PSYCHOLOGY AND EDUCATION (2024) 61(11): 1747-1767
ISSN: 1553-6939

The Effectiveness of the Problem-Solving Method in Reducing Mathematical Errors Among Third-Grade Primary School Students.

Ketfi Aicha[1], Pr. Benabdelmalek Abdelaziz[2]

[1]PhD – Educational Sciences, Faculty of Psychology, Education Sciences, and Speech Therapy - Constantine 2, Lab: Work Psychology and Organizational Management (Algeria).

[2]Educational Sciences, Faculty of Psychology, Education Sciences, and Speech Therapy - Constantine 2,

The Author's E-mail: bouthaina.ketfi@univ-constantine2.dz[1], educatio25@yahoo.fr[2]

Received: 05/2024 **Published: 11/2024**

Abstract:

Based on the objectives of the study, which is to identify the effectiveness of the problem solving method in reducing error. This study aims to answer the following question: How effective is the problem solving method in reducing the mathematical error of pupils in the third year of primary education?

In this study, I followed the experimental method, where the study sample consisted of (56) pupils, male and female pupils from the third year primary school in Boubrima Massaoud Ain Al-Tarik, Setif, divided into two groups, one experimental group consisting of (29) male and female pupils who studied using the problem-solving method, and the other control group consisting of (27) male and female pupils studied using the traditional method.

To answer the question of the study, the arithmetic averages were the arithmetic means and standard deviations of the scores of the experimental and as well as the use of T-test to ensure that the size of the effect is not the result of chance and randomness.

The results of the study showed the effectiveness of the problem solving method in reducing mathematical error through the findings of the study found the following results:

There are statistically significant differences at the level of significance (α=0.05) in the post-test between the average scores of the control group pupils and the average scores of the experimental group pupils in favour of the experimental group.

Keywords: problem-solving method, reducing mathematical errors, third-grade primary pupils.

Introduction

In today's modern world, human beings are witnessing tremendous development in all areas of life, which has been reflected in the school which offers different ways and means of teaching to help pupils fulfil their needs and ambitions, and this development is a reflection of the explosion of knowledge in all branches of modern science and technology.

This development is a reflection of the knowledge explosion in various branches of modern science and technology until the judgement of the extent of this development which has also affected educational research, as it has witnessed major transformations in the last two decades.

During the last two decades, the educational process has undergone major transformations by researchers, so the curricula and pedagogy of mathematics must respond to the data of development and take off their traditional robes, as pupils need more useful mathematics in their life paths and learning it does not contribute to preparing them to face the challenges of the future.

The function of mathematics is to prepare pupils who are able to face scientific life and have the ability to face it and to solve the issues they face and the ability to make sound decisions.

Mathematical errors have received great attention from educators and those interested in the teaching and learning process, as studies have indicated that pupils do not come to school with blank pages on which teachers inscribe what they want, but they carry a lot of concepts from their daily lives and experiences, and this is natural, because children deal with the environment and its phenomena and variables, so they form their own concepts about that environment that are consistent with their direct experiences in that area.

Hence the urgent need for teaching and learning strategies that provides us with broad, diverse and advanced educational horizons.

It helps our pupils to enrich their knowledge, reduce the severity of these errors and train them to be creative and productive.

This can only come with the presence of a specialised teacher who gives his pupils the opportunity to contribute to the development of generalisations, formulate and

experiment with them, and have the ability to show interest in pupils' ideas and use alternative methods to minimise the errors.

Perhaps one of the most important of these strategies, methods and programmes directed at reducing mathematical errors is the method of Problem solving, which is based on providing pupils with a sound scientific understanding.

At a time when talking about problem solving has become the requirement of every educational system in our schools today.

In light of the low achievement in mathematics, it has become an imperative for most educational institutions to address mathematical issues.

Mathematics, a subject in which the pupil acquires concepts, generalisations and skills that are indispensable in the study of other subjects indispensable to him and even in his life in general, as it is located in the heart of the body in relation to other subjects and at all educational levels.

For other subjects and at all educational levels, a deficit at some level in this subject inevitably constitutes an obstacle at subsequent levels, this deficit has become a concern for every educator at the level of building programmes or at the level of directing plans and strategies.

This is what the educational system seeks, which is to prepare a pupil who is able to solve his problems in general and mathematical problems in particular.

The current study came in the context of a scientific and practical framework to find out the effectiveness of the problem solving method in reducing mathematical error, a study that is in line with the general trend adopted by the Algerian Ministry of Education in improving the methods and techniques adopted in teaching in general and teaching mathematics in particular.

1: The Problematic:

Education plays an important role in human life, especially in the face of enormous technological development.

With the continued rapid pace of technological change, the school is facing a challenge to its basic tasks and is no longer able to provide the learner with the information he needs due to the complexity of the issues and the difficulty of predicting.

To provide the learner with the information he/she needs due to the complexity and unpredictability of the issues.

This has forced it to reformulate its philosophy and focus on preparing the individual for life and providing him with the skills and strategies necessary for self-learning.

Many countries are rushing to reform and develop their educational systems in order to improve the quality of the educational process, in an effort to optimise the educational process and improve its outcomes.

The subject of mathematics and related achievement has received great attention from educators and parents.

The most important reason for this interest may be the general public's belief in the strong relationship that links achievement in maths to the ability to think and solve problems, as maths is a form of abstract thinking that relies on. It also trains in problem solving methods because mathematical problems are real or hypothetical problems, so the authors of modern mathematics curricula and specialists in teaching methods emphasise that mathematics is a way of thinking based on understanding, recognising relationships and reasoning.

It adopts the method of discovery and discussion to reach the solution.(**Alawneh,2002,p88)**

Therefore, some of those interested in education, especially in mathematics, consider that the main goal of teaching mathematics is to learn how to solve problems and developing pupils' ability to use the most important problem-solving skills on the one hand and using the same mental processes at both ends.

Since the nature of the subject influences how it is learnt, mathematics is of a cumulative, synthetic nature, so its learning is based on stages and steps that must be adhered to, and because there is no optimal way to learn maths, it is no longer just mental exercises and skills.

The latter is no longer just mental exercises, abstract skills and symbolic relationships, but has new goals such as acquiring the scientific and peaceful way of thinking as the language of logic, the ability to solve problems, make decisions, take responsibility, and form a full awareness.

Problem solving is the natural pathway to learning, and the ability to solve problems, make decisions, and take responsibility.

Problem solving is the natural way of thinking in general, there is no maths without thinking, and there is no thinking without maths and there is no thinking without problem solving, so problem solving is important in the life of the learner and in increasing the level of his scientific achievement and making him organised in his thinking and work, able to identify and analyse them into its elements and research it

thoroughly to collect and scrutinise information, then propose hypotheses and test them, then make a decision and end up with general judgments that enable us to generalise the solutions in other places. Since mathematics helps to embed the method of problem solving in the general life of the individual.

This method is considered one of the most effective and important methods of teaching and learning mathematics, and given the importance that mathematics represents in mathematical knowledge and other fields of knowledge, it is necessary to form concepts and build them In order to form a coherent conceptual system in the cognitive structure of learners.

The learner has clear images and diagrams in the mind, enabling them to invest and employ them in situations of mathematical and other knowledge, where new concepts sometimes face wrong models in the learner's mind, which hinders the process of assimilating the information and ideas to be taught.

These models or misconceptions seem more logical and convincing to the learner, so it is necessary to recognise and implement them before presenting the correct concepts and this is what enables us to recognise a mathematical error that It is not a lack of knowledge or a product of chance, but is generally related to a mathematical situation and knowledge, as it is considered essential and necessary for the pupil's learning, as it is not possible to talk about effective learning without putting the latter.

This justifies the role of the teacher in selecting a situation with a suitable or appropriate problematic situation that makes the pupils make mistakes as a natural reaction because the repetition of the error creates doubts in the teacher about the effectiveness of his teaching method. This means that the learner's acquisition of any mathematical concept is done through stages and steps and then any experiences or scientifically inaccurate ideas that the individual acquires during the formation of this concept inevitably leads to misconceptions based on the learner's error, not only for the concept in question, but also for the subsequent experiences, ideas and concepts associated with it (**Ismail et al;2000;p146)**

The errors in learning maths that learners make while performing various mathematical operations are due to lack of correct understanding of some basic concepts and facts in the subject matter of the curriculum.

Failure to uncover the causes of these errors leads to their exacerbation, which makes them a reason for learners' aversion to the subject of maths

In addition, informing the teacher of the errors that occur and involving learners in treating them and developing a plan.

This is what our study is trying to achieve by finding out the causes of these errors, which leads to the exacerbation of these errors, which makes learners dislike the subject of mathematics.

This is what our study is trying to achieve by knowing the impact of the problem solving method in reducing mathematical error among learners in the third year of primary education.

The importance of mathematical concepts in the educational process has prompted many Specialists to address the concepts by researching, analysing, classifying, teaching methods and remedies used by the teacher so that his learners to acquire the concepts clearly and accurately.

Where we find a study **"Mousa Al-Najem, 2016"** which aims to reveal the impact of using the method of solving Problem solving method in teaching mathematics in the development of number sense among fifth grade learners.

And the study of **"Rasas, 2007&quot**; who used a proposed programme to treat common errors in solving mathematical problems solving among first grade secondary literary students in Gaza.

From the above and after reviewing some previous studies, the study's research question can be defined in the following main question:

How effective is the problem solving method in reducing the mathematical error of learners in the third year of primary education?

1:2: Hypotheses of the study:

- **General Hypothesis:**

Problem solving method has an effect on reducing the mathematical error of learners in the third year of primary education.

- **Partial hypothesis**:

✓ There are statistically significant differences at the level of significance (**α=0.05)** in the post-test between the average

Scores of the control group pupils and the average scores of the experimental group pupils in favour of the experimental group

✓ There are statistically significant differences at the level of significance **(α=0.05**) in the pre- and post-test in favour of the experimental group.

1:3:Objectives of the study:

The study aimed to:

- ✓ To identify the effectiveness of the problem solving method in reducing the error index in the subject of mathematics learners of the third year of primary school.
- ✓ Identify the misconceptions of mathematical concepts of learners in the third year of primary school.
- ✓ Identify the impact of using the problem solving method in reducing mathematical error.
- ✓ **1:4: Importance of the study:**

The significance of the study is determined by:

- ✓ The significance of this study is that it is part of a series of attempts to address one of the importance of this study is that it is part of a series of attempts aimed at addressing one of the issues of teaching maths, namely the misconceptions held by learners.
- ✓ This study may contribute to pushing learners towards a better level of mathematics education.
- ✓ This study may benefit teachers in developing and improving their teaching methods and guiding them to adopt modern teaching methods.
- ✓ This study may open the way for other research and improve it in reducing the error index in maths
- ✓ This study may benefit primary school teachers in preparing their lessons in light of the problem-solving method
- ✓ This study may contribute to pushing learners towards a better level in learning mathematics.
- ✓ The importance of employing the problem solving method as the highest output in thinking.
- ✓ The importance of employing this strategy, especially in mathematics curricula, because it is a method that leads to integrated and healthy growth in all aspects of personality.
- ✓ In response to modern educational trends that call for adopting international standards in teaching maths.

1:5: Defining terms:

- ➢ Concept of Problem Solving Method:

It is defined as a method of scientific thinking based on conscious observation, experimentation, and information gathering, in which it moves from the whole to the part (deduction).

It is a method of scientific thinking based on conscious observation, experimentation, and information gathering, in order to reach an acceptable solution(**Mohammed Sakran ,1999,p 149)**

- **Definition of procedural problem solving:**

It is the set of processes provided and supervised by the teacher to solve a mathematical problem in which the learners use the information and knowledge they have already learnt, and the skills they have acquired in overcoming a situation in a way that is unfamiliar situation in order to control it and reach a solution to it.

- **The traditional (regular) method:**

This is the method used to teach maths to learners in the third year of primary school, which focuses on introducing, explaining and presenting activities as a direct application of the concepts, generalisations and skills learned.

It includes evaluating learners' performance, discussing their solutions and providing feedback to them using oral presentation and summarising on the board.

The role of the learner is limited to listening, watching and sometimes contributing to the dialogue and discussion.

- **Defining Error:**

It is difficult to give an absolute or fixed definition of the concept of error due to its different connotations depending on different cultures

What we consider wrong in one culture may be right in another, and vice versa.

- **Maths :**

Al-Khawaldeh (1995, p76) defines it as an educational subject with an organised cognitive structure based on a logic that starts from the simple

It is based on teaching methods based on deduction, exploration, and problem solving.

- **Concept of Mathematical Errors Procedurally**:

These are the mistakes that learners make when studying maths, especially in the first stage of primary education, in which the learner begins to learn the principles, concepts and basic relationships of mathematics, as knowing the learners' mathematical errors benefits both the teacher and the curriculum developer as well as the authors of textbooks.

The teacher, curriculum developer, and textbook authors can work to confront such errors and develop a plan to treat and prevent them.

- **Pupils of the third year of primary school:**

They are a group of male and female learners who are between the ages of (8-7) years old and study in the third year of primary school

2:Method and Tools

2:1: Methodology of the study:

In light of the research variables and the sample available for the study, I adopted the experimental approach to find out the impact of the problem solving method in reducing mathematical error among learners in the third year of primary school, and this method is based mainly on the scientific experiment method to reveal the relationships between the different variables in the experimental situation.

2:2 Limitations of the study:

This study was limited by the following boundaries:

2:2:1 Spatial Boundary: The current study was conducted at Boubrima Massaoud Ain Al-Tarik Elementary School in Setif.

2:2:2 Temporal Limitations: The first semester of the academic year 2018/2019.

2:2:3 : Human Limitations: The current study was conducted on learners in the third year of primary school.

2: 2: 4 Academic Limitations:

The instructional materials used in this study included the number and arithmetic domain and the geometry and space domain from the maths textbook for learners of the third year of primary education 2018/2019, where the teacher prepared mathematical problems and life issues, revolving around the topics of (multiplication 1, multiplication tables Multiplication 1, Multiplication 2, Multiplication 2, Solids, Multiplication and the Distributive Property, Additive and multiplication), and then using these topics in teaching the experimental group using the problem solving method.

2:3: Study population

The population of the current study includes all students in the third year of primary school at Boubrima Massaoud Elementary School, Ain Trik Setif, for the academic year, 84 male and female learners who represent the statistical population of the study

2:4: Study Sample

This study was applied to a random sample of third grade primary school learners divided into two groups.

The study subjected the independent variable (problem solving method) to the experiment to measure its effect on the dependent variable (mathematical error) among learners of the third year of primary school, and the current study followed the experimental approach by dividing the study sample into two groups, which consisted of (56) male and female students.

In order to control the factors expected to affect the experiment, the sample was divided into an experimental group taught using the problem solving method and the other control group taught using the traditional method as follows:

- ✓ **The experimental group:**

The experimental group consisted of 29 learners who were taught using the problem-solving method in the subject of mathematics.

The control group:

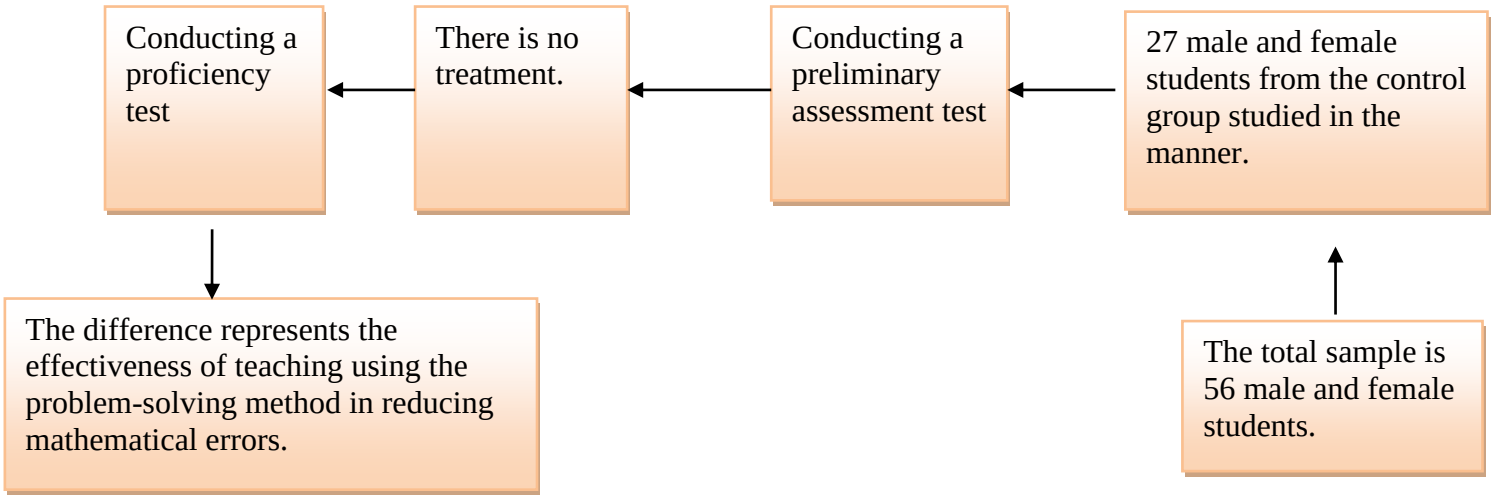
The experimental group consists of 27 learners who were taught in the normal way.

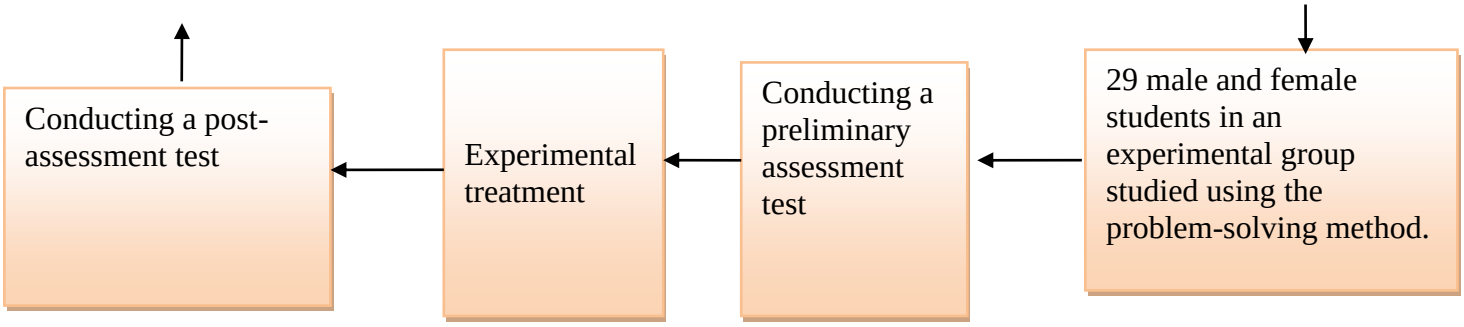
The applied study was carried out using the experimental design shown in the following

Table (01) Distribution of the study sample by group and gender of learners

Total	Females	Males	Group
Control	11	16	27
Experimenta	15	14	29
Total	26	30	56

Figure 1: Model of the experimental approach applied in the current study





Source: Prepared by the researcher

3:5:1 Test validity:

It means that the test measures what it was actually designed to measure, since the test questions were chosen on the basis of their discriminatory power, the test is honest to some extent and there are many ways in which honesty is measured. The study was limited to the honesty of the internal consistency of the test questions and this was verified by finding the Pearson correlation coefficient between the test questions and the total score, where the total consistency of the study tool is (0.642) at the level of significance (0.05).

3:5:2 Test Stability:

It means obtaining the same results when the measurement is repeated using the same instrument under the same conditions.' The stability coefficient is calculated in many ways. The learner found the stability coefficient by the two methods of semi-division of the test questions, and its value was (0.81), which is suitable for the purposes of the study.

3:6 Psychometric conditions of the study instrument:

3:6:1: Calculation of difficulty and discrimination coefficient:

Table 02: Difficulty coefficient values for the study test.

question	Difficulty factor
question01	**50**
question02	**42.85**
question03	**60.71**

question04	**42.85**
question05	**53.57**
question06	**46.42**
question07	**46.42**
question08	**42.85**
question09	**46.42**
question10	**50**

It appears from the above table that the difficulty coefficients of the test questions ranged between [65-35], and accordingly, all

Table (03): Discrimination coefficient values for the study test.

The coefficients of difficulty of the test items are acceptable.

question	**Discrimination coefficient**
Question01	42.85
Question02	35.71
Question03	28.57
Question04	35.71
Question05	35.71

Question06	35.71
Question07	42.85
Question08	50
Question09	42.85
Question10	35.71

Table (03) shows that the discrimination coefficients for the test questions range between [50-30], so the discrimination coefficients are considered acceptable and Appendix () shows this.

3:6:2 The internal consistency of the study tool:

The test scores were used to calculate the internal reliability of the study tool and each of its questions, and the extent to which the component questions are related to each other, and to ensure that there is no overlap. This was verified by finding the Pearson correlation coefficient between the test questions and the total score and the following table shows this:

Table (04): The internal consistency reliability of the test.

Test questions	Correlation coefficient	Level of significance
Question01	0.029	**0.87**
Question02	0.628	**0.05**
Question03	0.259	**0.17**
Question04	0.587	**0.05**
Question05	0.078	**0.68**
Question06	0.554	**0.05**
Question07	0.469	**0.05**
Question08	0.614	**0.05**
Question09	0.500	**0.05**
Question10	0.575	**0.05**

The overall consistency of the study tool	**0.642**	**0.05**

3:6:3 The stability of the test:

To check the stability of the test, the split-half reliability of the test questions was used, and its value reached (0.81), which is an appropriate value for the purposes of the study (Appendices 1), and Table No. (05) shows this:

Table No. (05): Showing the stability of the test using semi-compartmentalisation.

Reliability statistics

Cronbach's Alpha	Part 1	Value	.423
		N of Items	5[b]
	Part 2	Value	.143
		N of Items	5[c]
		Total N of Items	10
		CorrelationBetween Forms	.290
Spearman-Brown Coefficient		EqualLength	.818
		UnequalLength	.450
Guttman Split-Half Coefficient			.812

b. The items are: Q1, Q3, Q5, Q7, Q9.
c. The items are: Q2, Q4, Q6, Q8, Q10.

4. Study Procedures: (Implementation of the experiment)

After selecting the study sample, the teacher was briefed and trained on teaching the Problem Solving Method, according to the procedures and steps followed in the Problem Solving Method.

- Before starting the implementation of the study, the pre-test was applied to the students of the experimental group and the learners of the control group, in order to check the equivalence of the two groups before implementing the study.
- The study was implemented during the second semester of the 2018/2019 academic year, where the experimental group was taught with the Problem

Solving method, while the control group was taught with the traditional method, and the control and experimental groups took the same number of classes (18) over a month.

- After completing the implementation of the study, the post-test was applied to answer the study's questions and test its hypotheses.

Study variables:

The study included the following variables:

Independent variables:

Teaching method, which has two levels: Using the Problem Solving Method and the Traditional Method.

Dependent variable:

Reducing mathematical error.

2:4: Statistical processing methods:

The Statistical Package for the Social Sciences (SPSS), using a computer, was used to answer the study's questions with the following statistical methods:

1:2:4:Statistical methods used to check reliability and stability:

Difficulty coefficient to calculate the degree of difficulty of each test question.

The coefficient of discrimination to calculate the discrimination of the achievement test questions.

Correlation coefficient to reveal the internal consistency of the test questions.

Split-half method to verify the test's stability coefficient.

2:2:2:4: Statistical methods used to answer the study questions:

T test for differences between the means of two independent samples.

Arithmetic means and standard deviations of the two groups

5: Presentation and discussion of the results related to the general hypothesis:

5:1: General Hypothesis:

The hypothesis states: [Problem solving method has an impact on reducing the mathematical error of third year primary school students].

Its validity is discussed through the following null hypothesis:

H0: [There is no effect of problem solving method in reducing the mathematical error of students in the third year of primary education.]

To test the validity of this hypothesis, the Independent-Sample T-Test was used to identify the significance of the differences between the scores of the experimental and control groups in the achievement test in mathematics, and the following table shows this:

Table (06): The significance of the differences between the experimental and control groups in the mathematics achievement test.

The experimental group	The number	The arithmetic mean	Standard deviation	Value (T-Test)	Degree of freedom	significance level Sig	The indication
Pre-test	**29**	**9.24**	**1.38**	**2.75**	**48**	**0.008**	Function
Post-measurement	**27**	**8.01**	**1.88**				

Comment:

The above table shows the significance of the differences between the experimental and control groups in the maths test. The calculated 't' value reached (2.75) at the calculated significance level (0.008), which is less than the significance level specified in the hypothesis ($\alpha = 0.05$). Therefore, we reject the null hypothesis and accept the alternative hypothesis that: (the problem-solving method has an effect on reducing maths errors among students in the third year of primary education)

Discussion:

It is evident from the table above, which pertains to the significance of the differences between the experimental and control groups in the mathematics achievement test, and by examining the test results, and through the "t" test results, it was found that there are differences in favor of the experimental group with a mean of (9.24), which is consistent with most previous studies.
Like **Al-Zoubi's** study **(2011),** which aimed to investigate the impact of the problem-solving teaching strategy on the development of mathematical creative thinking

among primary school teacher learners at Yarmouk University, and **Shbeir's** study **(2012),** which aimed to determine the effect of the problem-solving strategy in addressing learning difficulties among eighth-grade learners, and **Taseer Al-Qaisi's** study **(2007),** which aimed to study the effect of the problem-solving strategy on achievement and mathematical thinking among basic education learners in Jordan.
These studies and others all prove the superiority of teaching using the problem-solving method over the traditional method.

Based on the results of this study and what previous studies have confirmed, it was found that there are statistically significant differences in favor of the experimental group at the significance level (α=0.05). The reason for these differences, which favored the experimental group, may be attributed to the effectiveness of the problem-solving method in reducing the mathematical error index compared to the conventional method. The problem-solving method provides learners with the opportunity to use different thinking methods, and through it, new concepts are learned and new information is discovered.
It allows the learner to transfer the developed experience from the first solution to other familiar or unfamiliar solutions, and it may provide unconventional ways of thinking and form a developed concept for creative problem-solving.

Learning scientific and practical skills, along with continuous training in problem-solving, deepens learners' understanding.
It helps learners develop self-confidence and self-reliance through facing challenges and finding solutions, no matter how much effort and time it takes.
Presentation of the results related to the first partial hypothesis and their discussion.
The hypothesis states: [There are statistically significant differences at the significance level (α = 0.05) in the pre-test measurement between the experimental and control groups.]
Its validity was discussed through the following null hypothesis:
H0: [There are no statistically significant differences at the significance level (α = 0.05) in the pre-test measurement between the experimental and control groups.]
To test the validity of this hypothesis, the Independent-Sample T-Test was used to determine the significance of the differences between the scores of the experimental group and the control group in the pre-test, as shown in the following table:

Table No. (07): Shows the means, standard deviations, and t-test results for the independent samples in the pre-test measurement of the experimental and control groups.

The experimental group	The number	The arithmetic mean	Standard deviati	Value (T-Test)	Degree of freedo	significance level Sig	The indication

			on		**m**		
Pre-test	**29**	**8.51**	**1.29**	**0.568**	**54**	**0.573**	Not indicative
Post-measurement	**27**	**8.33**	**1.10**				

comment
It is clear from the above table, which presents the results of the independent samples t-test in the pre-test measurement for the experimental and control groups. Where the calculated "t" value was (0.568) at the calculated significance level (0.573), which is greater than the significance level specified in the hypothesis (α = 0.05). Therefore, we reject the alternative hypothesis and accept the null hypothesis which states: [There are no statistically significant differences at the significance level (α = 0.05) in the pre-test measurement between the experimental and control groups.]

Discussion:
It is evident from the above table, which presents the results of the "t" test for two independent samples in the pre-test measurement of the experimental and control groups, and through the results of the "t" test, it was found that there are no statistically significant differences between the experimental group and the control group. This has been demonstrated by most previous studies (**Al-Zoubi, 2011; Shbeir, 2012; Al-Qaisi, 2007).** The reason for this is the equivalence of the experimental and control groups.

Presentation of the results related to the second partial hypothesis and their discussion.
The hypothesis states: [There are statistically significant differences at the significance level (α = 0.05) in the pre-test and post-test measurements of the experimental group.]
Its validity was discussed through the following null hypothesis:
H0: [There are no statistically significant differences at the significance level (α = 0.05) in the pre-test and post-test measurements of the experimental group]
To test the validity of this hypothesis, the independent two-sample t-test was used. (Paired- Sample T-Test)
This is to determine the significance of the differences between the means of the experimental group's scores in the pre-test and post-test, and the following table illustrates this:

Table No. (08): It shows the means, standard deviations, and "t" test results in the pre-test and post-test for the experimental group.

The experimental group	The number	The arithmetic mean	Standard deviation	Value (T-Test)	Degree of freedom	significance level Sig	The indication
Pre-test	**29**	**8.51**	**1.29**	**2.58**	**28**	**0.015**	Function
Post-measurement	**29**	**9.24**	**1.38**				

Comment:
It is evident from the table above, which pertains to the results of the "t" test for independent samples in the pre-test and post-test measurements of the experimental group. Where the calculated "t" value was (2.58) at the calculated significance level (0.01), which is less than the significance level specified in the hypothesis ($\alpha = 0.05$). Therefore, we reject the null hypothesis and accept the alternative hypothesis stating: [There are statistically significant differences at the significance level ($\alpha = 0.05$) in the pre-test and post-test measurements of the experimental group.] In favor of the experimental group with an average of (9.24).

Discussion:
It is evident from the above table, which presents the results of the "t" test for two independent samples in the pre-test and post-test measurements of the experimental and control groups, that there are statistically significant differences at the significance level ($\alpha = 0.05$) in the pre-test and post-test measurements of the experimental group in favor of the experimental group with a mean of (9.24). This is consistent with Al-Zoubi's (2011) study, which aimed to investigate the impact of the problem-solving teaching strategy on the development of mathematical creative thinking among primary school teacher learners at Yarmouk University, Al-Shubair's (2012) study, which aimed to determine the effect of the problem-solving strategy in addressing learning difficulties among eighth-grade learnerss, and Al-Qaisi's (2007) study, which aimed to investigate the effect of the problem-solving strategy on achievement and mathematical thinking among basic education learners in Jordan.

Where I found statistically significant differences in favor of the experimental group, and the reason for these differences in favor of the experimental group may be due to

the use of the problem-solving method in teaching, as this strategy has the ability to stimulate learners' thinking and imagination and attract learners to its content, which has been confirmed by most previous studies.

General analysis:

In conclusion, it is clear from the previous results that the use of problem-solving methods has a positive impact on reducing mathematical errors among elementary school learnerss, and it outperforms traditional teaching methods in this regard. This may be attributed to the fact that learning problem-solving is a strategic thinking skill that can be applied and transferred to other situations. Moreover, the teamwork involved in the problem-solving method provides learners with the opportunity to exchange ideas, suggestions, and experiences among themselves during their participation in sports activities. They share what is on their minds in terms of thoughts and opinions, and express the thinking processes they use during various sports activities, whether in writing or verbally. Consequently, the outcome of the interactions and discussions among learners results in each learner coming up with a set of ideas and cognitive strategies that have been exchanged among them, which will lead to a reduction in the severity of their mathematical errors.

References:

1: Al-Khawaldeh Muhammad and others (1995) General Teaching Methods, School Book Press, Ministry of Education, Sana'a.

2: Muhammad Sakran (1999) Social Studies Teaching Methods, Publishing House, Amman, Jordan.

Previous studies:

3: Ismail Wahidi Maher, Taj El-Din Ibrahim, (2000) The effectiveness of a proposed strategy based on some constructive educational models and learning methods in modifying alternative ideas about the concepts of their opinions and their effects on teaching methods among science teachers before serving in the Saudi Arabian problem "Message of the Gulf Arab Journal, Riyadh, Education Office

4: Al-Raghi Ali (2011) The effect of the teaching strategy based on solving the problem in developing creative mathematical thinking among students in the class, Master's thesis.

5: Tishir Imad (2011), The effect of the problem-solving strategy in treating learning difficulties among second-grade students, Master's thesis, Al-Azhar University, Gaza, Palestine.

Journals:

6: Tayseer Khalil Al-Qaisi (2007), The effectiveness of using the problem-solving strategy in achievement and mathematical thinking among students in the basic stage in Jordan, Journal of Educational Sciences, College of Education, Issue 12, Qatar.
7:Alawna, Shafiq. (2002). Training sixth-grade students on some problem-solving strategies and their impact on solving verbal math problems. Journal of the Arab Universities Union for Education and Psychology, Syria. Pages 87-104