Turkish Journal of Computer and Mathematics Education Vol.12 No. 7 (2021), 3296- 3305

Research Article

The Impact Of Innovative Matrix Strategy And The Problem Tree Strategy On The Mathematical Proficiency Of Intermediate Grade Female Students

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Article History: Received: 11 January 2021; Revised: 12 February 2021; Accepted: 27 March 2021; Published online: 16 April 2021

Abstract: The research aims to know the impact of the innovative matrix strategy and the problem tree strategy in teaching mathematics to intermediate grade female students on mathematical proficiency. To achieve the research objectives, an experimental approach and a quasi-experimental design were used for two equivalent experimental groups. The first is studied according to the innovative matrix strategy, the second group is studied according to the problem tree strategy. The research sample consisted of (32) female students of the first intermediate grade, who were intentionally chosen after ensuring their equivalence, taking into several factors, most notably (chronological age, previous achievement, and intelligence test). The research tools consisted of test of mathematical proficiency with its four components: (conceptual comprehension, Procedural fluency, strategic competence, and adaptive reasoning) and a scale for the fifth component, which is productive desire.

Key words:(Innovative Matrix Strategy, Problem Tree Strategy, Mathematical Proficiency).

PROBLEM RESEARCH:

The change of mathematics curriculum raised a number of questions among many mathematics teachers about how to teach it, and how to complete the course, while ensuring that it reaches the minds of students. The student in the first grade gets acquainted for the first time with mathematics by connecting it to life, and connecting it with the other sciences, and through many new ideas and topics in the new curriculum, and this requires creating a classroom environment that challenges its capabilities. Associations and councils for teaching and learning mathematics have emerged, especially the National Research Council in the United States of America (NRC), which has defined methods that ensure mathematics is successfully taught for any individual, and reaching the basic goals that should be achieved by mathematics curriculum in the classroom, which is called "mathematical proficiency", which is a term that includes all the experiences, competencies and knowledge necessary to learn mathematics (Al-Hanafi, 2019, 165) and thus developing the dimensions of mathematical proficiency among school students became one of the most important objectives of teaching mathematics (Loewenberg, 2003, p3) Hence the problem of the current research, as previous studies and educational reality prove the low levels of mathematical proficiency among middle school students, especially the first grade, which the researcher noticed from the reality of her work where she noticed the spread of errors in the understanding and understanding of students In the solution steps, as I noticed that most students do not realize the importance of mathematics and its life value, the researcher's view is consistent with many studies that have demonstrated the weakness of mathematics students in mathematical proficiency and their need to develop it, including, for example, the study (Hoffmann, et al, 2014) and the study (Muhammad, 2017) and the study of (Al-Menoufi and Khaled, 2018), (Students, 2018) and (Al-Mallouhi and Souad 2020) and others.

Therefore, the researcher considers experimenting with modern strategies in teaching that motivate the student, and focus on active learning is the innovation matrix strategy and the problem tree of strategy in which the student has a positive role, and accordingly the research problem can be formulated with the following two questions:

1. Is there an impact of the innovative matrix strategy on the mathematical proficiency of the first intermediate grade students in mathematics?
2. Is there an impact of the problem tree strategy on the mathematical proficiency of the first intermediate grade students in mathematics?

Importance of research:

The importance of research can be clarified through the following:

1. It is the first research as far as the researcher knows at the local and Arab level, which dealt with the innovation matrix and problem tree strategies as two modern strategies of active learning strategies, in teaching mathematics to intermediate first students, and their impact on their mathematical proficiency.
2. Keeping pace with global trends that call for active learning, and the learner's positivity in the educational process.

3. Providing mathematics teachers with modern strategies that can be used in teaching mathematics, in an attempt to develop their mathematical proficiency.

Research objective:

The current research aims to know the impact of the two strategies of the Innovative Matrix and the Problem Tree as two strategies in teaching mathematics to intermediate first grade students on mathematical proficiency.

Research hypothesis:

"There is no statistically significant difference at a significance level (0.05) between the mean differences of the scores of the two experimental groups (the first that will study the material using the innovative matrix strategy, and the second one that will study the material using the problem tree strategy in testing mathematical proficiency with its four components and the measure of productive desire."

The following sub-hypotheses were derived from it:

The first sub hypothesis:

"There is no statistically significant difference at the level of (0.05) between the average scores of the first experimental group students who studied the innovation matrix strategy and the second experimental group that studied with the problem tree strategy in the mathematical proficiency test.

The second sub-hypothesis:

"There is no statistically significant difference at the level of (0.05) between the average scores of the students of the first experimental group that studied the innovation matrix strategy and the second experimental group that studied the problem tree strategy in the productive desire scale.

Research Limits:

The current search is limited to:

1. Government intermediate and secondary school day in Baghdad governorate / center.
2. Female students of the first intermediate grade in Al-Istiqlal High School for Girls in the General Directorate of Education in Baghdad / Rusafa I, Baghdad Governorate.
3. The first semester of the academic year 2020-2021.
4. Mathematical proficiency includes five components (conceptual comprehension, procedural fluency, strategic competence, adaptive reasoning, and productive desire)

Define terms

Impact: defined by:

• (Shehata and Zainab, 2003) as: "the outcome of a desirable or unwanted change that occurs in the student as a result of the teaching process" (Shehata and Zainab, 2003: 22)

The researcher defines it theoretically as: the impact of the independent variable on dependent variables and observing the extent of the change occurring in it.

The researcher knows it operationally: The impact of the two strategies of problem tree and innovation matrix on the achievement of first-grade intermediate students and in processing their information.

Innovative Matrix Strategy: define by

• Ambu Saidi and Hoda (2016): "Give students a matrix that contains scenarios, ideas, events, or options related to a specific topic or field, then students form possible scenarios by choosing from the alternatives given in the rows of the matrix." (Ambu Saidi and Hoda, 2016: 70)

The researcher adopts the definition of (Ambu Saidi and Hoda,2016) a theoretical definition.

The researcher defines them procedurally: specific and logically arranged steps that the subject school (the researcher) takes to teach mathematics, to achieve the objectives of teaching the subject for the second experimental group students by giving the students a matrix containing scenarios, ideas, events, or options related to a specific topic, then the students Create possible scenarios by selecting them from the alternatives given in the rows of the matrix.

Problem Tree Strategy: define by

• Ambo Saeedi and Hoda (2016): "Empowering students with the skills of analytical accuracy of a single problem, and distinguishing between two important aspects which are the causes of the problem and its symptoms." (Ambu Saidi and Hoda, 2016: 149)

The researcher adopts the definition of Ambu Saidi and Hoda (2016), a theoretical definition.

The researcher defines them procedurally: specific and logically arranged steps taken by the subject school (the researcher) to teach mathematics, to achieve the objectives of teaching the subject to the students of the first experimental group, to equip them with the skills of analytical accuracy of one problem, and to distinguish between two important aspects, which are the causes of the problem and its symptoms.

Mathematical proficiency:

The US National Research Council NRC 2001 defined it as: the ability to learn mathematics successfully as it includes all aspects of expertise, competence and knowledge in mathematics and it includes five dimensions that work separately (NRC, 2001, 115)

It is procedurally defined in the current research as "specific processes and skills that enable the first-grade student to learn mathematics with mastery, aware of the value of that subject and able to apply it in life. It includes all the competencies that are required to perform all mathematical operations, solve problems, represent relationships, etc."

THEORETICAL BACKGROUND

Innovative matrix strategy

The Innovative Matrix strategy is one of the active learning strategies that depend on building knowledge and not transferring it, meaning that knowledge has its roots in the learner's mind, and thus its meaning cannot be formed by listing information by the teacher, but it is formed inside his mind as a result of the interaction of his senses with the world. The external, where the previous cognitive structure of the learner changes, and takes a new cognitive structure, as it assimilates the data of the new sensory experience (Bloom et al, 1999: 197)

The idea of the strategy: where the idea of strategy is based on giving students a matrix that contains scenarios, ideas, events or options related to a specific topic, or a specific field, then students form possible scenarios, by choosing the alternatives given in the rows of the matrix.

The aim of the strategy: The aim of the strategy is to develop teamwork, and it also helps in developing the skills of creative thinking, problem-solving, and decision-making among students.

Time to implement the strategy: to be implemented at any convenient time that the teacher sees, it may be at the beginning of the lesson, or the middle of it, or at the end. (Ambu Saidi and Hoda, 2016: 70)

Steps to implement the strategy: The strategy steps can be explained as follows:

1. The teacher predetermines where to present the array.
2. The teacher introduces the students to the matrix form shown below, and it contains information, as the number of classes depends on the nature of the topic, and the teacher's goal of taking the matrix.
3. The teacher asks students to create possible scenarios and other unlikely alternatives in the matrix.
4. The teacher discusses with students the ideas they have written and adjusts them. (Ambu Saidi and Hoda, 2016: 71)

Problem Tree Strategy:

The problem tree strategy is one of the active learning strategies in which students participate in a variety of activities that allow them to participate in a positive way, conscious thinking and sound analysis of the academic material, as learners participate in opinions, in the presence of the teacher facilitating the learning process, which drives them to achieve the learning goals. (Happiness, 2006: 33)

The idea of the strategy: The idea of the problem tree strategy is based on enabling students to have the skills of analytical precision for a single problem, by distinguishing between two important aspects, namely the causes of the problem and its symptoms.

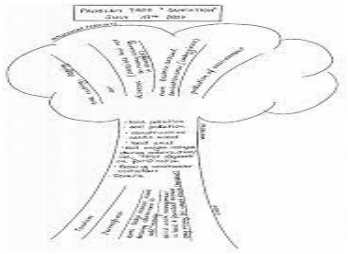
The goal of the strategy: The aim of the strategy is to help the student acquire the skills of analytical accuracy of the problems he is exposed to in his lessons.

Time to implement the strategy: The strategy can be used as an introduction at the beginning of the lesson, or as an activity during the lesson, or at the end of the lesson.

Implementation needs: A paper containing the strategy for each student group in the class. (Ambu Saidi and Hoda, 2016: 149)

Steps to implement the strategy: The strategy steps can be explained as follows:

1. The teacher explains to students the strategy and the steps for its implementation, as in the following figure:
2. After the teacher explains to the students the lesson related to a specific problem or issue, he distributes to them the activity sheet that includes the strategy, and the students write first the problem, then the causes of the problem, and finally the results of the problem.
3. The teacher discusses with the students the answers they reached. (Ambu Saidi and Hoda, 2016: 150)



Mathematical Proficiency:

The concept of mathematical proficiency:

The word mathematical proficiency appeared at the beginning of this century, specifically in 2001 by Kilpatrick el al, 2001, which expresses the skill and mastery in implementing the solution steps accurately and flexibly with the conceptual understanding of mathematics and mathematical processes by following logical and contemplative thinking, developing proofs, formulating problems and the ability to solve them and then The student sees mathematics as a valuable and useful subject and becomes more confident and capable when using it (Al-Hinnawi, 2018, 362)

While Obaidah (2017) takes care that mathematical proficiency is "the learner's ability to employ experiences and deal with them in order to form their cognitive construction and then apply it in solving problems, and generate new mathematical knowledge, through which the learner performs mathematical operations and acquires the skills in the map of the components of mathematical proficiency" (Obaidah, 2017, p.28).

Mathematical ingenuity also symbolizes one of the outcomes of learning mathematics, and it is called mastery in mathematics.

Mathematical proficiency is also known as "a modern approach to developing mathematics education linked to basic axes: the proficiency of the academic content as well as the components of mathematical proficiency which need to be developed and evaluated" (Philipp, 2010, p 11)

The components of mathematical proficiency:

Mathematical proficiency consists of five components, according to the American National Research Council, and it can be mentioned in a kind of brief explanation as follows:

1- conceptual understanding.

It is the student's ability to understand the main ideas by helping him to deduce those ideas and realize their value and what they denote, and then the student becomes able to use those ideas strategically to solve those problems, especially those that are not repeated, while avoiding misunderstanding (Wiggins, 2014,)

2- procedural fluency:

It is the ability to use mathematical principles and procedures in solving mathematical operations and represent mathematics symbolically (Garg, 2017,)

3- strategic competence:

It is the ability to solve mathematical problems, interpret and formulate them, determine data, represent them and solve them in an appropriate way, and it includes forming mental images to solve problems and devise plans for solutions (Abu Al-Rayat, 2014).

4- adaptive reasoning

It is a mental activity that helps to link some concepts, facts and procedures for the most appropriate mathematical solution to a mathematical problem. Adaptive thinking can be observed in two ways: the logical aspect in explaining the relationships between concepts and the nature of the problem, and clarifying the most appropriate method as a correct solution and stating the reason for choosing it (Andi et al, 2017)

5- Productive Disposition: it means realizing the value of mathematics and seeing it as a useful material that deserves attention and inclination to believe that the effort exerted in learning mathematics produces beneficial results as the learner sees himself as an active and interactive person with mathematics (Al-Mallouhi & Souad, 2020, 198)

The relationship between the components of mathematical proficiency with each other:

In fact, the five components of mathematical proficiency are interrelated with one another, and one of them cannot be mastered without mastering the above. This can be explained as follows:

- Conceptual comprehension: Conceptual comprehension assists students in the proper application of mathematical laws and representations and is a source of adaptive reasoning.

- Procedural fluency: The conceptual skills support them as they are two intertwined components. Without the necessary procedural fluency, students will not be able to reach a deep understanding of ideas and problem solving in mathematics, and strategic competence depends on fluency in problem solving.
- Strategic Competence: Strategic competence plays an important role in developing procedural fluency in mathematics and allows choosing the most appropriate strategies
- Adaptive reasoning: It is the main link that brings the components together. It helps enhance thinking skills and conceptual comprehension. It is indispensable in determining strategy in the event that students use strategic competence to formulate the problem.
- Productive Desire: It is important to what preceded it, especially procedural fluency and adaptive reasoning, as the productive desire enables them to find students themselves possessing the ability to learn and apply mathematics (Al-Mallouhi and Souad, 2020, p.199)

3. Research Methodology:

The researcher adopted the experimental design with two equivalent experimental groups with the post-test, because it is the most appropriate design for the current research, as in the following figure that shows the experimental design adopted in the research:

Table (1) the experimental design of the research

Groups	Independent Variable		Dependent Variable	Tools
The first experimental	Innovative matrix strategy	Equal Groups	Mathematical proficiency -	test of four components of mathematical proficiency
The second experimental	problem tree strategy			The scale of productive desire

The research community and its sample: The research community consists of middle school students in Baghdad governorate, which includes six education directorates. As for the research sample, it included students of the first intermediate grade in Al-Estiqlal Secondary School for Girls, which numbered 32 students. Two divisions of the first intermediate school were randomly selected to represent two groups. The research, with a rate of (16) students in the first experimental, (16) in the second experimental group

Adjustment procedures for the research sample:

1. Social environment: All students are from one environment, which is Baghdad.
2. Exclusion of students who had failed: The researcher excluded all students who had failed statistically, and from both groups to ensure the safety of the test.
3. Follow-up: The researcher personally followed up the students when applying the IQ test, and answered the questions asked by them about it.
4. Equivalence procedures: The researcher took several measures to equalize the two research groups, including (chronological age, previous achievement, intelligence test)

Search tools:

1- Preparing the test for measuring the components of mathematical proficiency:

After reviewing many previous studies, including the study of (Al-Hanafi, 2019) (Muhammad 2017) and (Ali 2019) and others, the following five components of mathematical proficiency were chosen: conceptual comprehension, procedural fluency, strategic competence, and adaptive reasoning - productive desire.

A test has been prepared to measure the first four components, while the productive desire has been prepared a special scale for it since it has a psychological aspect

Objective of the test: The test aims to measure the components of mathematical aptitude, represented in (conceptual comprehension, procedural fluency, strategic competence, and adaptive reasoning) in the integer and relative numbers classes of first-grade intermediate students

Formulation of the test content: In order to properly formulate the sections of the test of measuring the components of mathematical proficiency, the relative weights of the two integers and relative numbers were calculated according to the relative weight of the learning objectives and the amount of content for each subject, in addition to the relative weights of the components of mathematical proficiency. Then the test vocabulary was built in the form of multiple choice, with the instructions for solving the test, and thus the test became ready in its initial form.

- Validity and reliability of the test:

The test was presented, in principle, to a group of referees specialized in methods of teaching mathematics in order to ensure the validity of the test, and some items of the test were modified in light of the opinions of the arbitrators

To ensure the stability of the test: The test was applied twice, 15 days apart from the first time, as it was applied to a sample consisting of 35 students from two academic grades different from the research sample and from the same school from which the sample was chosen, and the results of the paragraphs stability factor were as follows:

Table (2) Stability of the vocabulary test for measuring the components of mathematical proficiency using correlation coefficients

No.	The components of mathematical proficiency	the number of vocabularies,	the Pearson Correlation Coefficient
1.	Conceptual comprehension	9	0.739
2.	procedural fluency	9	0.801
3.	Strategic Competence	9	0.819
4.	Adaptive reasoning	9	0.799
	The whole test	45	0.88

It is clear from the previous table that the values of the correlation coefficients are positive values with a high degree, and that they are statistically significant at a level of significance less than or equal to (0.01), which indicates the stability of the test items with an acceptable degree independently for each paragraph and at the overall level of the test.

- Difficulty coefficient and coefficient of discrimination for vocabulary:

The difficulty factor was calculated for each of the test questions, where the ratio of the number of correct answers to the question to the total answers was calculated, and then the students were classified into three groups (a higher group of 27%, a medium group, and a minimum group of 27%). The values of the difficulty coefficients ranged. In the test vocabulary, which is in the final form, it ranges between (0.44-069), which are good values. As for the effectiveness of false test alternatives, their values were negative. Thus, the test items are acceptable (Shehata and Zainab, 2003, 168)

- Calculating the test time: the time it took for each student individually to answer the test was monitored, then the average times of the students 'answers were calculated by dividing the times by the number of students, where the most appropriate time was 90 minutes

Method of test correction: one score is awarded for each correct answer, so the final score for the test is (45 degrees)

The final image of the test: The final version of the test was prepared after making sure of the validity and reliability of the test

2- Preparing the measure of productive desire:

The produced desire scale was prepared according to the following procedures:

The objective of the scale: This scale was prepared with the aim of measuring the productive desire of my group search

- Determining the dimensions of the scale: The research identified three dimensions of the productive desire scale, after reviewing previous studies, namely: the tendency towards diligence and perseverance in mathematics, an appreciation of the value and importance of mathematics, an awareness of the nature of mathematics).
- Formulation of the scale: The scale paragraphs were initially formulated, with the choice of three alternatives expressing the choices (agree, neutral, disagree), so that they reflect the students' behaviors that they may practice or feel when studying mathematics.
- The validity of the scale: The scale was presented to a group of expert arbitrators, and some phrases were modified in light of their opinions to suit the female students of the first intermediate grade.

Stability of the scale: To ensure the stability of the scale, it was applied to an exploratory sample other than the research group, whose number was (30) students, in order to calculate the reliability coefficient by the Cronbach alpha method, and the value of the reliability coefficient of the scale was (0.72), which is a value indicating the stability of the scale and that it is valid for application

- Scale correction method: the score for each statement ranged between 1-3 degrees, and the correction is done by giving the positive statements (agree = 3 degrees, neutral = 2 degrees, disagree = 1) while taking the negative statements (agree = 1, neutral 2, disagree = 3 degrees)

Therefore, the test score becomes upper = 90 and minimum = 30 points

- The final form of the scale: The scale came in its final form, with a number of paragraphs (30 paragraphs).

Under the three dimensions fall, diligence and perseverance in mathematics, appreciation of the value of mathematics and its importance in life, awareness of the nature of mathematics. (The following table shows the dimensions of the scale and the expressions it includes:

Table (3) specifications of the productive desire scale and the number of its expressions

	Dimensions	Positive statements	Negative statements	Total
1.	Diligence and perseverance in mathematics	1-4-5-6-8-19-18-23-30	2-9-12 -21-24-27-29	16
2.	Appreciation of the value and importance of mathematics in life	3-13-14-16-20	10-15-25	8
3.	Understanding the nature of mathematics	26-28-17	7-11-22	6
Total		17	13	30

Search Experience Application:

The researcher took the following steps in order to implement the research experiment:

1- Selection of the research sample from first-grade intermediate students from Al-Istiqlal High School for Girls, and (16 students) were selected as the first experimental group, and (16) as a second experimental group.

2- The application of the test of measuring the components of mathematical proficiency in the first week of the first semester of the academic year 2020/2021 AD in order to ensure the equivalence of the two groups, as mentioned previously,

The data have been processed statistically and are as shown in the following table:

Table (4): Arithmetic averages, standard deviations, and the value of the "t" test in the pre-application of the Mathematical Aptitude Test

The components of mathematical proficiency	the1st experimental group (n = 16)		the 2nd experimental group (n = 16)		T value	Significance value	The level of significance
	arithmetic mean	standard deviation	arithmetic mean	standard deviation			
Conceptual comprehension	3.70	1.78	3.98	0.97	0.89	0.4	not significant
Procedural fluency	3.39	1.14	3.82	1.73	1.50	0.15	not significant
Strategic competence	2.31	o.90	2.25	0.80	0.32	0.74	not significant
Adaptive reasoning	1.90	0.92	2.1	0.98	0.40	0.70	not significant
Totally Mathematical proficiency	11.28	2.41	12.10	2.28	1.30	0.21	not significant

It is evident from the previous table that there are no statistically significant differences between the mean scores of both groups (experimental) in the pre-application of the test of the components of mathematical proficiency, as all the indices of significance were <0.05, which is one of the indicators of parity between the two research groups for each component of mathematical proficiency as well as with regard to mathematical proficiency as a whole.

The (t) test was relied on for independent samples using the SPSS Statistical Package for Social Sciences program.

3- The application of the dimensional measurement of the components of mathematical proficiency test after the completion of the teaching of the three chapters, and the data have been processed statistically and are as shown in the following table:

Table (5) the results of the "T" test for the differences between the mean scores of the two research groups in the post application of the mathematical aptitude test as a whole and its components.

The components of mathematical proficiency	the1st experimental group (n = 16)		the 2nd experimental group (n = 16)		T value	Significance value	The level of significance
	Arithmetic mean	standard deviation	arithmetic mean	standard deviation			
Conceptual comprehension	3.70	1.70	8.17	1.18	6.5	0.01	significant
Procedural fluency	4.52	1.50	7.8	0.52	11.22	0.01	significant
Strategic competence	3.4	1.7	5.71	0.41	7.78	0.01	significant

Adaptive reasoning	3.32	1.26	5.65	0.65	9.41	0.01	significant
Totally Mathematical proficiency	17.13	4.84	27.71	1.85	11.20	0.01	significant

It is evident from the previous table that the mean scores of the second experimental group students are higher than the scores of the first experimental group students in the post application in the mathematical aptitude test in all components, which are in the order: 8.17, 7.8, 5.71, 5.65 for the components: conceptual comprehension - procedural fluency - strategic aptitude - adaptive reasoning Against the control group averages: 3.70, 4.50, 3.4, 3.32, 17.13 on the same components

We also note that the average scores of the members of the second experimental group are higher than the scores of the members of the first experimental group in the post application in the mathematical aptitude test as a whole, as the value of "t" came (11.20), which is a statistically significant value at a degree of freedom (30)

In order to ensure the validity of the hypothesis, the mean scores of the students of the first experimental group and the scores of the students of the second experimental group were calculated in the post application of the produced desire scale based on the t test. The following table presents the test results.

Table (6) the results of the "T" test for the mean scores of the two research groups in the post application on the productive desire scale.

Dimension	Group	Number	Averages	Standard deviations	T-value	Significance level
Productive desire	Experimental 1	16	48.21	6.7	9.83	0.01
	Experimental 2	16	61.90	6.12		

By looking at the previous table, we notice a statistically significant difference at the level (0.01) between the mean scores of the students of the first experimental group and the scores of the students of the experimental group for the second in the post application of the productive desire scale in favor of the second experimental group, where the value of T was "9.83", which is a statistically significant value at a degree Freedom (30), which confirms the rejection of the second hypothesis.

VIEW AND DISCUSS RESULTS

The researcher presents the results of her research according to the order of variables in the title and her hypotheses, as follows:

The results related to this variable presented in Table (4) showed the superiority of the second experimental group that was studied according to the problem tree strategy over the first experimental group that was studied according to the innovation matrix strategy with regard to the dependent variable represented in mathematical proficiency, which indicates the effectiveness of the problem tree strategy and strengthens the researcher did this for the following reasons:

• The problem tree strategy gives students the opportunity to access information and explore mathematical concepts through problem analysis and discussion, and it is one of the principles of applying the strategy where many discussions take place and it achieves one of the most important components of mathematical proficiency, "conceptual understanding."

• The analysis of the problem tree helped to exclude unnecessary data in understanding mathematical concepts and identifying the wrong ones, which raised the conceptual comprehension component for them

• The problem tree strategy provided the student with the choice of the most appropriate method for the solution and training on it, which resulted in raising their strategic competence as one of the components of mathematical proficiency.

• The problem tree strategy worked to motivate students to employ thinking skills such as induction, interpretation, induction, and training in providing evidence, which raised the level of their adaptive reasoning component

• The use of one of the active learning strategies contributed to providing a positive and stimulating environment in which the student could express the difficulties that he usually faces during the solution. This environment also encouraged the students to participate positively and effectively, leaving behind the usual aversion to mathematics

and engaging in group work in which they help each other and thus This increased the students' productive desire component

Conclusions

In light of the results of the research, the researcher reached the following conclusion:

The students of the first experimental group who studied the strategy of (problem tree) outperformed the students of the second experimental group who studied the strategy of (the innovative matrix), due to its positive impact on developing mathematical proficiency.

Recommendations:

1. Training teachers of mathematics on active learning strategies by involving them in training courses to create a positive atmosphere in the classroom, where the student is the center of the learning process.
2. Introduce mathematics teachers during their preparation to active learning strategies, especially the strategies of problem tree and innovation matrix, and how to prepare instructional plans in light of them.

The proposals:

In continuation of the current research, the researcher suggests the following:

1. Conducting more studies on teaching using the strategies of the problem tree and the innovative matrix in other study stages, and studying their impact on other variables such as types of thinking, the trend towards mathematics, and their use in other study subjects.
2. Conducting a study on a training program for mathematics teachers based on active learning strategies and its impact on the teaching performance of teachers and their students 'achievement and their attitude towards mathematics.

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