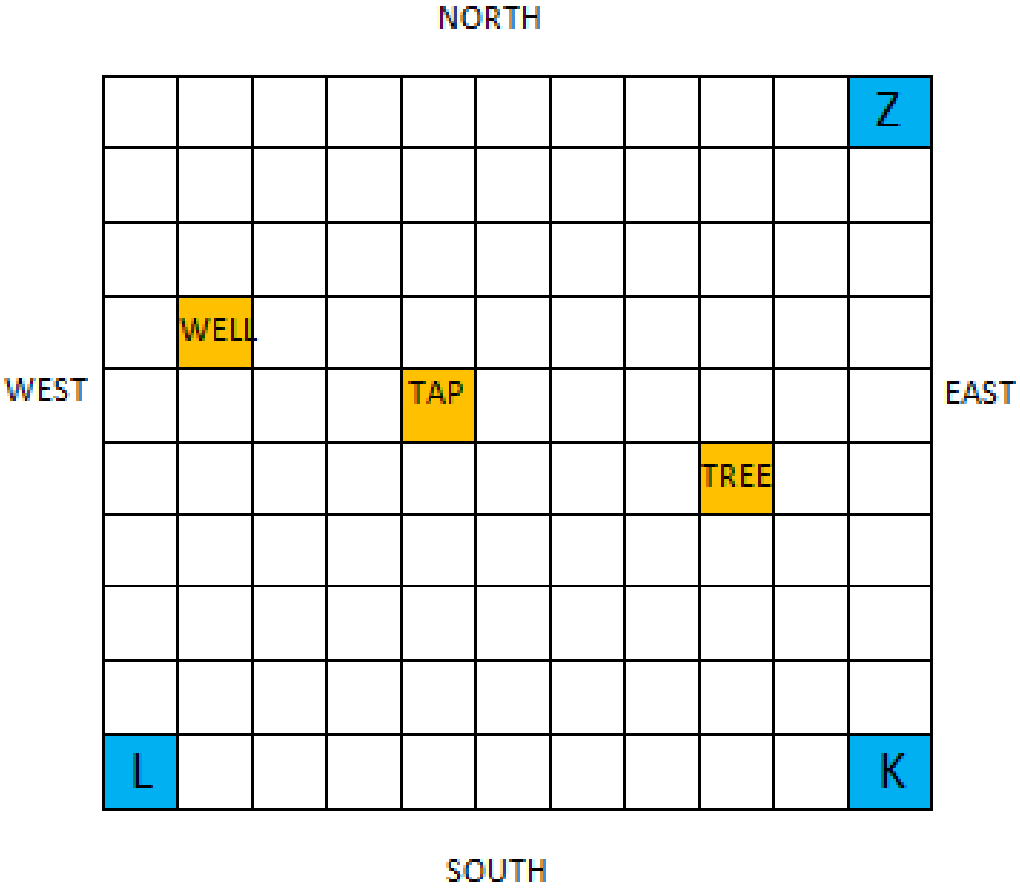
4. What are your thoughts about the lesson based on your observations?

Appendix 2

Target Board

Appendix 3

Map Used in the Role-Play Activity



Appendix 4

Map Used in the Evaluation Activity