



The Impact of Employing Dramatized Lessons on the Development of Solving Skills of Verbal Mathematical Problems and on Attitudes towards Mathematics among Third Graders

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Abstract

The study aims to identify the impact of employing dramatized lessons on the development of solving skills of verbal mathematical problems and on attitudes towards mathematics among third graders. A quasi-experimental method with experimental and control groups was used to achieve the objectives of the study. The study tools consisted of a test for mathematical problem-solving skills, and a scale for attitudes towards mathematics. After checking these instruments in terms of their validity and reliability, they were applied to a sample of (80) third grade students, distributed equally on control and experimental groups. The results of the study revealed that there were statistically significant differences in favor of the experimental group in the post-test of verbal mathematical problems-solving skills and the post scale of students' attitudes towards mathematics. Based on the findings, the study recommends the need for orienting education towards dramatized curricula.

Keywords: Dramatized lesson, attitudes towards mathematics, skills of solving verbal mathematical problems

توظيف مسرحية الدروس في تنمية مهارات حلّ المسألة اللفظية الرياضية والميل نحو الرياضيات لدى تلاميذ الصفّ الثالث الأساسي

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ملخص

هدفت الدراسة إلى معرفة أثر توظيف مسرحية الدروس في تنمية مهارات حلّ المسألة اللفظية الرياضية والميل نحو الرياضيات لدى تلاميذ الصفّ الثالث الأساسي. ولتحقيق أهدافها استخدم الباحث المنهج شبه التجريبي، وتمثلت أدواتها في اختبار مهارات حلّ المسائل الرياضية، ومقياس الميل نحو الرياضيات، وجرى التأكد من صدقها وثباتها، وطُبِّقَت على عينة مكونة من (80) تلميذًا من تلاميذ الصفّ الثالث الأساسي وُزِعَت بالتساوي على مجموعتين؛ ضابطة وتجريبية، وقد أظهرت نتائجها وجود فروق ذات دلالة إحصائية لتلاميذ المجموعة التجريبية على اختبار مهارات حلّ المسألة اللفظية الرياضية البعدي لصالح المجموعة التجريبية الذين درسوا بطريقة مسرحية الدروس، كما أظهرت وجود فروق ذات دلالة إحصائية لتلاميذ المجموعة التجريبية على مقياس الميل نحو الرياضيات البعدي لصالح المجموعة التجريبية، وأوصت الدراسة بضرورة الاهتمام بالتعليم عن طريق مسرحية المناهج الدراسية.

الكلمات الدالة: مسرحية الدروس، الميل نحو الرياضيات، مهارات حلّ المسألة اللفظية الرياضية.

1. Introduction

Mathematics is considered as one of the most important educational subjects that addresses the students' minds and develops their ability of discovery, problem solving and dealing with life problems and surrounding circumstances, which requires full knowledge of mathematics and its basic structure.

Mathematical problems are an important element in the structure of mathematical knowledge, given its great importance in the teaching and learning of mathematics (Abu Zeina, 2011: 292), as it's one of the most prominent standards of school mathematics, as confirmed by the documents of the National Council of Teachers of Mathematics (NCTM, 2000), where the standards of mathematics curriculum outlines a coherent vision for the process of teaching and learning of mathematics, which can empower students through several methods, such as: assessing the role of mathematics in the real world, developing the confidence and flexible thinking necessary for solving unfamiliar problems, and learning how to think and communicate mathematically (Pourdavood, 2003; Reeder, 2002).

Given the above, NCTM (2000) sets out a criterion for solving mathematical problems within the standards of mathematical processes, so that the learner can build new knowledge through the interacting and solving mathematical problems, applying and adapting appropriate solution methods, and observing the process of solving mathematical problems.

Kinzer, Virag & Morales (2011) pointed out that educational programs from KG to grade 12 should focus on developing the techniques of solving mathematical problem to achieve effective classrooms and to enable students to build new mathematical knowledge through solving problems, applying a set of strategies to solve appropriate problems, and thinking about the process of solving mathematical and non-mathematical problems.

Solving verbal mathematical problems is considered to be a complex mental activity, which made many scientists define intelligence, sometimes, as solving problems, and thus solving the mathematical verbal problems is considered a "high mental activity that involves many interconnected mental processes such as imagination, visualization, remembering, generalization, analysis, and synthesis, in addition to information, skills and processes such as desire, motivation and boredom" (Al-Sadeq, 2001: 243).

Despite this great importance of the mathematical problems, both mathematics teachers and students face difficulties in the teaching and learning of mathematics in general, and in solving verbal problems in particular. This importance is stressed when the student is confronted with a mathematical problem in which the student feels helpless and unable to solve it, which highlights the importance of student's need to read and well understand the problems and call for the need to train students to solve and deal with mathematical problems since the basic educational stages, extending with the student to the advanced stages of education.

(Abu Amira, 2002: 254-255) confirm that although most of the students are aware of the theoretical knowledge necessary to solve mathematical problems, they are still unable to solve these problems, which is clarified to be due to the emphasis on theoretical knowledge and the failure to provide students with the ability to deal and restructure knowledge, as well as due to the lack of students' training on higher mental processes, which calls for the need to search for the best ways to address this problem. Many studies have confirmed that students of the basic stage particularly face clear problems in solving the verbal problems, most notably the study of (Al-Shafei, 2010), (Al-Akka, 2014), (Ahmad, 2015), and (Juma'a, 2015). These studies attributed this weakness to a range of factors, spearheaded by restriction of mathematics teachers on traditional techniques during practicing the teaching of mathematics.

The most prominent studies that dealt with the skills of solving mathematical problems are (Al-Ashqar, 2018), (Al Haddad, 2018), (Jaber, 2018), (Eid, 2017), (Al-Mobayed, 2017), (Al-Kurd, 2017), (Priya, 2017), (Jarad, 2017), (Özsoy et al., 2015), (Gómez-Chacón, 2013), (Giardino, 2010), (Edens & Potter, 2007), and (Van Garderen, 2006), all of which has agreed on the importance of the mathematical problems, whether in the educational or daily life of students.

When examining the teaching strategies employed by the Mathematics teachers of the basic stage, we find that the dramatized lessons has not received enough attention from researchers or practical application of the teachers, despite its ease in instilling mathematical concepts and its enhancement of its understanding, and thus its reflection on the ability to

sense verbal mathematical problems, in the context of a long and crowded Palestinian curriculum.

Therefore, the researchers see the need to use new and unfamiliar strategies in the teaching of mathematics, especially the verbal mathematical problems; thus dramatized lessons is considered to be one of the most important means of communication that contribute effectively to give the student many skills for solving verbal mathematical problems, and also contributes in the formation of students' sentiment and awareness, and hence the growing interest in education and learning through theatrical activity, in order to prepare and form a conscious generation.

Although dramatized lessons are an important educational contribution in the twenty-first century due to its great importance in the field of education and development, it has not received adequate attention and has not been used as an instrumental method and an important component in the development of the educational process and in the development of many skills (Abu Haddaf, 2009: 11); thus we shed the light on the dramatized lessons and its attempt to employ as an effective and fundamental method in developing some skills of solving verbal mathematical problems (Battah, 2016: 3).

Several studies and researches have proven the effectiveness of employing the dramatized lessons in teaching and learning processes, especially in mathematics, such as the studies of (Khatib, 2018), (Darwish, 2016), (Al-Nahhal, 2015), (Lewis & Fege, 2014), (Kariuki & Rhymer, 2012), and (Farajullah, 2012), all of which have highlighted the clear impact of employing dramatized lessons on student's knowledge acquisition and promotion.

The ability to solve verbal mathematical problems requires the existence of attitudes and tendencies towards learning mathematics, as the tendency is influenced by the experiences of failure and success experienced by learners during their study of mathematics. Therefore, solving the verbal mathematical problems requires the student's sense of enjoyment and satisfaction during the study of mathematics, as well as his interest in activities, sense of importance, and love for the teacher (Abu Hilal, 2012: 50), which is supported by the dramatized lessons that brings an atmosphere of fun and joy to studying mathematics. Tendencies can have a positive impact on the behavior of the individual, increasing the desire to learn and motivating the attention to mathematics and its various branches (Al-Saadi, 2011: 286).

Among the most important studies that focused on the attitudes towards mathematics are the study of (Al-Nabulsia, 2018), (Abu Hilal, 2018), (Abdul Qadir, 2018) (Al-Rai'e, 2014), (Al-Hossny, 2014), and (Abu Hilal, 2012); all of these studies agreed significantly on the importance of taking into account the tendencies and attitudes of students and the need to strengthen them to increase their desire and love to learn.

Study Problem

Through the work of researchers in the field of education of the basic stage and educational supervision at Al-Aqsa University, both have noticed that there is a clear weakness in the students' possession of verbal mathematical problem solving skills, along with weakness in the ability to deal with such problems, which represents the problems and difficulties faced by students in the basic stage generally, and third graders particularly. This has been confirmed by the discussion held by the researchers with a group of experts, supervisors, specialists, managers and teachers about the weakness of pupils in possessing required verbal problem solving skills, which indicate that there is an urgent need to use new methods and techniques that well consolidate students' information and knowledge, makes them able to solve problems, and increases their linguistic and mathematical achievements significantly. Thus, the researchers proposed to use the dramatized lesson as a method to develop the skills of solving verbal mathematical problem among students.

In addition to the above, and through the review of previous studies and literature on the different variables of study, the researchers found a group of research gaps, which can be presented as follows:

1- The first research gap: Despite the importance of dramatized lessons in the educational learning process, none of the previous studies - as far as the researchers is aware - dealt with the direct impact of the use of dramatized lessons on the development of verbal mathematical problem solving skills or on students' attitudes towards mathematics; and in this behalf, the first research gap, which the researchers hopes to excel in this study is revealed. The researchers will work on overcoming this gap by identifying the effect of employing the dramatized lessons on the development of verbal mathematical problem solving skills and attitudes towards mathematics among third graders.

2- The second research gap: A review of previous studies shows that none of them - as far as the researchers is

aware - dealt with the same subject of the study and applied in the Arab environment in general or the Palestinian environment in particular. Hence, the researchers seek to excel in this study by applying it on the basic stage in Palestinian schools, especially the third grade, so the problem of the current study is determined by answering the following main question:

What is the impact of Employing Dramatized Lessons On The Development Of Verbal Mathematical Problems Solving Skills And Attitudes Towards Mathematics Among Third Graders?

To answer this question, the following sub-questions have to be answered:

1. What is the impact of employing dramatized lesson on developing verbal mathematical problems solving skills among third graders?
2. What is the impact of employing dramatized lesson on developing attitudes towards mathematics among third grader?

Study Hypothesis

The study aims to verify the validity of the following hypothesis:

1. There are no significant statistical differences ($\alpha \leq 0.05$) between the mean scores of the students' of the experimental group and their peers in the control group in the post test of verbal mathematical problems solving skills.
2. There are no significant statistical differences ($\alpha \leq 0.05$) between the mean scores of the students' of the experimental group and their peers in the control group in the post scale of attitudes of mathematics.

Objective of the study

The study aims to determine the impact of employing dramatized lessons on the development of verbal mathematical problems solving skills and attitudes towards mathematics among third graders.

Significance of the study

The study is expected to contribute to the following:

- Helping students enhance their skills and abilities in solving verbal mathematical problems and attitudes towards mathematics. It also assists them to participate effectively, usefully and fruitfully, through the stages of the dramatized lesson, which helps in the stability of information.
- The study deals with the effect of the dramatized lesson, a field that is rarely used in mathematics
- This study may be useful for mathematics teachers by giving them sufficient time to develop students' verbal mathematical problems solving skills and attitudes towards mathematics by employing dramatized lessons.
- It may be useful to the curriculum developers when formulating the curriculum of mathematics, so that attention is paid to the development of the skills of solving verbal mathematical problems and attitudes towards mathematics among students.
- Educational supervisors may benefit from holding training courses for teachers in order to train them to use the dramatized lessons on scientific bases and in accordance with their steps in order to teach mathematics, develop skills for solving verbal mathematical problems, and develop attitudes towards mathematics.
- The present study may open new avenues for researchers to conduct future studies in the use of new strategies in the educational process in different teaching stages, and in various subjects.

Operational definitions of the study:

- **Skills of Solving mathematical problems:** The ability to solve the problem accurately, quickly and reluctantly, including possessing partial problem solving skills, which are : understanding the problem, developing a solution plan, implementing the solution, and validating the solution in a variety of ways through the activities included in the dramatized lessons; those skills are measured by the score that the students gets in the test of skill for solving mathematical problems, prepared by the researchers for this purpose.
- **Attitudes Towards Mathematics:** Are the responses of acceptance or rejection towards a number of items that

revolve around dimensions related to the subject of mathematics, by which the grade that the students' scores is measured on the scale of attitudes prepared by the researchers.

- ***Dramatized Lessons:*** A systematic class activity in the field of mathematics held by the students of the third grade by performing dramatized roles of some of the lessons of mathematics proposed in the book of mathematics for the third grade, under the vital guidance and participation of the teacher to deepen the understanding and ease of remembering and the delivering of information in an interesting and attractive way, which develops verbal mathematical problems solving skills and attitudes towards mathematics through dramatization.

Study Limitations and Delimitations:

The results of this study can be generalized in light of the following delimitations:

- The study was limited to the third grade students in Jabalia Elementary UNRWA School (E), which was purposely chosen by choosing 2 classes, one as the experimental group, and the other as the control group.
- The study was limited to the second unit "Numbers within 9999" from the first part of the mathematics book scheduled for third grade students in Palestine.
- The results of this study are delimited and distributed based on the period of application of the study, which was determined by (12) lessons in the first semester of the academic year 2018 - 2019.
- The possibility of generalizing the results of the study is delimited by the validity and consistency of the measuring tools used in the study, which has been prepared and developed by the researchers, which are the test of mathematical problem solving skills consisting of (34) multiple choice questions and a scale for students' attitudes towards mathematics, consisting of (15) items.

Previous Studies

First: Studies Related To Dramatized Lessons

- **Al-Khatib, 2018:** The study aimed to examine the effect of using educational drama on kindergarten children's acquisition of mathematical and scientific concepts. A quasi-experimental method with experimental and control groups was used to achieve the objectives of the study. Various instruments were used, including a teacher's guide based on educational drama strategy and a scientific/mathematical concepts test, which were applied on a random sample of 50 kindergarten children, by which the number of children of the control group (11 boys and 14 girls) and the experimental group (12 boys and 13 girls). The study concluded that the experimental group outperformed the performance of the control group.

- **Darwish, 2016:** This study aims at identifying the impact of employing dramatization on developing the mathematical concepts and mathematical communication skills of the eighth-grade pupils in Gaza. The study followed the experimental method, with a study sample consisting of (82) students, divided into two equal groups (the experimental and the control groups). The study tools consisted of a test for mathematical concepts and a test for mathematical communication skills. The study concluded that there are significant statistical differences in both post-test in favor of the experimental group.

- **Al-Nahhal, 2015:** A study that aimed to reveal the effect of use of drama on development of concepts and mathematical thinking skills among sixth grade students. The study adopted the experimental method, with a study sample of (60) students, which were divided equally into equal groups (the control and experimental groups). The study tools were a test of mathematical and a test for mathematical thinking skills, both of which showed that there are significant statistical differences in their post application; this difference is in favor of the experimental group.

- **Lewis and Fege, 2014:** This study aimed to reveal the impact of the readers' theater on the ability of primary students to learn about reading. The study used the experimental method, with a study sample consisting of fifth graders, and the pre and post tests of oral fluency as the study tool. The results of the study indicated the effectiveness of theater in the classroom.

- **Kariuki and Rhymer, 2012:** The study was designed to identify the effect of drama based reading on the understanding of sixth grade students. The study followed the experimental method, with a study sample consisting of sixth grade students, divided equally over the experimental and control groups. The results of the study showed that there were significant statistical differences in favor of the students of the experimental group.

- **Farajullah, 2012:** A study that aimed to identify the impact of the use of educational drama on the development of mathematical concepts among first grade students in the Middle Governorate of Gaza Strip. The study followed the experimental method, with the design of the experimental and control groups, by which the experimental group, which is made up of (40) students, was taught adopting the educational drama, and the control group, made up of (41) students, which was taught adopting the traditional method. The study tool, which is a test of mathematical skills, has been applied to both groups, where the results of the study shows that there were significant statistical differences between the two groups, in favor of the experimental group.

Second: Studies Related To Mathematical Problem Solving Skills

- **Al-Ashqar, 2018:** This study aimed to identify the impact of using web quests in developing problem solving skills and mathematical communication among female tenth graders in Gaza. The researcher relied on a problem-solving skills test, and a note card for mathematical communication skills. The researcher adopted the experimental approach, with a study sample consisted of (80) female tenth grader. The results of the study indicated that there are significant statistical differences in the mean grades of the experimental and control group in the post tests; this difference is in favor of the experimental group.

- **Al Haddad, 2018:** A study that aimed to identify the impact of the use of the (Predict, Observe, Explain) strategy on the development of solving verbal mathematical problems among the students of the sixth grade in Gaza. The study adopted the experimental approach, with a study sample of (76) students, and a study tool of a test of mathematical problem solving skills. The results of the study shows that there are significant statistical differences in favor of the experimental group in the post tests.

- **Jaber, 2018:** This study aimed to reveal to examine the effect of employing concept maps on developing of verbal mathematical problems solving skills among sixth grade female students in Gaza. The study adopted the experimental approach, with a study sample of (76) students, and a test of verbal mathematical problem solving skills as the study instrument. The study found that there are clear individual differences in favor of the experimental group.

- **Eid, 2017:** A study that aimed to identify the impact of using two stereotypes of infographics in the light of visual approach in developing mathematical problem solving skill among eighth graders in Gaza. The study adopted the experimental method, with a study sample of (123) students, and a study tool of a test for mathematical problem solving skills. The results of the study indicated that there are differences in the mean grades of the experimental and control group in the test; this difference is in favor of the experimental group.

- **Al- Mobayed, 2017:** This study aimed to identify the impact of the use of the PQ4R strategy in developing mathematical problem solving skills among the ninth graders in Gaza. The study adopted the experimental approach, with a study sample of (80) students, and a study tools of a test of mathematical problem solving skills. The study found that there are significant statistical differences in the mean grades of the experimental and their peers in the control group in the test; this difference is in favor of the experimental group.

- **Al-Kurd, 2017:** This study aimed to identify the impact of using flipped classrooms on developing the skill of mathematical problem solving and mathematical communication among ninth graders in Gaza. The study adopted the experimental method, with a study sample of (89) students. The study tools consisted of a test for mathematical problem solving skills, and a test for mathematical communication, by which the results of the study shows that there are differences in the test of mathematical problem solving, in favor of the experimental group.

- **Jarad, 2017:** A study which aimed to detect the effectiveness of a suggested program based on TRIZ theory in developing the mathematical grade in the problem solving skills among eighth graders and their attitudes towards

mathematics. The study adopted the experimental method, with a study sample of (66) students. The study tools consisted of a test for mathematical problem solving skills, and a scale for students' attitudes toward mathematics. The most prominent results of the study shows that there are significant statistical differences in favor of the experimental group in the post application of the tests.

- **Al-Agha, 2017:** The study aimed at identifying the effect of using the graphic organizer strategy on developing visual thinking and solving geometric problem among ninth female graders in Gaza. The study used the experimental method, with a study sample consisting of (80) students. The study tools used are the test of the visual perception skills and the test of the ability to solve geometric problems. The most prominent finding of the study is the existence on significant statistical differences in the post tests in favor of the experimental group.

Third: Studies Related To Attitudes Towards Mathematics

- **Al-Nabulsia, 2018:** A study that aimed at identifying the impact of employing mathematics' lab in developing geometric skills and the tendency towards mathematics among the fourth grade students in Gaza. The study used the quasi-experimental approach, with the design of two equal groups (the experimental and control groups), and a study sample consisting of (57) students. The study tools used are a teacher's manual was developed for teaching in the mathematics' lab, a geometry skills test, and attitudes towards mathematics scale. The results of the study shows that there are significant statistical differences in the post application of the tests.

- **Abu-Hilal, 2018:** This study aimed at identifying the impact of entertainment-based learning on developing particular thinking skills in Mathematics among third graders and their attitude towards such method. : The study followed the two-group experimental design (pre and post) was adopted and applied on the study sample, which consisted of (79) students. To achieve the study objectives, a teacher's handbook of entertainment based learning was prepared along with thinking skills in Mathematics test and the Mathematics Attitude Scale (MAS). The most prominent results indicates that there are significant statistical differences in favor of the experimental group in the post application of the tests.

- **Abdul Qadir, 2018 :**A study that aims to identify the impact of employing numbered heads strategy on developing visual thinking skills in Mathematics and attitude towards it among fourth grade students in Gaza. This study adopted the experimental approach, with a study sample of (80) students, and study tools consisting of a visual thinking skills test and Mathematics attitude scale. The most important results of the study shows that there are significant statistical differences in favor of the experimental group in the scale of attitudes towards mathematics.

- **Dahlan, 2016:** This study aimed at detecting the effectiveness of employing digital storytelling in developing third grade pupils' skills in solving math verbal problems in Gaza. This study adopted the empirical approach, with a study sample of (70) students, and study tools consisting of a teacher guide based on digital storytelling and test for mathematical problem solving skills. The results of the study reveals the presence of differences in favor of the experimental group, and to its clear impact on reinforcing students attitudes towards Mathematics.

- **Al-Raie, 2014:** This study aimed to investigate the effectiveness of Differentiated Instruction Strategy (DIS) in teaching mathematics on acquiring mathematical concepts and the tendency towards mathematics by seventh graders. The study followed the experimental approach, with a study sample of (80) students. The study tools consisted of a content analysis for "sets" unit to gain the mathematical concepts and a test for mathematical concepts. The most important finding of the study is the existence of clear differences in favor of the experimental group in the student's tendency towards Mathematics.

- **Al-Hossny, 2014:** This study aims to identify the effect of using mathematical modeling on developing systematic thinking skills in Mathematics and tendency towards it by fifth grade students in Gaza. The study followed the experimental approach, with a study sample of (86) students. The researcher prepared a test for systematic thinking skills and a scale for tendency towards Mathematics, by which when applied, the results indicated that there are significant differences in favor of the experimental group in the scale for tendency towards Mathematics.

- **Abu Hilal, 2012:** This study aimed at investigating the effect of using mathematical representations to acquire the

concepts and the tendency towards mathematics among sixth graders. The study followed the experimental approach, with a study sample of (80) students, and a study tools of a test of acquiring mathematical concepts, a scale of tendency towards mathematics, and a teacher's guide for mathematical representations. The most prominent result of the study shows the clear impact of the test for acquiring mathematical concepts on the students' tendencies towards mathematics.

The study methodology and procedures:

First: Study Methodology

The researchers used the quasi-experimental approach that is based on two random groups (the experimental and control groups), using the experimental design of the pre-and post-test of two equal groups.

Second: Study population

The study population consisted of all third-grade students, totaling (828) students, for the first semester of the academic year (2018 - 2019), according to the statistics of the planning department of UNRWA in Gaza, of which (450) are male students and (378) are female students.

Third: Study sample

The sample of the study consisted of two study groups randomly chosen among the study population in Jabalia Elementary UNRWA School (E), where one group was chosen as the experimental group that has been taught by one of the researchers adopting the dramatized lesson strategy, and the other as the control group that is taught traditionally; each group consisted of (40) students.

Fourth: Study Tools

1- Test of Verbal Mathematical Problem Solving Skills: It was prepared according to the following steps:

a. Determining the test purpose: This test was designed to measure the impact of employing dramatized lessons on the development of verbal mathematical problems solving skills among third grade students.

b. Determining the verbal mathematical problem solving skills: The researchers reviewed the literature on the issue of verbal mathematical problem solving skills, and also analyzed the content of the second unit entitled "Numbers Within 9999" of the third grade mathematics book assigned for the first semester, where he proposed a list of verbal mathematical problem solving skills needed for third grade students, consisting of (understanding the problem, developing a solution plan, implementing the solution, and validating the solution).

c. The initial form of the test: The initial form of the test consisted of (34) multiple choice questions, each with four possible alternatives.

d. Exploratory experimentation of the test: After the preparation of the initial test, it was applied on an exploratory sample of (36) third-grade students outside the study sample, for the purpose of calculating the difficulty and discrimination indexes of the test items, testing the validity and reliability of the test, and determining how long it takes to answer the test when applied to the study basic sample.

e. Test Scoring: test was scored after the exploratory sample answered its questions, in which one degree was assigned for each test item, and thus, the score obtained by the student is limited to (0 and 34).

f. Analysis of the items of the verbal mathematical problem solving skills test: The results of students' answers on the test were analyzed in order to identify the degree of difficulty and discrimination index for each item of the test, where the researchers found that the difficulty index for each items ranged from (22.2%-55.6%), which indicated graduated levels of difficulty. In addition to that, the discrimination index ranged from (50%-75%) to distinguish between the responses of the upper and lower categories, where metrology accepts discrimination index when it reaches more than (20%) (Kilani et al., 448: 2008). Based on the above, the researchers kept all of the test items.

g. Validity of the test of verbal mathematical problem solving skills: The validity of the test was tested through

presenting it to a group of (6) specialized university academic staff and (8) educational supervisors to be guided from their views on the appropriateness of the items of the test to the third graders and to confirm the appropriateness of the vocabulary used scientific and linguistically; suggested modifications were taken into consideration. The internal consistency of the test was ascertained using Pearson correlation between the scores of each item of the test and the total score, in which the researchers found that all values of Pearson correlation for all of the test items range between (0.469-0.911), which are statistically significant at significance level ($\alpha = 0.01$); this indicates that the test is strongly valid.

h. Reliability of the test: To test the reliability of the test, the researchers used Kuder–Richardson Formula 21 and found that the reliability coefficient is (0.932), which is highly reliable and statistically significant coefficient (Ouda, 2002 :356).

i. Determining the test duration: The time needed to answer the test of verbal mathematical problem solving skills was determined by calculating the mean time it takes for the first and last student to finish the test; it was found to be (60 minutes).

j. The final form of the test of verbal mathematical problem solving skills: Based on the results of the arbitration and exploratory experimentation of the test and doing the necessary modifications, the number of test items after adjustment is (34) multiple choice questions, ready to be applied in its final form.

2- Scale for students' attitudes towards Mathematics, which was prepared according to the following steps:

a. Determine the scale purpose: this scale is designed to measure the impact of employing the dramatized lessons on attitudes towards mathematics among third grade students.

b. Determining the areas of the scale: The areas of the scale were in three areas: (Attitudes towards the nature of mathematics, attitudes towards learning mathematics, and enjoying the importance of mathematics).

c. Phrasing the scale items: The items of the scale were formulated in a procedural form, by which the number of items in its initial form was (16) items divided into three fields (nature of mathematics (6 items), learning mathematics (5 items), and enjoying the importance of mathematics (5 items)).

d. The scaling and correction of the scale: student responses are formulated according to the Likert scale (strongly agree "five points", agree "four points", neutral "three points", disagree "two points", and strongly disagree and has "one point") for positive items, and vice versa for negative items; each field included (2) negative items.

e. The validity of the Scale: the validity of the instrument was tested through:

- **Validity of the arbitrators:** The scale was presented to a group of arbitrators from specialists in education, curriculum and teaching methods of the Palestinian universities, to be guided from their views on the appropriateness of the items of the scale, as well as to ensure the validity and clarity of the language; some items have been added, deleted and modified based on the suggestions of arbitrators, by which the scale in its final form consisted of (15) items, by which (1) item from the field of nature of mathematics has been deleted.

- **Internal consistency:** internal consistency was ascertained using Pearson correlation between the scores of each area of the scale and the total score by applying the instrument on an exploratory sample of (36) students outside the study sample.

f. The reliability of the questionnaire: the reliability of the scale was calculated using the following methods:

- **Split Half Method:** The correlation coefficient between the results of the odd and even items was calculated for the three domains and the questionnaire as a whole and were as follows (0.680, 0.725, 0.619, 0.748) respectively and were adjusted using the Guttman coefficient and were (0.744, 0.791, 0.715, 0.851) respectively, all of which were high, indicating that the scale has a high degree of reliability.

- **Cronbach's alpha coefficient** to measure the reliability of each area and the items of the scale as a whole; the reliability coefficients were as follows (0.934 ,0.846 ,0.913 ,0.918), which indicates that the scale has a high degree of consistency of its vocabulary.

Fifth- The Equivalence of the study groups: the consistency of the experimental and control groups was ascertained in terms of: (pre-test of verbal mathematical problems solving skills, scale of attitudes towards mathematics, students' midterm grades in mathematics for the first semester, students' cumulative average in all subjects, and chronological age), as illustrated in Table (1).

| Variable | Group | Number | Mean | Standard deviation | Test Value | Sig | p-value |
|--|--------------|--------|--------|--------------------|------------|-------|-----------------------------|
| pre-test of verbal mathematical problems solving skills | Control | 40 | 6.225 | 3.174 | 0.391 | 0.697 | Statistically insignificant |
| | Experimental | 40 | 6.500 | 3.113 | | | |
| scale of Attitudes towards mathematics | Control | 40 | 2.955 | 0.614 | 0.533 | 0.595 | Statistically insignificant |
| | Experimental | 40 | 2.873 | 0.746 | | | |
| students' midterm grades in mathematics for the first semester | Control | 40 | 13.278 | 1.473 | 0.119 | 0.906 | Statistically insignificant |
| | Experimental | 40 | 13.218 | 2.832 | | | |
| students' cumulative average in all subjects | Control | 40 | 71.025 | 5.196 | 0.214 | 0.831 | Statistically insignificant |
| | Experimental | 40 | 70.775 | 5.240 | | | |
| chronological age | Control | 40 | 9.505 | 0.169 | 0.718 | 0.475 | Statistically insignificant |
| | Experimental | 40 | 9.478 | 0.173 | | | |

It is clear from the above table that the calculated T-value equal to (0.391, 0.533, 0.119, 0.214 and 0.718)), respectively, which is smaller than the index T- which is equal to (2.00), when the degree of freedom (60) and the average statistically significant ($\alpha = 0.05$), and this indicates that there is no statistically significant differences between the experimental group and the control group, and this means that the two groups are consistent.

Sixth: procedures of the study: The present study included the following steps:

- Review of educational literature related to the present study, in order to learn how to prepare the study tools and design the experiment.
- Preparing a test of verbal mathematical problem solving skills and the scale for students' attitudes towards mathematics.
- Application of tests on a small sample in order to determine the time of the test, and to find the degree of easiness and difficulty, discrimination coefficient, and test the validity and reliability of the test.
- Choose two classes randomly from Jabalia Elementary UNRWA School (E), in which one class was chosen as the experimental group and the other as the control group.
- Ensure evenness of the two groups in some variables that are expected to have an impact on the dependent variable in terms of (pre- test of verbal mathematical problems solving skills, scale of attitudes towards mathematics, students' midterm grades in mathematics for the first semester, students' cumulative average in all subjects, and chronological age).
- Teaching the unit to both the control and experimental groups according to the experimental design, so that the experimental group adopts the dramatized lessons, and the control group is taught using the traditional way.
- At the end of the application of the experiment, the test of verbal mathematical problems solving skills and the scale of students' attitudes towards mathematics are applied once again to reveal the impact of employment of dramatized lesson technique.
- Test grading, data collection, analysis of the results of the study, and discussion.
- Highlight the study recommendations in the light of its results, and then provide a set of suggestions.

Seventh / statistical methods used:

The statistical Package for Social Sciences (SPSS) was used to perform the required analysis and statistics for the data of the test and scale, by which the means and standard deviations were calculated, analysis of covariance (ANCOVA), and Multivariate analysis of covariance (MANCOVA) analysis was also used, in addition to calculating the size of the impact of the employment of dramatized lessons through ETA square (η^2).

Results of the study (discussion and interpretation):

Based on the study questions and hypotheses, the following results were obtained:

➤ **Presenting and discussing the result of the first question:**

What is the impact of employing dramatized lesson on developing verbal mathematical problems solving skills among third graders?

To answer this question, the arithmetic mean and standard deviations of the pre and post grades of third grade students in the experimental and control groups to the test of verbal mathematical problems solving skills were calculated, as illustrated in the following Table (2).

| Test of for verbal mathematical problems solving skills | Group | Number | Pre-test | | Post-test | |
|---|---------|--------|----------|--------------------|-----------|--------------------|
| | | | Mean | Standard deviation | Mean | Standard deviation |
| | Control | 40 | 6.225 | 3.174 | 19.78 | 2.72 |
| Experimental | 40 | 6.500 | 3.113 | 31.30 | 2.11 | |

It is clear from the above table that there are significant differences between the arithmetic means of the test of verbal mathematical problems solving skills in the two groups, the experimental (which adopted dramatized lessons), and the control group (adopted the traditional teaching method) in both the pre and post tests. To determine whether those differences were statistically significant, analysis of covariance (ANCOVA) has been conducted for the grades of the third-grade students in the experimental group and the control group of the post-test of verbal mathematical problems solving skills, taking into consideration the results of the pre-test. It's worth mentioning that this statistical analysis works on eliminating the differences resulting from the effect of the pre-test between the experimental and the control groups; the results of this analysis is illustrated in the Table (3) below:

Table (3): Results of the analysis of covariance (ANCOVA) between the mean grades of the third grade students in the experimental and control groups on the test of verbal mathematical problems solving skills

| Source of Variance | Sum of squares | Degree of freedom (df) | Mean squares | F value | Significance (sig) | Eta Square (η^2) |
|--------------------|----------------|------------------------|--------------|---------|--------------------|-------------------------|
| Pre (concomitant) | 8.73 | 1 | 8.727 | 1.48 | 0.23 | |
| Teaching Method | 2637.87 | 1 | 2637.867 | 446.75 | 0.00 | 0.85 |
| Error | 454.65 | 77 | 5.905 | | | |
| Total | 55293.00 | 80 | | | | |

It is clear from the above table that there are significant statistical differences between the experimental and control groups in the test of verbal mathematical problems solving skills, where calculated F-value of the total grade of the test were (446.75) respectively, both of which are statistically significant at level of significance ($\alpha = 0.05$); this indicates to the existence of significant statistical difference of the employment of dramatized lessons on the development of verbal mathematical problems solving skills among third graders.

Regarding the effect size, ETA square (η^2) was calculated and was found to be (0.85), which indicates that the use of dramatized lessons has made a great variation in the dependent variable on the development of verbal mathematical problem solving skills, meaning that ETA square shows that (85%) of the effect size is in the dependent variable, which is a large impact; to determine the direction of these differences, the researchers calculated the modified arithmetic means and standard errors of the students' grades in the test of verbal mathematical problems solving skills for both the

experimental and control groups, as shown in Table (4) below.

Table (4) : Modified arithmetic means and standard errors of the students' grades in the test of verbal mathematical problems solving skills for both the experimental and control groups

| Test | Group | Arithmetic Mean | Standard Error |
|---|--------------|-----------------|----------------|
| Overall Test Of Verbal Mathematical Problems Solving Skills | Control | 19.79 | 0.38 |
| | Experimental | 31.29 | 0.38 |

The results in the above table indicates that the difference in the modified arithmetic means of the students' grades in the test of verbal mathematical problems solving skills for both the experimental and control groups was in favor of the experimental group, which indicates to the existence of significant statistical differences between the mean grades of the experimental group and their peers in the control group in the post test of verbal mathematical problems solving skills; these differences were in favor of the grades of the experimental group. The results of the study are consistent with the study of (Al-Ashqar, 2018), (Al-Haddad, 2018), (Jaber, 2018), (Eid, 2017), (Al-Mobayed, 2017), (Al-Kurd, 2017), (Jarad, 2017) and (Al-Agha, 2017). In these studies, the experimental group was superior to the control group; this superiority was statistically significant, according to the strategy.

There are several factors that lead to the success of dramatized lessons to develop verbal mathematical problem solving skills among third graders including that dramatized lessons deliberates the developmental characteristics, abilities and quick thinking of children, and that the educational experiences provided in educational plays are diverse and suitable for the learner and are within their daily requirements. Also, educational plays takes into consideration the individual differences between students in a way that suits their abilities and links previous experiences with new mathematical knowledge, which has helped students generate ideas and strategies to solve verbal mathematical problems. Moreover, educational plays helps to simplify the educational material to a degree that suits all students, and in accordance with their understanding and mental abilities, which reflects on the understanding of the verbal mathematical problems. They also habituate students on the use of the Classical Arabic language, acquiring new abilities in the field of accurate declamation and understanding of new vocabulary, formulating and practice of sentences, as it contains the manifestations of spoken language, and thus help students in writing and reading, which reflects on their ability to read and write verbal mathematical problems. In addition to that, the educational aids used in drama plays such as pictures, figures and shapes have had a great impact on the understanding of verbal mathematical problems. Other factors include the fact that educational plays concentrate on the active role of the student positivity and activism, by which the student has the largest role in this technique, increasing the students' participation in the educational process within the classroom to a large extent, as they include movement, characterization and role playing, by which the student may be a participant or a spectator; in both cases, the thinking, interest and motivation for learning will be stimulated and increased. This will be reflected positively in the level of possessing and mastering of skills for solving verbal mathematical problems.

➤ **Presenting and discussing the result of the second question:**

What is the impact of employing dramatized lesson on developing attitudes towards mathematics among third grader?

To answer this question, the arithmetic mean and standard deviations of the pre and post grades of third grade students in the experimental and control groups to the scale of attitudes towards mathematics were calculated, as illustrated in Table (5) below.

| Skills of attitudes towards mathematics | Group | Number | Pre-Scale | | Post-scale | |
|---|--------------|--------|-----------|--------------------|------------|--------------------|
| | | | Mean | Standard deviation | Mean | Standard deviation |
| Nature Of Mathematics | Control | 40 | 3.07 | 1.00 | 3.55 | 0.35 |
| | Experimental | 40 | 3.17 | 0.90 | 4.59 | 0.40 |
| Learning Mathematics | Control | 40 | 2.95 | 0.90 | 4.07 | 0.64 |
| | Experimental | 40 | 3.05 | 0.78 | 3.52 | 0.51 |
| Enjoying The Importance Of Mathematics | Control | 40 | 2.61 | 0.89 | 4.34 | 0.38 |
| | Experimental | 40 | 2.66 | 0.82 | 3.93 | 0.60 |
| Overall Scale | Control | 40 | 2.87 | 0.75 | 3.23 | 0.43 |
| | Experimental | 40 | 2.96 | 0.61 | 4.56 | 0.37 |

It is clear from the above table (5) that there are significant differences between the arithmetic means of the dimensions of students' attitudes towards mathematics in the two groups, the experimental (which adopted dramatized lessons), and the control group (adopted the traditional teaching method) in both the pre and post scales. To determine whether those differences were statistically significant, Multivariate analysis of covariance (MANCOVA) has been used; the results of this analysis is illustrated in Table (6) below:

Table (6): Results of the Multivariate analysis of covariance (MANCOVA) between the mean grades of the third grade students in the experimental and control groups on the scale of attitudes towards Mathematics

| Source of Variance | Sub-Dimensions | Sum of squares | Degree of freedom (df) | Mean squares | F value | Significance (sig) | Eta Square (η^2) |
|--------------------|--|----------------|------------------------|--------------|---------|--------------------|-------------------------|
| Pre (concomitant) | Nature Of Mathematics | 0.54 | 1 | 0.54 | 3.91 | 0.05 | |
| | Learning Mathematics | 0.21 | 1 | 0.21 | 1.06 | 0.31 | |
| | Enjoying The Importance Of Mathematics | 0.57 | 1 | 0.57 | 3.66 | 0.06 | |
| | Overall Scale | 0.02 | 1 | 0.02 | 0.25 | 0.62 | |
| Teaching Method | Nature Of Mathematics | 21.14 | 1 | 21.14 | 154.55 | 0.00 | 0.67 |
| | Learning Mathematics | 13.03 | 1 | 13.03 | 65.50 | 0.00 | 0.46 |
| | Enjoying The Importance Of Mathematics | 35.79 | 1 | 35.79 | 228.89 | 0.00 | 0.75 |
| | Overall Scale | 22.38 | 1 | 22.38 | 262.92 | 0.00 | 0.77 |
| Error | Nature Of Mathematics | 10.53 | 77 | 0.14 | | | |
| | Learning Mathematics | 15.32 | 77 | 0.20 | | | |
| | Enjoying The Importance Of Mathematics | 12.04 | 77 | 0.16 | | | |
| | Overall Scale | 6.55 | 77 | 0.09 | | | |
| Total | Nature Of | 1354.64 | 80 | | | | |

| Source of Variance | Sub-Dimensions | Sum of squares | Degree of freedom (df) | Mean squares | F value | Significance (sig) | Eta Square (η^2) |
|--------------------|---|----------------|------------------------|--------------|---------|--------------------|-------------------------|
| | Mathematics | | | | | | |
| | Learning Mathematics | 1262.84 | 80 | | | | |
| | Enjoying The Importance Of Mathematics | 1258.56 | 80 | | | | |
| | Overall Scale | 1284.17 | 80 | | | | |

It is clear from the above table that there are significant statistical differences between the experimental and control groups in the scale of students' attitudes towards mathematics and all dimensions, where calculated F-value of the test dimensions and the total grade of the scale were (154.55, 65.50, 228.89, 262.92) respectively, where all values are statistically significant at level of significance ($\alpha = 0.05$); this indicates to the existence of significant statistical difference of the employment of dramatized lessons on the development of attitudes towards mathematics among third graders.

Regarding the size of the impact of each dimensions, ETA square (η^2) was calculated and was found as following : nature of mathematics (0.67), learning mathematics (0.46), enjoying the importance of mathematics (0.75), and the overall scale (0.77); this indicates that the use of dramatized lessons has made a great variation in the dependent variable on the development of students' attitudes towards mathematics. In other words, ETA square shows that (77%) of the effect size is in the dependent variable, which is a large impact. To determine the direction of these differences, the researchers calculated the modified arithmetic means and standard errors of the students' grades in the scale for attitudes towards mathematics for both the experimental and control groups, as shown in Table (7) below.

Table (7) : Modified arithmetic means and standard errors of the students' grades in the scale of students' attitudes towards mathematics for both the experimental and control groups

| Dimension | Group | Arithmetic Mean | Standard Error |
|---|--------------|-----------------|----------------|
| Nature Of Mathematics | Control | 3.55 | 0.06 |
| | Experimental | 4.58 | 0.06 |
| Learning Mathematics | Control | 3.52 | 0.07 |
| | Experimental | 4.33 | 0.07 |
| Enjoying The Importance Of Mathematics | Control | 3.22 | 0.06 |
| | Experimental | 4.56 | 0.06 |
| Overall Scale | Control | 3.43 | 0.05 |
| | Experimental | 4.49 | 0.05 |

The results in the above table indicates that the difference in the modified arithmetic means of the students' grades in the scale of attitudes towards mathematics for both the experimental and control groups was in favor of the experimental group on all dimensions of the skills of attitudes towards mathematics; this indicates to the existence of significant statistical differences between the mean grades of the experimental group and their peers in the control group in the post-scale of students' scales towards mathematics; these differences were in favor of the experimental group in each dimension of the scale and in the overall scale as well. The results of this study are consistent with the results of the studies of (Al-Nabulsia, 2018), (Abu Hilal, 2018), (Abdul Qadir, 2018) (Al-Rai'e, 2014), (Al-Hossny, 2014), and (Abu Hilal, 2012).

The success of dramatized lessons to develop attitudes towards mathematics among third graders may be due to the reason that educational drama evokes students' pleasure and happiness, considering its containment of various artistic elements, such as decoration, lighting, clothing, music, etc. Also, they provides the students with the possibility to enact

roles and simulate different characters, which bring pleasure to the souls of the performing and the viewing students. In addition to that, the educational theater has a major effect on the development of attitudes, as they work on venturing to the students through what is presented so that the student finds himself emptying all his energy with all that he sees and expresses his pent-up emotions and desires that he hides. Representation works to eliminate some negative behaviors such as anxiety, shyness, repression and fear, which is reflected on students' attitudes towards Mathematics. Moreover, dramatized lessons help increase the students self-confidence by progress and improvement of their level through the follow-up of researchers during classes.

Study Recommendations:

In light of the findings of the study results, the following recommendations can be provided:

- Seeking the assistance of specialist in the field of dramatized lessons to participate in the planning and development of curricula.
- Incorporate mathematics teacher guides into meaningful instructional plays, which helps students gain mathematical concepts, positive values and attitudes, increase their motivation, develop creativity and mathematical problem solving skills and high thinking skills, and help them understand the subject better.
- The need to use dramatized lesson as a teaching method, to simplify mathematical concepts, and to easily deliver information.
- The need to pay attention to education through dramatized lessons and to encourage teachers to adopt it in teaching, along with providing the teacher the required time in the weekly program allocated in all materials, including the performance of certain topics through dramatized lessons.
- The need to provide an educational theater in each school, to make the student more relieved and more capable of learning, to be self-reliant, independent, and to address some of the behavioral problems in which the students of this stage may face.
- Use the dramatized lessons in teaching mathematics to ordinary students and to students with learning disabilities.
- The need to introduce the dramatized lessons in teaching methods courses in the faculties of education, and training the trainee teachers for its employment in the teaching of mathematics.

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