

## The Effectiveness Of Using Representative Activities In Developing Mathematical Concepts Among Pre-School Children

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### Abstract

*The research aimed to determine the effectiveness of using drama in improving students' understanding and application of mathematical concepts, improving their performance in mathematics and developing their skills in this field. The semi-experimental approach was relied upon, as the research sample was divided into two groups, one of which was the control sample, which was taught in the traditional way, while the experimental sample was trampled using educational drama. It was found that there are significant differences between each of the skills level of students in the experimental sample and the control sample, the mean scores of students in the experimental sample are higher than students in the control sample. This indicates the effectiveness of the proposed education strategy through drama in developing students' mathematical skills. The results were interpreted that drama-based practices help in learning mathematical concepts better and that these students have a better understanding of mathematical concepts. The experimental treatment using educational drama has contributed to the variance in the mathematical concepts test by approximately 91%, which indicates the effectiveness of the experimental treatment in developing the mathematical concepts test in the experimental group. There is a need to switch to education through drama for kindergarten children to develop their sports skills in the Kingdom of Saudi Arabia.*

**Keywords** Drama - mathematical skills - kindergarten - Saudi Arabia - Brunner's theory - Piaget's theory.

### 1. Introduction

The kindergarten stage represents the beginning of the path that will help children achieve their dreams and future goals, and therefore it is very important to provide a distinctive and integrated education at this stage to pave the way for success in the later grades. The kindergarten stage represents their starting point in the world of learning and development that will help them achieve their goals in the future. Children learn basic skills that pave the way for academic learning in later grades. The kindergarten curriculum includes many basic areas such as language, mathematics, science, arts, movement, and social skills (Al-Kubaisi, 2022). These areas are taught through interactive activities and educational games, which help children develop<sup>1</sup> their abilities and life skills. Kindergarten is also an important stage for the development of personality and social relationships for children, as they learn

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how to interact with others and communicate effectively. This stage also helps to develop self-confidence, independence, and responsibility (Saeed, 2022) (Taner, 2020).

Mathematical skills are among the basic life skills that children must develop in kindergarten, as these skills play a crucial role in developing their mental, physical and social abilities. At this stage, children learn basic mathematical concepts such as counting, addition, subtraction, measurement, geometry, statistics, and probability. The development of mathematical skills in kindergarten helps to develop mathematical intelligence, critical and logical thinking, in addition to improving memory, concentration and spatial awareness (Aida Zyoud, 2019). Mathematical skills can be taught to children through interactive activities and educational games that encourage children to learn in a fun and interesting way. These skills can also be taught in an interactive and direct way, such as using real objects in learning and training. Developing mathematical skills in kindergarten is crucial to improving children's capabilities and developing them comprehensively and integratedly. Therefore, teachers and parents must work to develop these skills at this vital stage in children's lives (Walaa, 2021).

Educational and acting drama is an effective tool in teaching mathematical skills to kindergarten children, as it gives children the opportunity to learn in an innovative and fun way, and helps them understand mathematical concepts better. Many experts in the field of education have confirmed that the use of educational drama and drama can help improve children's mathematical skills, by experimenting with these concepts in an innovative and fun way (Al-Khatib, 2018). Drama also helps in developing children's social, linguistic and mathematical skills, as they learn by interacting with each other and experimenting with the different roles that they have to perform, which contributes to the development of their language, numeracy and social skills. The use of educational and acting drama in teaching mathematical skills to kindergarten children is very important, as this age is a crucial stage in the development of mathematical, social and psychological skills, and acting drama can provide a suitable educational environment for children to experience mathematical concepts and enhance their skills. It can be said that the use of educational and acting drama in developing mathematical skills among kindergarten children represents an effective and appropriate approach to developing children's skills and enhancing their social and psychological development, and teachers and educators can use this tool to teach children in an effective and fun way (Yang, 2022).

There are many educational and social theories that dealt with the use of acting drama in developing mathematical skills in children in kindergarten, perhaps the most important of which is Vygotsky's theory, which was developed to extend its practical application to the use of acting drama to teach mathematical skills in an innovative and fun way (Mohamed, 2023). As well as Brunner's theory, which indicated that children learn through their social environment, and that play can help enhance children's mental and social development (Ezenwosu, 2022). Which supports the application of theory on the use of acting drama to enhance children's mathematical learning. Montessori theory was also developed to use dramatization as a way to motivate children to learn and self-explore in the area of mathematical skills. Piaget's theory also did not overlook the use of acting drama to motivate children to think and analyze in the field of mathematical skills, as the theory indicates that children learn by interacting with their environment, and that learning occurs when children are motivated to think, analyze and interact with their surrounding environment (Heiba, 2021).

The scientific importance of the research stems from the fact that it sheds light on one of the issues related to the use of the active and interactive learning strategy in promoting the learning of young children in the Kingdom of Saudi Arabia, which is a modern and innovative strategy in the field of education. Many schools, teachers and parents are also helping to enhance the learning of young children in Saudi Arabia. As well as providing scientific data on the impact of educational and acting drama on the development of mathematical skills, which can be used in developing more effective educational strategies in the future, by applying the results of the study in daily educational practice. The research also enriches scientific knowledge about the development of mathematical skills in young

children, especially in light of the growing need to develop students' skills in mathematical sciences in the Kingdom. As for the applied importance, it stems from the positive impact that the application of the results of the study can have on teaching and learning in the Kingdom of Saudi Arabia.

The development of mathematical skills in young children is one of the most important challenges that teachers face, and the educational and drama strategy can be an ideal solution to these challenges. The interaction and active learning encouraged by the use of didactic drama helps children better understand mathematical concepts and apply them to everyday life more effectively (Taner, 2020). In addition, educational drama and drama can help improve children's social, cooperative, language and motor skills, skills that help children prepare for later grades. The results of this study can be used to develop educational curricula in the Kingdom of Saudi Arabia, to improve children's learning in the primary educational stages, and to achieve modern education goals that focus on stimulating interaction and active learning (Abd al-Karim, 2020).

The research aims to determine the effectiveness of the use of educational and dramatization in improving students' understanding of mathematical concepts and applying them better, and enhancing their interest in the subject. The research also aims to provide recommendations and suggestions to improve the quality of mathematics education for kindergarten children in the Kingdom of Saudi Arabia, improve their performance in mathematics and develop their skills in this field. Thus, the aim of the research is to improve the quality of mathematics education for kindergarten children in the Kingdom of Saudi Arabia by using educational and dramatization as an effective tool in education. Thus, the research attempts to answer the following question: "What is the effect of using educational and dramatic drama on the development of mathematics skills among kindergarten children in the Kingdom of Saudi Arabia"?

To achieve the objective of the research, the semi-experimental approach was followed. Because it is considered the appropriate curriculum for the nature and objectives of the study, which tends towards measuring the effectiveness of using educational drama in acquiring mathematical and scientific concepts among kindergarten children. The selection was designed through two groups, one of which is the experimental group, and the other is the control group. The study relies on the independent variable, which reflects the method of teaching, which is through the traditional method, and the proposed method through relying on educational drama. The dependent variable represents the development of mathematical concepts among kindergarten children. The study population consisted of all kindergarten children in the Eastern Province, Saudi Arabia. While the study sample consisted of kindergartens in Dammam Governorate, the sample was divided into two groups, a control group that relied on education in the traditional way, while the experimental group relied on the use of educational drama in teaching. A set of applied determinants was relied upon to select the control group to ensure convergence in the cultural, economic and social levels.

In view of the increasing importance of children's education methods, and the novelty and effectiveness of educational drama as one of these teaching methods for children, this research represents an attempt to consolidate the scientific and practical foundations of the mechanisms of developing the skills of kindergarten children through educational drama. Educational drama is one of the effective and fun educational tools that are used in many countries around the world, and it is considered one of the modern means that are used to convey information, ideas and concepts in an innovative and interesting way, and helps to stimulate thinking, develop students' skills and improve the level of learning. Educational drama in the Kingdom of Saudi Arabia supports formal education in schools, universities and other educational institutions, as it helps to communicate information and concepts in a simple and smooth way, and contributes to improving the level of understanding and interaction with the study material (Abd al-Karim, 2020). Educational drama in the Kingdom of Saudi Arabia is also an effective way to promote national identity, Islamic values, and Arab culture, as various topics related to the history, heritage, and cultural

heritage of the country are included, and thus contribute to strengthening belonging and loyalty to the homeland and society. Educational drama in the Kingdom of Saudi Arabia also works to develop students' skills such as communication, cooperation, leadership, creativity and innovation, and encourages students to think critically and solve problems, which ultimately leads to improving the level of learning and achieving educational goals in an innovative and interesting way (Al-Khatib, 2018).

The remainder of this paper is organized as follows. Section 2 describes the literature review that dealt with the subject of the research, and comes up with the most important ideas and results related to the educational drama strategy and its role in developing the mathematical skills of kindergarten children. Section 3 is the research problem, Section 4 presents the research hypotheses. Section 5 develops the main ideas of the present contribution and integrates them into the field context, general setting and organizational concepts relevant for subsequent analysis. In Section 6, the analysis and discussion of the applied case that reflects the subject of the research, through application to the study sample in Dammam, Saudi Arabia. Section 7 concludes.

## **2. literature review**

Educational drama is one of the fun and effective educational tools that are used in teaching many subjects, and it is considered one of the modern means that help stimulate thinking and develop students' skills. There are many previous studies that dealt with the use of educational drama in teaching mathematical skills to kindergarten children. These studies improve the level of learning and develop students' skills in mathematical subjects, and help communicate concepts and information in an interesting and innovative way. These studies indicate that the use of educational drama in teaching mathematical skills to kindergarten children helps in developing the child's skills in arithmetic, measurement, arrangement and classification, and helps to improve their abilities in problem-solving and critical thinking. Perhaps one of the most important of these studies is (Saeed, 2022), which aims to study the attitudes of public school teachers in the Western Badia region towards the use of drama in education. The results of the study showed that the majority of teachers in public schools in the Western Badia region believe that the use of drama in education can be effective in improving students' academic achievement and developing their social, linguistic and creative skills.

The study also showed that the main barriers to the use of drama in education include the lack of administrative support and appropriate training for teachers, in addition to time constraints and financial challenges. As for (Al-Kubaisi, 2022), it aimed to study the effectiveness of the cartoon concepts strategy in developing some concepts and skills in mathematics for children with special needs. The results of the study showed that the cartoon concepts strategy was able to significantly develop some concepts and skills in mathematics for children with special needs, and that the children who received training using this strategy achieved better results in tests than children in the control group. Thus, the use of cartoon concepts strategy can be effective in developing some concepts and skills in mathematics for children with special needs, and it can be used as an effective educational tool to improve mathematics learning for this group of children.

Despite the different application tools, many studies supported the application of educational drama, as (Yang, 2022) tended to use video as a tool for studying mathematics. The results showed that teachers who used intentional teaching technique achieved better results in teaching mathematical concepts to children. These results can be used to improve the teaching of mathematics in kindergartens and schools. As for (Mohamed, 2023), it dealt with the impact of education based on digital drama in the development of comprehensible and expressive language among children in kindergarten. The results showed that the experimental group that learned using education based on digital drama achieved a significant improvement in comprehensible and expressive language, while there was no significant improvement in the control group that learned using traditional methods. This indicates that education based on digital drama can be effective in developing receptive and expressive language in kindergarten children. He also stressed (Abdul Karim, 2020) the

impact of teaching poetic texts in the manner of dramatic representation on the literary appreciation of third-grade middle schoolgirls in the city of Riyadh in the Kingdom of Saudi Arabia. It was concluded that the use of the dramatization method in teaching poetic texts has a positive effect on the literary appreciation of female students, as the level of literary appreciation among female students who learned poetic texts by the method of dramatic representation in the Kingdom of Saudi Arabia was improved.

It was also found (Ezenwosu, 2022) that students who were taught using drama achieved better results in tests compared to students who were taught in the traditional way. While (Taner, 2020) determined the impact of sports activities based on play on various areas of development in children. It has been shown that the representational sports activities based on play positively affect various areas of development in children, such as linguistic, social, emotional, motor and intellectual development. As for (Heiba, 2021), social drama was used to teach economic concepts to children of kindergarten age. It concluded that social drama was effective in improving children's understanding of some economic concepts, as it could help enhance their understanding of difficult and abstract concepts. Teachers and educators can use this type of program to teach children economic, social and other cultural concepts in an innovative and interesting way.

In the same context, (Aida, 2019) aimed to measure the effectiveness of educational drama in developing mathematical concepts among kindergarten children. The results showed that the use of educational drama can improve the level of understanding of the child, and that the children who learned using educational drama achieved better results in tests than the children in the control group who learned using traditional methods. This supports the findings of (Al-Khatib, 2018), which dealt with the impact of using educational drama on the acquisition of mathematical and scientific concepts among kindergarten children in Jordan. It was concluded that the use of educational drama can significantly improve the level of mathematical and scientific concepts acquisition among kindergarten children, and that children who learned using educational drama achieved better results in tests than children in the control group who learned using traditional methods.

Masoum (2013) also found that the use of drama in teaching mathematics can improve students' achievement and understanding of the subject. Also, students who were taught using drama achieved significantly better results compared to students who were taught using the traditional method of teaching. He recommended the need to include drama in the curricula for teaching mathematics, and to improve the training of teachers on how to use drama in learning. This was also supported by (Farajallah, 2012), where he concluded that the use of educational drama can significantly improve the level of students' understanding of mathematical concepts, and that the use of educational drama can be effective in improving students' understanding of mathematical concepts in the first stage of basic education. It can be used as an effective educational tool to develop students' mathematical concepts.

The literature review indicates that the use of educational drama in developing mathematical skills among kindergarten children indicates the effectiveness of this method in improving the level of learning and developing students' skills in mathematical subjects. This method is considered one of the modern means that help stimulate thinking and develop children's mathematical and logical abilities. These studies emphasize the importance of including educational drama in academic and educational programs to enhance the learning of mathematics among kindergarten children in the Kingdom of Saudi Arabia, improve their academic level and develop their life and social skills. One of the positive aspects of the dramatic use in learning mathematical skills for children in kindergarten is that it works to improve focus, attention and social interaction in children, and also helps to develop their language and communication skills.

### **3. Research problem**

The research deals with the problem of some children's difficulty in developing mathematics skills in kindergarten, which affects their academic progress in the later stages.

This is due to the fact that some children find it difficult to understand and apply basic mathematical concepts, which affects the development of their skills in this field. A literature review showed that the use of drama in education can help improve students' understanding and application of mathematical concepts, and improve their performance in mathematics. However, there is still a need for research and analysis to find out the effectiveness of using drama in teaching mathematics to kindergarten children in the Kingdom of Saudi Arabia, and how it can be applied effectively in schools and kindergartens.

#### **4. Research Hypothesis**

The research is based on two hypotheses, which will be tested and analyzed based on statistical methods, as follows:

H1: There is a statistically significant effect of educational drama in developing the skills of kindergarten children in the Kingdom of Saudi Arabia at a significant level of 5%.

H2: Teaching the proposed strategy achieves a significant effect size using an Eta square higher than the value (0.14) in developing the test of mathematical concepts as a whole and its main concepts among the children of the research group.

#### **5. Theoretical framework**

##### **5.1. Educational drama strategy**

The idea of educational and acting drama is based on the theory of active learning, which emphasizes the role of the child in building and learning knowledge, as he learns through interaction and active participation in the educational process instead of only listening to the teacher or reading. It represents a method that uses a series of activities, carried out by children, under the guidance of the teacher, to achieve specific educational outcomes, centered on representational activity, through which the child unites with a specific role, in a specific situation, and based on learning, in order to achieve a specific educational goal. John Dewey's theory emphasized the importance of practical and interactive experience in the teaching process, and that dramatization is an educational methodology used to enhance interaction and active participation of children in learning and critical thinking processes (Saeed, 2022). This is done through the use of live performance and representation to enhance understanding and practical application of academic concepts. Jean Piaget's theory also emphasized that children need the opportunity to learn through play and lively interaction. Educational and acting drama is used to educate young children through dramatic games, small plays, group acting, showcasing, and self-representation (Al-Kubaisi, 2022). These methods are used to teach children basic concepts such as numbers, letters, shapes, colors and other concepts. Freud's theory was that children learn through experience and interaction. Vygotsky's theory also emphasized that children learn through the social and cultural interaction that takes place in their surrounding environment. Teaching through educational drama contributes to enhancing communication and interaction between individuals and promoting social and educational culture (Yang, 2022). It also helps in motivating children, calling for their interest and actively participating in the educational process. Drama is used in many other fields, including the arts, entertainment, and outreach. Using drama in teaching mathematics helps motivate students and make mathematics more fun and interesting. Drama can be used in mathematics education to illustrate complex mathematical concepts in a simple and innovative way, and to motivate students to continue learning mathematics. The use of drama improves students' skills in mathematics, including understanding mathematical concepts, their application in solving mathematical problems, analyzing mathematical data, and critical thinking (Aida Zyoud, 2019).

##### **5.2. Educational and social theories of educational drama**

Educational theories all suggest that children learn by interacting with and interacting with their environment, and that play and social interaction can help enhance children's learning and personal development. Thus, acting drama can be used as an effective tool for teaching mathematical skills to children in kindergarten, and perhaps the most important of these theories (Al-Tuhamy, 2018)- :

Vygotsky's theory

It focused on the concept of social learning, and it indicates that learning depends on the interaction between the individual and the social environment surrounding him, and between the individual and others in this environment. Drama is an effective way to teach mathematical skills in kindergarten because it enables children to enjoy learning and encourages them to actively participate in the learning process. When children participate in drama, they learn by interacting with others and learning through the different roles they have to perform, which contributes to the development of their social, language and numeracy skills (Torbert, 2005). In addition, the acting drama encourages children to learn in an innovative and fun way, which enhances their desire to participate and interact and makes the learning process more interesting and attractive. Thus, the use of acting drama in teaching mathematical skills in kindergarten represents an effective and appropriate approach to developing children's skills and their social and psychological development (Walaa, 2021) (Heiba, 2021).

Bruner's theory: The proponents of this theory believe that any topic can be taught to any child based on the way the topic is presented, and the extent to which the method of presentation is appropriate to the characteristics of the learner, as mental development proceeds from sensory to representation to abstraction. The effectiveness of learning is related to the extent to which the style and style of education is chosen that suits the level of cognitive development of the learner. Bruner assumed that there are three styles of learning. Learning by doing, which refers to doing or participating in something (Abd al-Karim, 2020). Conceptual learning is based on the use of the senses or visual sensory media in representing what is intended to be taught, i.e. the image replaces the actual thing, whereby a cognitive representation of it takes place and is stored within the learner's cognitive structure. Symbolic learning, in which interaction with the surrounding environment occurs through language and internal mental representation of the meanings and meanings of symbols (Yang, 2022). This theory can be applied to the use of drama to teach mathematical skills, where children can participate in playing two roles and discuss mathematical rules and strategies and apply them on the stage. Role-playing can also help enhance children's oral and mathematical language, as children can apply the mathematical concepts they learn in real life and in play (Al-Khatib, 2018).

Montessori theory: It focuses on educating children in a personal and individual way, and believes that the child is the one who leads the learning and development process. Play and social interaction are an essential part of children's learning, and dramatization can be used as an effective tool for teaching mathematical skills to children in kindergarten (Ezenwosu, 2022). The theory suggests that children learn best when they can explore and experiment in a systematic and structured way, and dramatization encourages children to learn through play and experience. Drama is used to teach mathematical skills in kindergarten by creating situations and scenes that include different mathematical concepts, such as counting, addition, subtraction, multiplication, etc., and children can experience these concepts in an innovative and fun way. Dramatization is also an effective way to enhance children's oral and mathematical language, as they learn through social interaction and the practical application of mathematical concepts (Saeed, 2022).

Piaget's theory: Who advocated that knowledge is built when children learn new things step by step, and thus encourages learning by experience and focus on the process of self-stimulation, and focus on the mental processes that the learner performs during his interaction with educational and life situations. His experiences and employ his abilities to perform the role appropriately, which is reflected in the development of his knowledge structures. That children learn by interacting with their environment and by building

knowledge through experience and social interaction (Mohamed, 2023). When children participate in drama, they learn by interacting with others and learning by experiencing the different roles they have to perform, which contributes to the development of their social, language and numeracy skills. Piaget's cognitive theory consists of four main stages of the development of intelligence and thinking, which is the sensory and motor stage, which lasts from birth until the age of two years, and is characterized by reliance on the motor and perceptual senses in interaction with the surrounding world. The stage of mental operations, which lasts from 2-7 years of age, in which the ability to use symbols, signs and words to express and interact with the surrounding world is developed. As for the stage of dependent operations, it lasts from 7-12 years old, and is characterized by the ability to analyze problems, think logically, and deal with multiple ideas. The formal operational stage, which lasts from the age of 12 years and above, and is characterized by the ability to think more abstractly and complexly, and to think ahead and plan for the future (Al-Kubaisi, 2022).

Froebel model: This model emphasizes that children learn best when mathematical concepts are applied to everyday life. Dramatization can be used to apply and experiment with these concepts in a creative and fun way, helping children to better understand mathematical concepts (Masoum, 2013).

The researcher benefited from the knowledge construction of the previous theories in reasoning and emphasizing the importance of the effective role of drama in acquiring the kindergarten child various concepts, in addition to developing his artistic skills and talents and enriching his linguistic vocabulary, as well as self-confidence and self-realization through playing motivating roles for them in addition to fun and pleasure; Because the content of the stories contains excitement and suspense, and thus the drama achieves many psychological, social and mental goals, which satisfies the needs of the child and fulfills the requirements of personal growth.

### **5.3. Mechanisms of using acting drama in teaching mathematical skills**

Several methods of dramatization in the development of mathematical skills can be applied, which included role-playing to teach mathematical concepts, by assigning different roles to children and encouraging them to interact with each other. Different roles can be assigned to children to learn different concepts. Indicative theater and educational games can also be used to teach mathematical concepts, by preparing a story or a play that teaches children mathematics, and encouraging children to participate in role-playing games to learn mathematical concepts (Walaa, 2021). Didactic drama methodologies involve acting through movements, through nonverbal communication, showing how much we can say without speaking, and how much we communicate through gestures. The show is direct, which mirrors pre-planned scenes, but the action and dialogue are carried out spontaneously in the moment. The five sensory memory is also improved, and it also works on auditory and visual perception. Where we experience life through our senses, vision and hearing are essential tools for reading and understanding (Aida Zyoud, 2019).

### **5.4. Educational drama methods used to develop mathematical skills**

The mechanisms of applying drama in children's education depend on the use of mathematical tools, such as balls, disks, and geometric shapes, to build structures and shapes and solve mathematical problems. Creativity and social interaction can be enhanced by adding theatrical elements, such as costumes, decorations, and music. Children can also play different roles in sports, such as referees, players, and coaches, and apply mathematical concepts, such as counting, measurement, and arithmetic, in the context of fun and social interaction. In addition to using movement, dance, and acting to enhance sensory and motor perception, improve movement coordination, balance, and coordination, and enhance mathematical concepts, such as proportions, distance, and angle (Saeed, 2022). Kids can also use imagination and imagination to create math games and solve math problems, stimulating creativity, critical thinking and creative solutions. Children can use colors and shapes to learn mathematical concepts, such as separating geometric shapes and learning numbers and mathematical operations. Creativity and critical thinking can be stimulated by



creating new activities and games using colors and shapes (Faraj, 2012). Acting out mathematical stories, such as the story of the rabbit and the tortoise, and learning mathematical concepts, such as time, speed, and balance, and applying them in various activities. And learn mathematical concepts in a fun and simple way by playing. Various activities, such as sports, memory games and puzzles, can be created to enhance mathematical abilities and arithmetic skills. And using different materials, such as paper, cloth, and wood, to build mathematical structures and shapes, and learn mathematical concepts creatively and innovatively (Al-Khatib, 2018) (Ezenwosu, 2022).

**6. Analysis And Discussion**

**6.1. Action research tools**

- Placement test for mathematical concepts (prepared by the researcher).
- A set of representative stories that reflect the mathematical concepts that will be relied upon in the test scale (prepared by the researcher).
- Testing mathematical concepts and foundations, which was designed by the researcher to measure the impact of the tools used in developing mathematical skills among kindergarten children. Data analysis and probabilities).

**6.2. Exploratory test**

The test was applied to an exploratory sample of 25 boys and girls from kindergarten, who were not members of the sample, who had previously studied these concepts. An agreement was made with a teacher to teach these concepts to the exploratory sample, before the field application of the study took place. The aim of the exploratory application was (calculating Test time when applied to the basic research sample - calculating the internal consistency coefficients - calculating the test stability coefficient - finding the difficulty coefficient and the discrimination coefficient).

**6.3. Calculate the internal consistency and stability of the test**

The internal consistency of the mathematical concepts test was verified, as Pearson's correlation coefficient was calculated between the score of each test item and the total score of the level to which this item belongs, then the correlation coefficient was calculated between the total score for each test level and the total score of the test. Reliability was calculated to test mathematical concepts on the same experimental sample, Cronbach's alpha coefficient was used.

Table 1. Correlation coefficients of the questionnaire axes and the total score of the test

<b>Dimensions</b>	<b>Number Of Questions</b>	<b>significance level</b>	<b>correlation coefficient</b>	<b>Cronbach's alpha stability coefficient</b>
Concept of numbers and mathematical operations	7	0.000	0.628	0.746
The concept of patterns, functions and algebra	4	0.000	0.581	0.825
measurement	6	0.000	0.724	0.797
Geometry and spatial sense	6	0.000	0.607	0.824
Data analysis and probabilities	7	0.000	0.691	0.801
full test				0.798

Table (1) shows that all the correlation coefficients were statistically significant at the significance level of 0.05, and the correlation coefficient values ranged between (0.58 - 0.72), and this indicates that all dimensions of the test enjoy internal consistency. The results also showed that the stability coefficient for the test dimensions ranged between (0.746-0.825), which are high values, which indicates that the test is characterized by a high degree of stability, and that there is an acceptable amount of internal consistency among the test items.

#### **6.4. Determine the difficulty coefficients for the test items**

The “difficulty coefficient” means the percentage of students who answer the question with a correct answer for the paragraph. The aim of calculating the degree of difficulty for the test paragraphs is to ensure that the paragraphs have a degree of difficulty ranging between (20-80). The researcher used the following equation to calculate the degree of difficulty. For each item of the test (difficulty coefficient = (the number of students who answered the question wrongly X the number of students who tried to answer the question) 100%. The results showed that the difficulty coefficients ranged between (0.27-0.76), and therefore all test items It was acceptable in terms of ease and difficulty.

#### **6.5. Determine the discrimination coefficients for the test items**

The task of discrimination is to determine the ability of the paragraph to distinguish between children who have the ability to answer, and those who do not have this ability, and in order for the researcher to obtain the coefficient of discrimination for each paragraph of the test paragraphs, the children were divided into two groups, the first upper group and included (30%) ) from the total number of children who obtained the highest scores in the test, and the second lowest group, which included (30%) of the total number of children who obtained the lowest scores on the test, and the scholars believe that the discrimination coefficient should not be less than (25%) and that the higher the score Distinguish from it the more the better. The discrimination coefficient was calculated for each question of the test according to the following formula, (discrimination coefficient = the number of correct answers in the upper group - the number of correct answers in the lower group) / half the number of children in the two groups). The discrimination coefficients for the test items ranged between (0.31-0.65), and accordingly, all the test items were accepted in terms of the values of the discrimination coefficient.

#### **6.6. The veracity of the arbitrators**

Presenting the test in its initial form to a group of arbitrators and experts, in order to take their opinions and ensure (the extent of the comprehensiveness of the test for the mathematical skills it includes - the coverage of the test paragraphs for the content - the scientific and linguistic correctness of the paragraphs - the extent to which each question achieves the goal set for it - the appropriateness of the wording for the level of children - Make general comments on the test). In light of the observations made by the arbitrators, the researcher did many things, the most important of which are (modifying some questions - reformulating the test paragraphs to suit the children's level - adding another group - deleting a group of questions - reshaping the test and distributing the questions better). The test was applied to the children in the survey sample.

#### **6.7. Application of tribal research tools**

A test to determine the initial level of mathematical concepts is applied to the children of the two groups (experimental and control), at the beginning of the semester, in order to ensure the equality and homogeneity of the children of the research sample, before conducting the experimental treatment. The child and his motives are affected by the environment in which he lives, the family and the environment surrounding them, which affects how they perceive things, phenomena, relationships and the formation of concepts. The cultural level of the parents is also one of the factors affecting the information the child

acquires and what prepares him for the mental stimulation he needs to explain his observation of the phenomena. Different environments (Al-Tohamy, 2018)

Table 2. Homogeneity between the experimental and control groups in terms of test dimensions for the pre-measurement

Dimensions	experimental group		control group		t	Sig
	Mean	standard deviation	Mean	standard deviation		
Concept of numbers and mathematical operations	17,615	0.041	18,468	0.007	-1,849	0.070
,The concept of patterns functions and algebra	18,402	0.012	18,488	0.009	-1.178	0.142
measurement	15,467	0.048	15,672	0.026	-1,844	0.091
Geometry and spatial sense	18,692	0.018	18,583	0.048	1,039	0.162
Data analysis and probabilities	15,985	1,676	15,922	1,678	0.092	0.464
Complete test	17,126	2,042	17,340	2,232	-0.569	0.286

One-sample Kolmogorov-Smirnov test was applied to both groups. The data were found to follow a normal distribution ( $P > 0.05$ ). This enables the use of parametric tests (Levine's t-test). The t-test was used to test the significant differences between the control and experimental samples for pre-measurement. Table (2) shows that there are no significant differences between each of them, at a significant level of 5%. This indicates the existence of homogeneity and parity between the two groups. The children of the two groups ranged between five and six years of age, and the researcher looked at the children's records showing their names and ages, and thus the ages of the two groups were confirmed in terms of economic, social and cultural level and age, before presenting the proposed method.

**6.8. Testing the first hypothesis**

The first hypothesis of the research tests the existence of a statistically significant effect of educational drama in developing the skills of kindergarten children in the Kingdom of Saudi Arabia at a significant level of 5%. To test the validity of this hypothesis, the t-test results were relied on for the difference between the mean scores of the experimental sample and the control sample in the post test, as well as the significant differences between the mean scores of the experimental sample for the pre and post test.

Table 3: The post-test for both the experimental and control groups, and the pre- and post-test for the experimental sample.

Dimensions	Post-test	control			t Stat	P (T<=t) one-tail	experimental sample			P (T<=t) one-tail
		mean	Variance	t			mean	Variance	t	
The concept of numbers and Mathematical operations	control	21,169	1,139	-8,24	0.00	Pretest	18,468	0.007	-53,705	0.00
	Experimental	24,614	0.085	0	0	Post-test	24,614	0.085		0

<b>The concept of patterns and Functions and algebra</b>	control	19,992	0.059	-31,460	0.00	Pretest	18,488	0.009	-46,354	0.00
	Experimental	26,421	0.108	60	0	Post-test	26,421	0.108	54	0
<b>measurement</b>	control	21,988	0.010	-26,416	0.00	Pretest	15,672	0.026	-66,641	0.00
	Experimental	25,739	0.111	16	0	Post-test	25,739	0.111	41	0
<b>Engineering and spatial sense</b>	control	20,367	0.062	-16,327	0.00	Pretest	18,583	0.048	-24,935	0.00
	Experimental	24,003	0.235	27	0	Post-test	24,003	0.235	35	0
<b>data analysis and possibilities</b>	control	22,463	0.038	-10,267	0.00	Pretest	15,922	1,678	-16,971	0.00
	Experimental	26,293	0.936	67	0	Post-test	26,293	0.936	71	0
<b>Complete test</b>	control	21,317	1,106	-14,568	0.00	Pretest	17,340	2,232	-23,705	0.00
	Experimental	25,349	1,192	68	0	Post-test	25,349	1,192	05	0

The previous table reflects the presence of two types of tests, the first shows (t-test) to test the significance of the differences between the scores of each of the control and experimental research samples, as a result of teaching through educational drama. Where it is clear that the value of (P-value < 0.05), for all dimensions of the test, there are significant differences between each of the skills level of students in the experimental sample and the control, and by examining the values of the average scores for each of them, we find that the average scores of students in the experimental sample are higher than students in the control sample, The average of their scores in the post application for the experimental sample was 25.35, compared to 21.32 for the control sample, the calculated t-value was (-14.568). This indicates the effectiveness of the proposed education strategy through educational drama in developing students' mathematical skills. As for the second test, it shows the effect of teaching using educational drama. Significant differences were examined between each of the mean scores of the experimental sample before and after teaching through the proposed strategy. It is clear that the differences are significant between each of them, and that it is in favor of the post-test for the experimental sample. The average score for the post-application of the experimental sample was 25.35, compared to 17.34 for the pre-application. The calculated t-value was (-23.705). This confirms the effectiveness of educational drama in developing the sports skills of kindergarten children. Thus, the validity of the first hypothesis of the research was verified.

This result can be interpreted that practices based on educational drama can help in learning mathematical concepts better and that these students have a better perception of mathematical concepts. It encourages children to use their exploratory, innovative, performance, diligence and acting energies through imagination, diagnosis and creativity, exchanging individual and group roles, operating improvisation techniques and natural spontaneous recitation, imitating others and assuming their roles in a meaningful and expressive dramatic spirit. Children have the skills of dialogue, cooperation, problem-solving, and the development of innovative and critical thinking skills; because creative drama activities are by their very nature open-ended; they provide opportunities to identify the problem, solutions to the problem; To try out new behaviors and get feedback.

These results are consistent with what (Saeed, 2022) concluded that the use of drama in education can be effective in improving the level of academic achievement of students and developing their social, linguistic and creative skills. It also agrees with the study (Al-Kubaisi, 2022) that the acting drama strategy was able to significantly develop

some concepts and skills in mathematics for children with special needs, and that children who received training using this strategy achieved better results. The results also agree with (Abdul Karim, 2020) that the use of the dramatization method in teaching poetic texts has a positive effect on the literary taste of students, and that the use of the dramatization method helps in stimulating interest and enjoyment of poetic texts. The results of (Ezenwosu, 2022) also agreed that the use of drama in teaching mathematics can contribute to improving students' skills. Likewise (Taner, 2020) that the representational sports activities based on play positively affect the various areas of development in children, such as linguistic, social, emotional, motor and intellectual development. (Heiba, 2021) indicated that the use of social drama in teaching economic concepts to children at kindergarten age was effective in improving children's understanding of some economic concepts. The difference lies in the scope of application, as the current study focused on kindergarten children in the Kingdom of Saudi Arabia, as well as on the development of sports skills through drama.

Torbert (2005) also confirmed that the role played by drama and play in training children on life skills, as they see that games and activities are more than just entertainment, as they help children develop basic life skills that affect development and contribute to school readiness. They allow children to acquire listening skills as well as social and cooperative skills, the ability to self-control and focus, and encourage literacy and mathematics. Al-Khatib, 2018 attributed the superiority of the children of the experimental group in mathematical concepts to the fact that the use of educational drama aroused their constant desire to play roles, and raised their level of ambition, which had a clear effect on increasing their acquisition of mathematical concepts, while the children of the control group did not. Provoking their abilities within the usual teaching method, at the same level as the method of using educational drama, and the flexibility of educational drama, and the educational means, tools and activities it contains that are used in an interesting and interesting context, facilitated the process of achieving the goals. As the use of educational drama is consistent with what children tend to like, in terms of the availability of the element of movement and play, which helped to arouse the interest of children, so the children follow with passion what is going on in front of them of events, so that the child becomes a positive participant in learning, instead of being a passive recipient, and all of this facilitates and deepens comprehension, influencing the learning of mathematical facts and concepts and recalling them when needed.

The results also agreed with (Abdul Latif, 2011), which indicated that artistic activities play an important and effective role in acquiring scientific and mathematical concepts for kindergarten children, because they allow the child the opportunity to use his senses and rely on himself to explore what is around him, and to answer questions that baffle him. It helps him to use practical practice in acquiring the concept, as art is complementary to science, which gives the child many opportunities that help him to think and innovate, and children must participate in choosing the works and activities that are presented to them, as children tend to work hard and actively if they themselves participate in choosing these activities.

### **6.9. Testing the second hypothesis**

To determine the effectiveness of the experimental treatment in developing mathematical concepts, and to test the validity of the second hypothesis of the research, which is "the experimental treatment achieves great effectiveness by using an Eta Square higher than the value (0.14) in developing mathematical concepts as a whole and its main concepts among the children of the research group." The Eta Square equation was used to determine the size of the effect of treatment in the development of mathematical concepts, depending on the value of "T" calculated when determining the significance of the differences between the two applications (pre and post) for the experimental group. As well as the post-test for both the control and experimental groups.

**Table No. 4 Eta square and the size of the effect of experimental treatment on the development of mathematical concepts among kindergarten children**

Test dimensions	Post-test (control - experimental)				Experimental sample (pre-test)			
	D F	t Stat	$\eta^2$	Imp act size	D F	t Stat	$\eta^2$	Imp act size
Concept of numbers and mathematical operations	1	-	0.85	high	1	-	0.9	high
	2	8,240	0		2	53,705	96	
,The concept of patterns functions and algebra	6	-	0.99	high	6	-	0.9	high
		31,460	4			46,354	97	
measurement	1	-	0.98	high	1	-	0.9	high
	0	26,416	6		0	66,641	98	
Geometry and spatial sense	1	-	0.96	high	1	-	0.9	high
	0	16,327	4		0	24,935	84	
Data analysis and probabilities	1	-	0.89	high	1	-	0.9	high
	2	10,267	8		2	16,971	60	
Complete test	5	-	0.78	high	5	-	0.9	high
	8	14,568	5		8	23,705	06	

It is clear from the previous table that the value of the Eta square for the dimensions of the test of mathematical concepts for the experimental group, where we find that there is a high significant effect size for all dimensions of the test (greater than 96%), as it reached 0.906 for the total test, which reflects that the experimental treatment using educational drama has It contributed to the variance in the mathematical concepts test by approximately 91%, which indicates the effectiveness of the experimental treatment in developing the mathematical concepts test of the experimental group. The ETA square value was 78.5% for the interaction between the traditional method of teaching and the use of educational drama in teaching. As the use of educational drama combined education and play, stimulating the child mentally, emotionally and kinetically, to build his learning on his own, by acting out dramatic roles, and by using educational drama it is possible to overcome some of the educational and psychological problems facing children, especially those problems related to weakness. Their ability to focus. It is agreed (Al-Khatib, 2018) that the use of educational drama arouses the attention of children, because the events of the lesson are embodied in a tangible, live manner, which makes the experiences that are presented have a direct impact on the children, and therefore the children participating in the drama have the ability to infer The information, as if it comes from within them and they own it, and this result agreed with the result of the study (Al-Ameen, 2015), which revealed a positive relationship between the use of dramatic activities in kindergartens and social adaptation. This result can be explained by the change in the stereotype in teaching that accompanied the educational drama, which attracted children to it and increased their interaction with it, and contributed to eliminating feelings of tension, shyness, and the authority of the teacher, as drama requires children to use their senses greatly, such as listening, focusing and observing, which leads to comprehend and install mathematical concepts, and the educational drama is an application of Brunner's theory of cognitive growth and discovery learning, as he believes that any subject can be taught to any child, and this depends on the appropriateness of the presentation style for the characteristics of the learner. This result also agreed with (Yang, 2022) that using video as a tool for studying

mathematics provided better results in teaching mathematical concepts to children. And (Mohamed, 2023) that drama-based education has led to the development of absorptive and expressive language among children in kindergarten. He also confirmed (Aida, 2019) that the use of educational drama can significantly improve the level of a child's understanding of mathematical concepts, and that children who learned using educational drama achieved better results in tests than children in the control group who learned using traditional methods. And (Farajallah, 2012) that students who learned using educational drama achieved better results in tests than students in the control group who learned using traditional methods. The use of educational drama can be effective in improving students' understanding of mathematical concepts in the first stage of basic education, and it can be used as an effective educational tool to develop students' mathematical concepts.

## 7. Conclusions

To examine the effectiveness of the educational drama strategy in developing mathematical concepts among kindergarten children in the Kingdom of Saudi Arabia, the proposed strategy was applied to the experimental sample, while teaching was done in the traditional way for the control sample. The research tools relied on a placement test for mathematical concepts, to ensure the homogeneity of both groups before starting the implementation of the strategy. The drama strategy relied on a set of representative stories that reflect the mathematical concepts that will be relied upon in the test scale. And a test of mathematical concepts and foundations, to measure the impact of the tools used in developing mathematical skills among kindergarten children, and it includes five basic axes, which are, in order (the concept of numbers and mathematical operations - the concept of patterns, functions and algebra - measurement - geometry and spatial sense - data analysis and possibilities). The study found that there are significant differences between the skill level of the experimental and control students, in favor of the experimental sample. This indicates the effectiveness of the proposed education strategy through educational drama in developing students' mathematical skills. Significant differences between each of the mean scores of the experimental sample before and after teaching were examined through the proposed strategy. It is clear that the significant differences between each of them, and it is in favor of the post-test of the experimental sample. This indicates that educational drama has contributed to children's acquisition of dialogue, cooperation, problem-solving skills, and the development of innovative and critical thinking skills. Because its activities are open-ended by nature. They provide opportunities to identify the problem, solutions to the problem. To try out new behaviors and get feedback. It was also found that there is a high significant effect size for all dimensions of the test, which reflects that the experimental treatment using educational drama has contributed to the variance in the mathematical concepts test, which indicates the effectiveness of the experimental treatment in developing the mathematical concepts test of the experimental group. As the use of educational drama combined education and play, stimulating the child mentally, emotionally and kinetically, to build his learning on his own, by acting out dramatic roles, and by using educational drama it is possible to overcome some of the educational and psychological problems facing children. I recommend the need to provide the necessary resources to implement activities related to educational drama, such as costumes, accessories, raw materials, and furniture needed to equip the classroom. Appropriate electronic resources, such as videos, applications, and interactive games, can also be provided to assist teachers in carrying out activities related to educational drama. Provide appropriate training and workshops for teachers in the use of educational drama in teaching mathematics to kindergarten children. This training can help improve teachers' skills in planning, implementing, and evaluating activities related to educational drama.

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