

Development of pre-school math skills based on an instructional design with creative drama

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Suggested Citation:

Güney Z., Altıkardeş, Ç., İsmail, İ. & Güney Y. E. (2022). Development of pre-school math skills based on an instructional design with creative drama. *International Journal of Innovative Research in Education*. 9(2), 250-268 <https://doi.org/10.18844/ijire.v9i2.8728>

Received from September 03, 2022; revised from November 25, 2022; accepted from December 12, 2022.

Selection and peer review under the responsibility of Assoc. Prof. Dr. Zehra Ozcinar, Ataturk Teacher Training Academy, Cyprus.

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Abstract

It is known that the foundations of learning in the cultural and educational process are laid in the preschool period. In this period, children acquire information on many different subjects by interacting with their environment in every field. Suggestions, intuitions, and experiences lie in the formation of this knowledge. Children, who learn mainly through intuition, gain experiences thanks to the mutual symbolization they make with objects. In this process, they try to make sense of what they perceive according to their experiences. In this study, it was aimed to improve the mathematical skills of preschool children with the use of creative drama techniques, based on the strategies suggested in the instructional design model of Seels and Glasgow, and accordingly, the teaching processes were designed with sessions and activities that included two classroom processes and discussed within the scope of the literature.

Keywords: Creative drama; game; instructional design (ID); mathematical skills.

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1. Introduction

Children's acquisition of cognitive skills and acquisitions takes place within a learning process (Yang & McBride, 2020). It is known that concepts are qualitatively important in the formation of cognitive skills. As a result of the observations, they make in their cultural environment, children can follow the path from complexity to intelligibility by making use of the power of concepts during the period of gaining skills such as comparison, inference, and prediction. Learning experiences aimed at gaining the above-mentioned features in early childhood can be provided to the child both naturally and in his/her daily life. Children naturally learn mathematical concepts in their daily lives through experience. For example, children have the opportunity to experience mathematical-based concepts and skills such as sorting dolls by hair color, measuring the size of different objects with a pencil, naming them, matching one-to-one with the dogs saying they live in the kennel, counting the olives on their plate while counting.

The process of acquiring concepts about learning experiences begins in infancy (Tan, Poon & Rifkin-Graboi, 2022). Babies start to produce ideas that will satisfy their curiosity by using their senses. Objects in the environment can contribute to the formation of these ideas. The size and smallness of the objects they hold in their hands can give ideas about whether they are grasped or not. When comparing a ball and a square-shaped object, rolling the ball, and keeping the square object in place, can give an idea about the conservation of shapes, their positions or states, and perceptions. By examining the space in large and small areas, they increase their awareness of the location. As long as they are going to comment on their body size, they will only start when they reach the maturity of crawling and walking. By getting under the chair and trying to get on top of it, they gain experience in sizing their bodies. Children who put objects on top of each other have the experience that when they fall, the whole is formed from the parts, or vice versa, that they are parts of the whole.

Children playing in play corners experience mathematical processes (Clements, 2022). It can be shown as an example to form a basis in mathematical skills that the child who prepares food for his friends puts food on their plate equally or puts less or more food on demand, and can place objects such as glasses, plates, and forks on the table as much as the number of people. Thanks to the above, children gain concretely and prepare for the basics of mathematical skills such as division, multiplication, addition, and subtraction, which are necessary for solving abstract situations at primary school age (Ulutaş, 2015).

In the studies carried out in the field on this subject, Şenol (2011), as well as Berner et al. (2022), asserted that the creative drama-supported mathematics teaching program increased students' success in mathematics lessons and caused a positive increase in their self-concept levels. Fleming, Merrell, and Tymms (2004) stated that the reading, mathematics, attitude, self-concept, and creative writing scores of the experimental group students who were taught using the creative drama method were higher than the scores of the control group students. Saab (1987) did not state that he concluded that the creative drama method was effective in the success of 6th-grade students in terms of mathematical problems and that it had an effect on students' creativity and attitudes. Similarly, 18 years after this study, Kariuki and Humphrey (2006) did not observe a change in terms of attitude and interest, although it increased achievement in 4th-grade students, similar to the results of Saab (1987).

Masoum, Rostamy-Malkhalifeh, and Kalantarnia (2013) stated that using drama in mathematics education gives better results than traditional teaching. Chaviaris and Kafoussi (2010) stated that they concluded that the drama method contributed to the cooperation of the students in the mathematics lesson. Kayhan (2009) stated in their research with 3rd-grade students that creative drama increases success in mathematics teaching, Soner (2005) in addition and subtraction of fractional numbers, and Hatipoğlu (2006) in numbers and geometry. Hendrix, Eick, and Shannon (2012) stated that creative

drama is effective in the teaching processes of scientific concepts. Ulubey and Toraman (2015) stated that the creative drama method increases academic success, according to the results they obtained from a total of 65 publications, including 23 articles, 37 masters, and 5 doctoral theses. As a result, it is revealed that creative drama has a significant effect on mathematics teaching.

O'Neill (1995) stated in her book that process drama can be used by both instructors and learners. The common opinion that emerged as a result of the discussions is; new information can be obtained to solve the identified problems, and in this way, individuals can both analyze the context (relationship) within the roles they enter and enable the meaning to come to life in their minds with new information (Schneider, Crumpler & Rogers, 2006). In a way, the method of finding in Socrates' teaching includes question and answer as well as problem analysis, group brainstorming, and analysis of previous case studies. We can say that it provides the formation of new information, mental animation, and discovery of meaning by reaching knowing and meaning by pretending to live in larger and more difficult situations with the characters portrayed in roles, similar to Socrates' method of finding.

1.1. Purpose of study

This study aims to discuss the learning processes by applying the creative drama technique with the principles of the instructional design model in the development of mathematics skills in the preschool period. For this reason, creative drama applications in the development of mathematical skills aim to exemplify the instructional design (ID) approach in a teaching process and environment. The aim is to discuss the studies on this subject in the context of the literature and to reveal they're possible educational effects. In this context, the literature studies related to the study are stated in the following paragraphs. In this process, the basic concepts, the scope of the topics, the suggested practical session examples, and approaches based on instructional design (ID) models are pointed out.

1.2. Literature review

1.2.1. Integrating Math Activities with Game Activities

To teach concepts to children, methods for their language should be applied. Games that make up the period they have fun can meet this requirement as their language. Through games, teachers can interactively teach children mathematical concepts and skills. The drama focuses on the process and pedagogical approach to how children learn and interact with concepts and skills (Lee, Enciso & Brown, 2020). Through play, children start to develop positive thinking toward mathematics naturally without losing their motivation and without dealing with conceptual confusion (Miller et al., 2022). It is known that many games and activities will support the discipline of mathematics (Wang, Hu & Zhang, 2021; Ndijuye & Benguye, 2023). Matching cards, finger games, materials designed for pattern making, puzzles, etc. can be counted as an example. As a game, hop on, hide-and-seek, high off the ground, etc. examples can be multiplied.

Using dramatic games, children can have inclusive classification activities. Doctor, mechanic, hairdresser, and housekeeping games can be counted as dramatic games. The plays that children create by imitating the roles they see in real life are known as dramatic plays. Thanks to these roles and imitations, they classify the materials in the hairdresser, the events experienced, or the materials owned by the doctor, in a way that symbolically internalizes the doctor's duties. Games played in the garden of the school or natural environments outside the school in free time provide gains for children's mathematical skills. Games played with sand can be given as an example. Knowing how many buckets of sand it carries, counting, understanding the difference in the amount of sand taken by each container, and comparing, filling, or emptying sand into different containers also support measurement skills (Aktaş Arnas, 2006).

1.2.2. *Creative Drama in the Preschool Period*

Woodson (1999) quoted Davis & Behm's research in 1978, creative drama is the act of animating a subject using the experiences of the participants, guided by a leader. Creative drama is an improvisational and process-oriented form (Woodson, 1999). In creative drama, children exhibit what they want to convey with the materials they can reach, by revealing their creativity. Here is an example of using a broom as a horse.

Bowell and Heap (2001) mentioned that creative drama can be easily adapted to the educational environment and can be used as an effective teaching strategy for young students: Drama strengthens perception. It includes processes similar to unscripted theater culture and drama experiences by improvising with the help of instant reactions with roles, signs, and plays in the creation process as soon as intellectual communication opportunities arise. Mattevi (2005) quoted Burger's research in 1986. It contributes to research, thinking, and problem-solving skills (Miller, 2020). They stated that by shaping the learning processes with the help of drama, fun, and successful results were achieved.

Drama affects the development of the child; Physiologically, the body is healthy, improvisation contributes to the flexible and fluent structure in communication skills, develops the understanding of humanistic empathy, the imagination becomes more active creatively, and has positive effects on the control of the initiative, skill, self-confidence, and emotions, because the drama processes are done within the group, cooperative learning and stated that the behavior change process took place as a result of the above stages. Learning in creative drama is permanent as it takes place with fun. It is process-oriented because it develops communication skills with the group, empathy, perspective (Athanasios & Sanchez, 2020), and mutual trust (Göktürk, Çaliskan & Öztürk, 2020). It is an effective teaching approach for children as it is compatible with social and cultural ideas (Lee, 2014).

Children enjoy observing the environment, asking questions, and doing research to find answers to their questions. In drama, the child internalizes the role he plays, has fun while playing, and learns at the same time. Since drama offers children the opportunity to learn by living, it ensures that learning is permanent. One of the teaching methods frequently used in the preschool period is drama (Aykaç & Çetinkaya, 2019; Türkel & Koray, 2020). Behavior changes processes and skill acquisitions in the preschool period progress by observing the environment and asking questions. Among the most important reasons for this are the intense curiosity and questioning processes about the environment of this period. As a result, it contributes to the learning of children by internalizing the roles they play, having fun with their existing knowledge, and constructing new information at any time. Drama helps students develop their imaginations through interactive play processes while supporting their creativity and learning by living (Yildiz, 2016).

Studies on this subject have concluded that drama education in the preschool period affects mathematical skills positively (Erdoğan, 2006) and improves scientific process skills (Özkan & Tuğluk, 2018). It is stated that the drama-based curriculum is effective in helping children gain creative thinking and scientific process skills (Çilengir Gültekin, 2019). Drama in the preschool education program is very effective in learning both as a method and a type of activity because it is an approach that provides the opportunity to learn by experience and makes the child active (Ozkan, 2021).

On the other hand, since creative drama is done as a group, it is known that it affects the success of learning processes by affecting the interaction process both socially and emotionally. Children who take on the roles of other characters demonstrate their interpretations to empathize and reflect the emotions of the characters they play. However, since creative drama is created through play, it is known to affect psychomotor development as well as motor skills (Ömeroğlu et al., 2010). When learning and teaching processes are considered social processes, it is seen that the dialogues between

the learner and the teacher create an interactive environment (Cody, 2015). These processes have a collective structure that includes the creative power of the learners and acts together. Drama processes are processes in which concrete learning is expressed physically and emotionally in a flexible structure (Coleman & Luton, 2021). For drama practices, Lee et al. (2015) revealed in their study that drama has positive effects on literacy achievements, 21st-century skills, art, and motivation (Medina, Perry, Lee & Deliman, 2021).

1.2.3. *Drama*

Drama, which started to develop at the end of the 19th century, is used in teaching processes to achieve achievements and goals. In the studies and analyses in the literature, it can be said that drama education can be considered a learning process and that, by its nature, drama practices have transitioned into educational methods pedagogically (McAvoy & O'Connor, 2022). It is central to the idea of progressive education to help them become independent, creative, and socially minded (O'Toole, 2021). Drama is the revival of the learning processes of individuals in the cultural development process to achieve the events, goals, and objectives by improvising or taking on different roles in the group (Adıgüzel, 2015). Drama expresses the concepts of "doing something", "something done", and "playing" in ancient Greek.

There are no studies and design models in which creative drama is systematically designed together with the principles of instructional design (Özbek, 2009). Way (1968) states that drama is a tool that contributes to the learning processes through life experiences, and he did not characterize drama as a lesson. Lehtonen et al. (2020) stated that emotion, cognition, experience, and understanding integrate with drama learning and lead children to act in their daily lives. As children gain new knowledge and skills on top of their existing knowledge, they can try different situations they will encounter as if they are living in inaccessible environments. With the positive results of studies on drama activities, research in many disciplines is increasing. Creative drama practices are encountered in areas such as art education, Turkish teaching, foreign language teaching, social studies, life science, science, and mathematics teaching (Akgul & Tanriseven, 2019; Keles & Çepni, 2019; Er-Türküresin, 2020).

1.2.4. *Creative Drama*

We are expected to come up with creative ideas in all areas of life, with current information such as innovations that have been revealed through creative perspectives such as the discovery of fire and writing throughout the history of humanity. Even in the last pandemic, the development of the vaccine has ensured that humanity is affected as little as possible by the pandemic all over the world. Even though the rapid advances in information and communication technologies are difficult to follow in all areas of life, creative thinking has taken its place in the middle of the information and communication age (Stevens, Miller & Michalski, 2000). Starko (2005) defined creativity as producing a new solution. Craft (2005) points out that it is the generation of new ideas. Emphasizing the creativity of teachers, Jeffrey and Woods (2003) say that the guidance of teachers who have control of the learning process is important for the creativity of students (Güryay, 2021). Heathcote (1991) pointed out that creative drama should have features such as overcoming creative works.

In America, Taylor (2000) quoted Ward's research in 1930, Ward argued that creative drama has positive effects on children's physical and cognitive development, socialization, and imagination and that group activities affect their self-expression skills, cooperation, and social life (Bolton, 1979). In England, Heathcote (1991) expressed it as the ability of children to produce quick and spontaneous solutions to the problems they face in changing situations, rather than narrating the actions through storytelling. Bolton (1979), on the other hand, applied process drama and argued that learning

through discovery would occur by pretending to experience cultural experiences, based on the idea of "acting as if you were doing". Hornbrook (1998), on the other hand, argued that Heathcote and Bolton's thoughts are the field of psychology rather than a cultural perspective, and stated that educational drama should be theorized as a social process in the historical lifestyle process (Özbek, 2009).

1.2.4.1. Phases of Creative Drama

As in educational plans and all branches of art, the answers to questions such as what, why, when, how, where, who, and to who constitute the stages of creative drama studies. It is necessary to follow certain stages in creative drama. The leader can structure and change these stages according to the work to be done. Drama includes the stages that should be followed in the structuring of a creative drama lesson or activity based on the experiences gained from the experiences. These stages are listed by Adıgüzel (2019) as (a) Warm up Preparation Studies, (b) Animation, and (c) Evaluation-Discussion steps.

Mathematics lessons are feared when creative drama activities are planned by the principles of instructional design, with an approach based on activities in the mathematics teaching process, student-centered, aiming to add new information on previously acquired knowledge and skills, developing creativity with methods such as improvisation, solving the problems encountered in a short time, and supporting analytical and algorithmic thinking. It can lead to permanent learning by moving away from being a lesson and embodying abstract concepts in students' mental schemes. Thus, it can be argued that students can analyze different problems that they may encounter and produce different solutions (Yenilmez & Uygan, 2010).

2. Materials and Methods

This study is based on providing children with positive attitudes towards mathematics, to provide new information to children's existing knowledge to develop mathematical skills. While creating the plans, the materials available in the literature were used as much as possible. The instructional design process has been enriched with games to attract the attention of preschool children and increase their motivation. In addition to the fact that the games created are fun, it is ensured that the skill acquisition is educational. Another point that is considered in the teaching plans is the application of the principle from simple to difficult, as suggested in the literature so that the child can comprehend the relationship.

2.1. Ethics

This study is one of the new examples based on the instructional design model of drama in the education of mathematical skills. At this stage, there is no need to get permission from students and parents. This permission may only be required for lab work.

In addition, to avoid negative prejudices against mathematics, it is aimed to explain how children should internalize the learning situation in a fun way by experiencing and imagining events during the drama process. By adopting the principles of one-to-one matching, comparison, grouping, classification, spatial perception, geometric shapes, measuring modeling (pattern), and ordering; Sample activity plans on numbers, counting, addition-subtraction, and the part-whole relationship were designed with the creative drama method, following the Seels and Glasgow's instructional design (ID) model.

3. Results

3.1. Some Drama Techniques Used in Sessions

3.1.1. Impromptu

It is a technique in which the concept of spontaneity comes to the fore. When applying the improvisation technique, sharp lines, strict rules, and situations such as proving ability (to exhibit any acting) are not mentioned. Because the animations in improvisation should be left to spontaneity, one's the emotional world and creativity. It cannot be expected that there will be any scenario, if it is expected, this situation should be called theater, not drama. We can define the improvisation technique as the process of freely enacting a determined emotion or situation by the participants. Improvisation processes are in close relationship with the resulting product (Adıgüzel, 2006). The experiences and products in the process are specific to the group's display of their thinking and roles in the 'living moment'. Therefore, the products are original. This originality can only be repeated through a reference. The unique experiences of each improvisation mean that improvisation cannot be repeated. As it can be understood from here, the existing potentials and readiness of the participants in the 'moment of the process' are the determining factors of improvisation (Medina, Perry, Lee & Deliman, 2021). Creative drama, which provides solutions to problems in the process through improvisations, can be one of the effective methods in learning processes (Güray, 2021).

3.1.2. Leading Role

In drama activities, the person who is the teacher or trainer who manages the process is accepted as the leader of the group. It is a technique that progresses in the form of the teacher being in a guiding position and performing some roles during the creative drama activities. Since there will be a certain fiction in this process, a teacher may be needed at points that children cannot follow. The leader makes the process reach its goal by giving some instructions. It is important that the teacher is in the role or directs the role, as it will prevent the process from deviating from its purpose (Adıgüzel, 2019).

3.1.3. Dull Image

In creative drama activities, the participants do not show any movement, speech, or sound; We can say that it is a technique in which they create their forms of expression by taking on certain images individually or in groups. They can reflect their forms of expression with forms such as a photographic frame, a painting that is a work of art, or a sculpture. Individuals or groups that masquerade as their expressions should take care to use understandable expressions so that other participants can understand and develop ideas. The frozen image technique is the participant's display of a moment from life in a motionless manner (Karadeniz & Okvuran, 2014).

3.1.4. Role Cards

During the creative drama activities, certain cards are prepared and given to distribute roles to individuals or groups. Participants improvise with the information on these role cards. While written role cards are prepared for the literate group, picture role cards are preferred for preschool children. The role cards should contain information on the characteristics of the people to be played, the conflict point of the event, and the place and time of the event. Care should be taken to ensure that there is no contradictory information in the role cards prepared for the participants. While personality traits are given in the role cards, if it is prepared to take into account the personality traits contained in the role cards in the other group, accusatory expressions will naturally be avoided. Based on these features, the fact that role cards help improvisations shows their functionality.

3.1.5. Photo Frame

We can say that this technique is explained by the fact that the participants photo-graph their feelings and thoughts in a way that reflects the whole, based on an event or a subject they portrayed during the process. This created photograph is the embodiment of the phenomenon to be expressed. By using this technique, the leader can easily adapt drama activities to the process ergonomically and economically. For example, participants are told a story. They are asked to tell this story with three

photo frames. It is possible to organize the events by making story predictions with these photographs prepared according to the flow of the event. The dull image and the photo frame are compared to each other. While the leader stops the process and focuses on the image, the photo frame appears as a technique that is applied at certain time intervals in the flow of the process (Akar, 2000).

3.1.6. Incomplete Material

Participants are presented with materials such as an unfinished picture, an identity document, a personal item, or a letter. Participants are asked to comment on the incompleteness of this material and to engage in discussions and exchanges of ideas. Reasoning and guessing skills are at the forefront of this activity. Question patterns that will be supported while making ideas about the unfinished material are useful. Examples of questions such as "Why could the material be left unfinished?" "What could have been done to prevent the material from being left unfinished?" With the ideas that emerge as a result of these evaluations, the participants determine the animation topics. The subject of improvisations may be that the participants solve the problem with the material or deal with the processes to complete the material (O'Neill, 1995).

3.2. Session Plans

Seels and Glasgow's (1998) instructional design (ID) model states that the systematic handling, analysis, and analysis of teaching and learning conditions can be used both in large organizations and in smaller instructional settings (İpek, 2001). Based on the ADDIE instructional design model, as in many instructional design models, this model and another model can be applied in a linear structure or hierarchical level. The teaching strategy includes the planning and implementation of the materials used in the lessons and the teaching processes (Özbek, 2009; Güney, 2019).

Although the stages of Seels and Glasgow's (1998) ID model, which is also used effectively in the project management process, are phased out piecemeal, it can also be considered as a whole project model. Creative drama is actively used in the learning and teaching processes with the effective use of technology and the richness of materials, as it will concretely reveal the performance gains of the project cycle in the creative drama process, and it ensures that the process is completed effectively and efficiently. In this context; While planning the sessions, the stages specified in the direction of Seels and Glasgow's instructional design (ID) model were planned with ten steps. At the beginning of these steps is problem analysis. Problem analysis (needs analysis) is completed in these steps in the model (Seel & Glasgow, 1998).

1. In the first step of the problem analysis, what the needs are, all aspects should be revealed, what level of the current knowledge of the learners is, what kind of gains and skills will be achieved at the end of the teaching process, how and how much these skills can be approached in real terms to what they should ideally be, and what differences may arise from. Should be foreseen and the design steps should be created. At the beginning of the factors that guide this stage, it is necessary to reveal what the previous knowledge of the learners is and the priorities for its development. The readiness level and characteristics of learners should be taken into consideration. While performing the needs analysis underlying the problem analysis, the ideal, and the real comparison, the differences between them, and the priorities to reduce these differences should be revealed. During the process analysis, the technology, materials, and learning environment to be used are determined, and cost-effective planning should be made in terms of learning environment, time, and cost. While performing the performance analysis, the teacher's performance, knowledge skills, the participation of the learners in group work, their achievements, achievements, and skill acquisition, and the motivations and participation of the learners in the learning process should be evaluated. An answer is sought to the

question of whether learning will take place with an instructional approach or a noninstructional approach. As the last step, the purpose of the lesson or project is written.

2. Sorting and analyzing the work and tasks that students need to do.

3. While performing the instructional analysis, the behaviors required to implement the planned content by performing the learning activities should be determined. With this stage, the process of determining the target behaviors and achievements begins. At this stage, the answer to the question of what should have been learned is sought.

4. Mager or ABCD target writing formats are used to determine the targets.

5. Mager format has three stages, and ABCD format has four stages. In Mager format 1-2-3 steps, in ABCD format 1-2-3-4- steps, and functions and targets can be determined.

6. At the stage of determining instructional strategies; It should be determined what needs to be done for learning to take place, and what kind of technology or materials should be presented for the content to provide the gains. By determining the teaching strategy, concepts, principles, activities, group work, mind maps, shape animation, etc., obtaining new information, based on previous learning. Planning is done by including materials and guides. The distribution process, on the other hand, can be said as the ways of communication and transmission displayed in the learning environment.

7. At this stage, which is determined as material development or acquisition, there should be interactive tools that can be used in both visual and auditory learning environments, from written texts to animations and interactive videos suitable for the level of learners. During the use of these tools, the learning environment should be suitable for children, the environment should be isolated, and it should be free from distractions. After the materials are determined, they should either be produced with the available resources or the materials made and produced by the designers should be used by purchasing them.

8. For the knowledge and skills to be gained in the process evaluation stage, the process, material, etc. planned or designed in the previous stages. It should be used as the organizer of the missing, faulty structures and planning in the stages. While evaluating the process, it should be constructive rather than critical, and the correct application should be given promptly. Process evaluation should be timely, onsite, and of good quality to avoid misunderstanding.

9. In the eighth stage, which is the application and control stage, the design process planned during the model steps should be applied to the course teaching and all teaching strategies, and process evaluation should be made during the application.

10. Whether the design process made during the evaluation (permanence) stage of the results has been successful or not, whether the ideal learning environments have been reached or not, can be demonstrated experimentally or observationally, as well as descriptively.

11. In the last stage of the model, the missing items are completed as a result of the evaluation, and the dissemination and sharing process is started. This process can be applied online or directly to groups. This situation is especially used for project team management purposes.

In the study process, creative drama activities were designed as two sessions in line with the steps of Seels Glasgow's Instructional design model, and this design process is discussed below.

3.3. Needs Analysis (Problem Analysis)

For children not to see mathematics as a problem in their later years, it is necessary to lay the foundations for mathematical skills correctly in the preschool period. It is known that children have difficulties in making sense of mathematical concepts since abstract concepts are not fully developed

in the preschool period. Therefore, it is known that explaining mathematics to children by embodying it will contribute more to their learning processes.

1st Session: Acting with the group, paying attention to the event, applying the instructions in the teaching environment, establishing relationships between objects and numbers, motivating themselves to accomplish a task or task, and adding new information on top of their existing knowledge are among the targeted gains.

2nd Session: Children's use of objects from one to nine, adding and subtracting using these objects, and motivating themselves to achieve a job or task is among the targeted acquisitions.

3rd Session: It is among the targeted acquisitions that children make predictions about the object situation and event, apply the instructions about the location in the space, and comprehend the part-whole relations. Preschool children's language is game processes, so it is expected that explaining mathematics to children interactively with games will contribute to the transfer of information from short-term memory to long-term memory. In this context, it is planned to use creative drama, which includes games and game processes and many techniques, as a method. The materials used in the creative drama sessions were designed and thoughtfully prepared for the acquisition of mathematical skills. One of the reasons why creative drama is preferred is that it contributes to the developmental areas of children and supports these areas. It is known that cognitive development processes are important in learning mathematical skills.

3.3.1. 1st Session

Subject: Relationship between Objects and Numbers

Class: Preschool 5-6 years old study

Number: 12-16 people

Duration: 55 minutes

Method-Technique: Improvisation

Tools and Materials: Eva papers, magnets, garbage bags, long sticks, rope, bucket, colored number images, cloth bag, box, chalk.

1/1st Activity (Duration 5 min.) Warm-up (Task and instructional analysis): The leader has prepared a rectangular prism-shaped box beforehand. A number is affixed to each surface of this box. The directive that is required to be applied separately under each affixed number is given in Table 1 below. (The texts under the numbers are interpreted as a request of the box from the participants.) While the work done with the box is explained, the leader shows how to shake and stop the box. The leader starts the warm-up process after this stage.

Table 1

Directions for the dice-shaped box to be prepared

For the number zero, run zero times.	For Figure five, do the forward leg raise five times?
For a number, hug your friend once.	For the number six, collect six apples from the tree.
For number two, find and bring two objects that are the same in your location.	For the number seven, count out loud from zero to seven.
For the number three, jump three times with clapping hands.	For the number eight, take eight steps forward and stay there.
For the number four, take four steps back from where you were and stay there.	For the number nine, give yourself a strong clap nine times.

1/2nd Activity (Duration 15 min.) Game (Determining the goals and criteria and preparing the environment and tools): A few blue garbage bags are placed on the ground. These bags represent the sea. Thirty fish cut from eva papers, prepared by the leader in advance, are placed on the bags that represent the sea. Four empty buckets are placed in sequence six meters from the place where the bags are located. A path is created between the bags and buckets that represent the sea. The leader divides the participants into four groups four. (The process of dividing the groups begins with the participants counting as one-two-three-four keeping their numbers in mind. The leader completes the group formation process by saying one to one, two to one, three to one another, and four to one another.) He distributes the four fishing rods that he prepared beforehand to the groups, respectively. These fishing rods are prepared with the help of a rod and rope. There are magnets on both fish and fishing rods. The groups will take turns fishing. The duration is one minute. The leader asks four people in the groups to fish quickly during this time. The caught fish are transported to empty buckets. Fish caught at the end of the game are counted by the leader. With the help of chalk, the number of fish collected is written on the ground next to the bucket. The group that collects the most fish will be the winner, and the final round is completed by repeating the game with the remaining four people. In total, five rounds are played. In the end, the participant who collects the most fish is determined.

1/3rd Activity (Duration 20 min.) Impromptu (Presentation of content with instructional strategies): The leader starts the process without changing the groups in the game stage. Prepared colored number images are placed in a cloth bag. All number images, including zero, have been prepared in duplicate. There are twenty images in total. When the leader walks around and instructs the participants to choose a number image from the bag, the participants start the improvisation process. The leader has determined four times and places. These are respectively 1. Time to start the day, 2. Feeding time, 3. Activity time, 4. Free time. The learning environment is the school for all four time zones. The choice of places such as the garden and classroom in the school environment is left to the imagination of the participants.

For the first group, the leader asks the participants to improvise the 'time to start the day' at school using the number of visuals they have chosen. For the second group, the participants are asked to improvise the 'feeding time' at school using the number of visuals they have chosen. For the third group, the participants are asked to improvise the 'activity time' at school using the number of visuals they have chosen. For the fourth group, the participants are asked to improvise the 'free time' at school using the number of visuals they have chosen.

1/4th Activity (Duration 10 min.) Formation (Media development): The leader carries out the formation by designing songs with the whole group. Pre-prepared musical instruments are given to the participants. Then they are asked to compose songs about numbers using these instruments.

1/5th Activity (Duration 5 min.) Evaluation: The leader takes the shape of a circle and sits on the ground with the whole group. Participants are asked the following questions:

1. How did you find the event and what else would you like?
2. Do numbers help us in our daily life?
3. Where do we encounter numbers in our daily lives?

3.3.2. 2nd Session

Subject: Addition and subtraction of numbers from 1 to 9

Class: Preschool 5-6 years old study

Number: 12-16 people

Duration: 55 minutes

Method-Technique: Improvisation, Role cards, Unfinished material.

Tools and Materials: Collection box, adhesive number labels, adhesive addition and subtraction labels, newsprint, picture images, glue, small balls, red pencil, cards with numbers, crayons, chalk.

2/1st Activity (Duration 10 min.) Warm-up (Task and instructional analysis): Nine newspaper pages were prepared by the leader. Numbers are written on the newspaper pages with a red pen. The newspapers are placed on the ground in order, starting from the newspaper page with the number one to the page with the number nine. A large area is created with newspaper pages on the floor. Meanwhile, fun background music is prepared to be played by the leader. It is explained to the participants that when the music turns on, they have to turn the newspapers around. When the music is stopped, the participants are asked to stand in the newspapers. It is stated that the participant who is excluded from the newspapers cannot participate in the next round. In the second round, a newspaper page is removed. Care should be taken to include the pages of the newspaper removed in numerical order. In this way, when one newspaper is removed from nine newspapers, it becomes concrete that eight newspapers remain. A newspaper page is ejected at the start of each round. Warming up continues until only one newspaper page remains. In the last round, the participant remaining on the newspaper page is determined.

2/2nd Activity (Duration 15 min.) Game (Determining the goals and criteria, preparing the environment and tools): A collection box is prepared by the leader in advance. Two pipes are glued onto an open 'V'-shaped cardboard box. A basket is placed under the parts of the pipes that are close to each other. Newspaper sheets are prepared in the form of balls large enough to pass through the pipe. (The message should be given to the participants that the newspapers have been used and are evaluated in this way because they will be recycled.) The newspaper balls thrown from the right pipe represent the first collection, and the newspaper balls thrown from the left pipe represent the second collection. Newspaper balls passing through the two pipes become total in the basket. Participants are numbered one-two-three-four-five-six-seven-eight. It is stated that the participants of the same number should come together, and groups of two are formed.

Two paths are drawn with chalk at a distance of three to four meters to the collection box the place. One of the paths is set to the right pipe and the other to the left pipe. At the beginning of the drawn paths, the cards with the numbers are placed face down in advance by the leader. The prepared pairs are asked to play their games in turn. The two members of the group explained that one has to target the right pipe and the other the left pipe. The aim here is to make it clear that those collected (first collected, second collected) are different. The binary group, whose turn comes first, is kept at the beginning of the marked road lines until the start command is given by the leader. When the start command comes, the participants are asked to take the prepared cards and run toward the box. Newspaper balls as many as the number on the cards are thrown into the pipes and the participants' collection process is completed. In the final stage, the total number of newspaper balls collected in the basket is counted. The participants complete the game process by applauding as much as the number of newspapers collected while returning from the drawn path. The game phase is completed by playing the same game with the other groups, respectively.

2/3rd Activity (Duration 15 min.) (Presentation of content with instructional strategies) Impromptu: Participants are asked to form a circle by the leader. Participants are named plus and minus by the leader. Groups are formed by combining the plus ones and the minus ones. Thus, two groups of eight people are formed. The groups are asked to use the newspapers brought beforehand by the leader in improvisations. Improvisation topics are as follows;

First group: There are five newspapers in the classroom. Your three friends are bringing three more newspapers. How many newspapers do you have? What would you do in class with newspapers?

Participants are asked to act out the moment in line with the information given and the questions asked.

Second group: There are nine newspapers in the classroom. Four of your friends lose four newspapers in the classroom. How many newspapers do you have left? What would you do in class with newspapers? Participants are asked to act out the moment in line with the information given and the questions asked.

2/4th Activity (Duration 10 min.) Formation (Media development): The leader makes the group sit in a circle. An incomplete math box is placed in the middle of the circle. Next to the box, there are materials such as glue, addition mark label, subtraction label, number label, crayons, and small balls. Ask the whole group to complete and decorate the unfinished math box.

2/5th Activity (Duration 5 min.) Evaluation:

1. What are the things you liked most about the work?
2. How do you reduce your crayons?
3. How do you increase your crayons?

To point out here, during the process, children should not be expected to give correct answers and complete the transactions completely and without errors. The study aims to enable children to gain an affinity for mathematical concepts by having fun.

3.3.3. 3rd Session

Subject: Establishing Object States Part-Whole Relations

Class: Preschool 5-6 years old study

Number: 16 people

Duration: 55 minutes

Method-Technique: Improvisation, Leading Role, Photo Frame, Dull Image

Tools and Materials: Chest, glass box, key, apple, scissors, kraft paper, tape, magnifying glass, glasses, crayons, glue, black felt-tip pen, string.

3/1st Activity (Duration 5 min.) Warm-up (Task and instructional analysis): Participants are asked by the leader to imagine themselves as a glass box. Participants are allowed to take shape imaginatively as if it were a glass box. It is indicated by the leader that there is something in each of these glass boxes. What happens is left to the imagination of the participants. In the directions given by the leader, they are told to walk slowly first. Then they are reminded that they should not bump into each other, and it is mentioned that the glass may break. By changing the directive, it is imagined that the glass boxes crash into each other and break. Meanwhile, music is played that sings about broken glass. The dream cycle is continued by assuming that the broken pieces are scattered around and the pieces in the box are also scattered in the same way. Meanwhile, the technique is applied in the leading role. Passing through the participants and distributing glue, the leader continues the step of giving instructions. It is thought that the box can be restored by gluing the glasses that make up the parts of the broken box. Participants are asked to collect the broken pieces and glue them together. While collecting the pieces, the leader tells the participants that the pieces can be sharp, heavy, small, or large, and the power to convey the concept is increased. In addition, it is especially stated in the instructions that they should be careful due to the cutting feature of the glass. Finally, the participants are asked to take the form of a glass box again as they were in their original state.

3/2nd Activity (Duration 15 min.) Game (Determining the goals and criteria, preparing the environment and tools): A map was prepared with kraft paper beforehand by the leader. Certain directions were written on the map and clues were given. A trace was created by drawing map pieces on kraft paper

with a black felt-tip pen. (Like a puzzle.) The pieces are cut and adjusted to restore their original shape when put together. These pieces are glued to the walls of the space by the leader. Scissors, magnifying glasses, glasses, and rope are placed on the ground and certain parts of the place in advance by the leader. Assuming that these pieces are the pieces that come out of the glass boxes and are scattered around, it is ensured that the participants are collected. The participants are asked to take the pieces attached to the wall and put them together to form the whole map. The map is examined by using the collected materials. In the meantime, with the leader's role again, examinations are made on the map.

The transfer of the directions given on the map to the participants is done by the leader. Participants are informed that there must first be a key on the map. The key previously hidden by the leader in the space is found by the participants. Then the other directive on the map is mentioned. This directive is about finding a treasure in the queue. This treasure is a chest. A chest was previously placed by the leader in a part of the space. Inside the chest is a glass box. There is a green apple in the glass box. The apple was placed inside the glass box and pre-divided into four parts. It is ensured that the participants start their way to the ballot box by overcoming difficult obstacles. These obstacles are made imagined by the leader as streams, tunnels, and rocks. Participants are expected to overcome obstacles with their imagination. (For example, a bridge can be built by combining wood to cross the stream. In this way, they can be crossed to the opposite side of the stream.) Finally, a chest is found. It opens with the key. The pieces of green apple in the glass box stored in the chest are taken.

3/3rd Activity (Duration 20 min.) Impromptu (Presentation of content with instructional strategies): Participants are asked to take the shape of a circle. Participants are named blue, yellow, red, and green apples. Four groups of four are formed by gathering the participants called apples of the same color. The following topics are given to the groups in order;

First group: They are asked to form a photo frame of the whole apple found.

Second group: They are asked to create a photo frame with apples cut in half.

Third group: They are asked to create a photo frame with apples divided into three parts.

Fourth group: They are asked to create a photo frame with an apple divided into four parts.

Groups are given one minute to prepare their photo frames. Afterward, the groups are expected to present their work in turn. After presenting their work to each group, they are asked to take the form of a still image at the command of the leader. After each image, the groups are given a voice to comment on the groups that became the frozen image. Thus, the process is completed.

3/4th Activity (Duration 5 min.) Formation (Media development): The four groups of four people mentioned earlier in the improvisation are asked to sit on the floor side by side. Each group is given cardboard, scissors, and crayons prepared by the leader. Cardboards were drawn by the leader in such a way as to divide them into pieces like a jigsaw puzzle with the help of a pencil. Each group is allowed to draw something they want on this cardboard and create their puzzles. At the end of the drawing, the sections determined by the leader are cut into pieces by the groups with the help of scissors. By putting these parts together again, the whole is formed. Finally, the jigsaw puzzle is completed.

3/5th Activity (Duration 10 min.) Evaluation:

The leader takes the form of a circle with the whole group and sits on the ground. Participants are asked simple questions;

1. What are the things you liked most about the work?
2. What would you like to see?
3. What did you learn?
4. What did you notice while creating the puzzle activity?

5. By chatting about the parts and whole of the apple, questions about the subject are asked of the participants. Participants are expected to share their ideas and thoughts.

4. Conclusion

Creative drama is used as a method for many lessons in institutions that provide education in the preschool period. Creative drama can also be used as a method for the acquisition of mathematical skills. It is known that children learn easily with the principle of doing-living in an active state by using their imaginations. The senses play an important role in learning processes. Children develop mental awareness by touching, smelling, feeling, seeing, and using their senses of taste. In this context, the subjects to be taught become meaningful and permanent by being shaped by the formation of mental maps. Objects that exist in life or symbolic objects that have taken the place of those objects are helpful for the drama to gain a concept. Thanks to drama, children can experience permanent and desired developments in mathematics that include abstract concepts. In this context, the use of creative drama as a method to develop children's mathematical skills has been explained above within the instructional design processes. In line with Seels and Glasgow's Instructional Design Model, how to design creative drama activities in ten steps are explained, along with the planning of the above activities and sessions, as well as the implementation processes.

By integrating the stages of creative drama with the ten steps of Seels and Glasgow's ID Model, mathematical skills were supported in the preschool period. While aiming to support mathematical skills, it is necessary to understand abstract concepts. Children need some concretizations to understand abstract concepts so that children can understand concepts more easily by getting rid of semantic confusion. The session plans created within the creative drama contain effective explanations of the embodiments. The process of designing and teaching process with Seels and Glasgow's instructional design (ID) model has been discussed above.

The instructional design processes mentioned above can be applied to children aged 5-6, covering the preschool period, as well as to children at the next primary school level and younger children by planning the learning design steps according to the level of the students. While adapting the instructional design, art education, music therapy, etc. can be used to enrich the content. applications can be added. Appropriate steps and ID models selected by the project design team can be used for learning, practices, and educational projects organized with Instructional Design Models, in the same way as other special teaching techniques and methods used in the teaching process for age groups. For this purpose, new studies and trials should be carried out by child developers, educational technologists, visual designers, instructional software developers, instructional designers, and teachers and educators from all fields, to be used in future educational processes.

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