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**THE EFFECTIVENESS OF THE DEVELOPED NARDO MODEL IN LATERAL THINKING AMONG SECOND-YEAR INTERMEDIATE FEMALE STUDENTS IN MATHEMATICS**

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**Abstract**

The current research aims to recognize the impact of Nardo's developed model in lateral thinking in female students II average in mathematics, and the two researchers used the experimental design, as the research sample was divided into two groups, the experimental reached 42 female students, 42 female officers, and a number of equivalencies between the two research groups were made: (Previous achievement in mathematics, time age calculated by months, IQ test) In order to achieve the research objective, a lateral thinking test was prepared consisting of (25) A paragraph, and appropriate statistical analyses of the test paragraphs were applied while ascertaining their psychometric properties. The results showed a statistically significant difference between the two research groups and for the benefit of the experimental group in the dependent variable, and in the light of the research results some recommendations were reached. "The interest in creating the right atmosphere in the lesson and this will stimulate and elevate the motivation of learning in students and thus raise the level of lateral thinking" A number of suggestions were also made, including "a comparative study of Nardo's developed model with other teaching modules."

**Keywords:** Effectiveness, developed Nardo model, lateral thinking, second intermediate year, mathematics.

**Introduction**

The subject of mathematics currently lives in a current crisis. Students do not consider the subject to be meaningful or valuable. In addition to the traditional methods used by teachers while teaching the subject, they indirectly demonstrate to students the sincerity of their perception. (Al-Zubaidi, 2010:2), So students don't care about it because they find it dry and abstract. It deals with numbers, symbols, shapes, etc., and they also find it difficult to study and accept it. This in turn has affected their low attainment. (Saho, 2018: 108), and that low attainment may lead to neglect of interest in the thinking skills of all kinds they have in particular this article, Math and its attainment have found increased interest by parents and teachers only. Society associates math achievement with the ability to think of a student to solve mathematical issues, Mathematics is an important aspect of abstract thinking because it relies on computational codes. (Alauna, 2002:88), Modern trends



in teaching have focused on developing thinking and using higher levels of thinking and paid great attention to it and urged students not to be confined to lower levels of thinking. (Mohammed 2019:19). Side thinking represents a pattern of important thinking in the student's life. It emphasizes mental activity and is instrumental in acquiring knowledge and solving student problems. The process of developing it has become a task because it helps learners verify preconceptions and the lack of restriction of thinking on the traditional limits of logic. (Al Badri and Others, 2016:474), So we find many students at different educational stages need to teach lateral thinking especially higher stages, as it is an important stage for mental development and training in thinking in different ways, to generate new ideas and concepts for problem solving. (Al Masoudi and Al Maliki, 2021:276), Although the importance of lateral thinking, many studies have confirmed that there is a weakness in lateral thinking among students in mathematics, including the study (Khater and Abdulmir, 2024), in addition to the study (Al Shammari, 2017), This study showed learners' indifference to their knowledge of the correct answer to solving the mathematical issue that requires them to think deeply by using lateral thinking skills, sufficiency and dependence on conservation and superficial thinking. (Al Khazrji, 2021:463). And because of the importance of lateral thinking, many studies have emphasized the development of this kind of thinking as a study. (Mansouri, 8 201), study (Kamal, 2017) and study (Metwally, 2019), these studies also urged the need to use modern teaching methods and models that contribute to the development of students' side thinking skills. So the two researchers wanted to use one of the modern teaching models that might contribute to the development of lateral thinking. It is Nardo's developed model that develops higher thinking skills in students, It also increases the positive interaction between them, and makes them the focus of the educational process. It makes them more effective in the learning process within the classroom and invests them in achieving attainment because it is active learning where it contributes to interaction and communication within the classroom. Students interact in building solutions and deep reflection on the questions asked as it is a modern teaching model by asking questions and students think about it by answering these questions. This is one of the most important components of successful education because it is an effective means of maintaining intellectual and active excitement within the class and helping students interact with the teacher through active environment or interaction between students themselves. Questions are a means of intellectual interaction. (Khater and Abdul Emir, 2024: 596), thus identifying the problem of research by answering the following question:

What is the effectiveness of Nardo's developed model of lateral thinking in female second graders average in mathematics?

### **The Importance of Research**

Recent trends towards modern curricula specifically emphasize mathematics curricula and teaching methods. Mathematics is a fertile field to train students in sound thinking methods. One of the strategic objectives of education in developed countries is to make education for the development of thinking skills. So many educators have taught and used thinking in decision-making and problem-solving. (Al Masoudi and Al Maliki, 2021:275). Side thinking is one of the patterns of thinking that depends on devising the highest possible solutions and alternatives to problems. It can look at more than one direction in situations or problems presented and jump the steps of solving problems, that is, preserving all available information. (Know him, 2006:188189),



educators emphasize that the main goal of learning is to develop the abilities of students who are able to understand and solve problems in an effective manner consistent with the spirit of the times. (Karamanah and Abu Senna, 2022:253), and because traditional teaching methods can no longer convey the ideas and techniques of the age to students' minds, This requires the use of more technical methods, models and methods that work on the excitement and challenge of students based on their needs and in line with their abilities and aptitudes and are determined to reduce anxiety and boredom. It helps them to preserve their facts, information, concepts and invest their energies. (Abdulghafar, 2016: 4), The most prominent of these models is the Nardo model derived from the learning course. The models are an effective means of assisting teachers how to design and apply teaching on the ground. This model has special characteristics in teaching. It also has a background in educational design and unit planning. It collects experiences and information to help plan the educational process through students' participation in the classroom. (Khater and Abd al-Amir, 2024:595). The middle stage is the transition from childhood to maturity and maturity. It includes students at the beginning of adolescence. This stage is characterized by a clear and continuous growth towards maturity in aspects of personality and all its manifestations, especially mental maturity. (Zahran, 1995: 323-324), so the importance of research is:

- 1- The study is prepared in response to educational trends that emphasize the need for attention to modern teaching methods and models based on constructive theory, including the Nardo model.
- 2- The intermediate stage is the link between two important stages in the educational process.
- 3- The importance of mathematics subjects in the main subjects taught at all levels of education, and their teaching may extend beyond these stages.
- 4- This study contributes to helping math teachers and teachers to use modern teaching models that develop students' lateral thinking skills.

**Research Objective:**

The current research aims to identify the impact of Nardo's developed model of lateral thinking on female students of the second average in mathematics.

**Research Hypothesis:**

There is no statistical difference at an indicative level (0.05) between the average grades of the pilot group students (who study according to the developed Nardo model), and the grades of the control group students (who study according to the usual method) in the lateral thinking test in mathematics.

**Research Limits:**

- 1- Time limit: First semester for the academic year (2024-2025).
- 2- Spatial limit: One of the Government's morning middle schools for girls in the building district of the Directorate General of Education of Misan Governorate.
- 3- Objective limit: Chapters (I, II, III, IV) of the math book scheduled for the second grade average, i 6, for the year 2024.
- 4- Human threshold: second grade students average for the academic year (2024-2025).



**Sixth: Definition of terms:** The meaning of the terms in the research is as follows:

1- Nardo's developed model is known:

(Zair and Inside, 2015): "An integrated descriptive scheme containing the process of designing and implementing the subject or study, giving guidance and evaluating the learning in class and including a number of strategies that have a bearing on the selection of the appropriate material, teaching methods and methods, actions that stimulate motivation in the learner and the use of appropriate evaluation methods." (Zair and Inside, 2015:138)

2- Procedural definition of the NARDO model

Sequential and sequenced steps followed by the course school to clarify the lesson and work to guide students to follow these steps to find appropriate solutions to the study problem, and use the school for appropriate evaluation methods during the course of the course.

3- Lateral thinking he defines:

4- (Al-Kubaisi, 2013): "A thought characterized by research and free embarking on multiple directions and angles rather than going one way to solve a problem or clarify a particular situation, focusing on generating new ways to see things. If creativity is the way to use our minds, then lateral thinking is the best way to use our minds."

#### **Procedural Definition of Lateral Thinking**

A pattern of non-traditional thinking that uses innovative solutions where it helps students find new ways of thinking, and is measured by the grades obtained by second-grade students average in the lateral thinking test.

#### **Chapter II/Theoretical background**

##### **NARDO Developed Model**

is a model of evolution by the learning course in the United States of America and ensures students use the simulation method (Similar) with computer programs, audio-visual tools and tools to keep up with modern techniques of learning in evidentiary construction. Students learn how to solve problems by themselves. The role of the teacher is to facilitate understanding of students by appropriate problems and then allow them to self-think and diagnose the solution method. (Zaire and Others, 2017:73), The constructive theory is an effective contemporary theory in general education, In mathematics education and learning in particular for its effective and outstanding role in giving students opportunities to have a positive role in building their knowledge of themselves and to be active during the learning process rather than receiving knowledge in a ready manner. as well as emphasizing meaningful and understanding learning through the student's use of his or her knowledge and abilities to solve problems in his or her daily life. (Obeid, 2010:178), and because constructive teaching works to build an active educational environment and defies students' thoughts, it has received considerable global attention as it has been applied in teaching and learning, so many models and strategies based on constructive theory have emerged, including the Nardo model. (Najdi and others, 2003:404)

#### **Steps to teach according to Nardo's developed model:**

1- **Preface:** It creates appropriate conditions as well as the students' minds and links the subjects of the previous course to the current one.



2- **Raise the problem:** The teacher raises the issue for students and the students work to install it in their books.

3- **Self-reflection:** Students think about the perfect and appropriate solution to their problem and the teacher follows up on the solutions.

4- **Facilitation of understanding:** Explains the teacher and gives close solutions to students.

5- **Exploration:** The teacher takes new questions in the light of old questions but in another way.

6- **Reorganization of knowledge information:** The teacher arranges the information according to the rule and available requirements.

(Allawi & Ahmed, 2024:273)

### **Side Thinking**

It is a term associated with Edward De bono. He was the first to use it in 1967, referring to the thinking in which an individual perceives the problem from different angles. This thinking surrounds various other perspectives. It may even be based on what is Malov or far away from thinking. The names of lateral thinking have been multiplied according to the vision of Eduard de Bono and educational and psychological scientists. (Overview thinking, lateral thinking, out-of-the-box thinking, renewed thinking, serious creativity). (Mohammed, 2019:576), lateral thinking is known as one of the types of thinking that depends on devising the highest possible number of solutions that a student seeks when exposed to a sporting situation. (Al-Haidari, 2017:216)

### **Side Thinking Skills**

Side thinking consists of five skills: (New Realization Generation Skill, New Conceptual Generation Skill, New Ideas Generation Skill, New Alternatives Generation Skill, New Innovation Generation Skill).

(Al-Kubaisi, 2013:131)

### **Previous studies**

#### **1- Previous study on Nardo's developed model**

Study (Khater and Abdul Emir, 2024): This study aimed at "knowing the impact of the Nardo model on the achievement of middle second grade students in the subject of Arabic grammar", the researcher chose the experimental design, and the study included two experimental and control groups where each group of (32) Students, the researcher used the attainment test as a tool for research that is from (37) Paragraph, the researcher also used a number of statistical means to analyze the results and procedures of the research, and the search for the superiority of the students of the experimental group who studied the subject of Arabic grammar in the Nardo model over the students of the control group who studied the same subject in the usual way.

#### **2- Previous study on lateral thinking**

Study (Al Saadi, 2017): This study aimed to "reveal the effectiveness of the Eddy and Shire model in the achievement of mathematics in students in the second grade medium, and the effectiveness of the Adi and Shire model in the lateral thinking in students in the second grade medium," the researcher selected the experimental design, and the study included two groups consisting of the experimental group of (34) students and control group (33) students, and the researcher used a



number of statistical means, and also prepared two tools for research that are of (20) A paragraph for each, namely the collectible test and the lateral thinking test, resulted in the search for a statistical difference in favour of the group studying according to the Eddie and Shire model and had an effect on the collectibility test and lateral thinking.

### Chapter III/Research curriculum and procedures

**First: the pilot curriculum:** the two researchers followed the pilot curriculum to achieve the current study's objective and hypothesis.

#### Second: Experimental design

The pilot design was adopted for two equal groups with a dimensional test, which included a pilot group that was studied according to the NARDO model, while the teaching was conducted according to the usual method of the control group, as shown in Table 1.

**Table (1) Experimental design for research**

Post test	Dependent variable	Independent variable	Parity of the two groups	The group	T
Side thinking test	Side thinking	Nardo Model	- Previous achievement in mathematics	<b>Experimental</b>	1
		Normal way	- Age calculated by months - IQ test	<b>Control</b>	2

#### Third: The research community and its appointment

**1- Research society:** The current research community is represented by middle-grade second-graders in the morning middle and high schools of the Directorate General of Misan Education for the academic year (2024-2025).

**2- Sample research:** The intentional method was used in selecting the sample research. The Middle School of the Toby Tree for Girls was selected from the schools of the Directorate of Misan Governorate, for several reasons, including:

- 1- The school administration and teachers cooperate with the researchers.
- 2- Some female students come from an almost homogeneous cultural and social level.
- 3- The school is close to the researchers' residence.
- 4- The availability of four divisions for the second grade average, of which this school was randomly selected for the division (b) to become the experimental group studied according to the NARDO model, where its number reached (45), and Division (d) to be the control group to be studied in the usual manner and reached Following the statistical exclusion of female pupils, the number of whom was 5, the number of female pupils (84) Students(42) Students per group, as shown in Table 2.

**Table (2) Distribution of divisions to groups before and after exclusion**

Number of female students After exclusion	Number of female students who didn't succeed	Number of female students Before exclusion	Division	Group
42	3	45	B	Experimental
42	2	44	D	Control
84	5	89	Total	

**Third: seizure procedures**

The internal integrity of the experimental design (parity of the two research groups): prior to the commencement of actual teaching, the students' parity of the two research groups was conducted in a number of variables that may affect the integrity of the experiment and the results of the research, as follows:

1- Previous achievement in mathematics: This variable refers to the final math average of the two research groups for the previous academic year (2023-2024). The students' grades were obtained from the individual school records of the students. After statistically processing the grades, the two research samples were found to be equivalent in this variable. Table 3 shows this.

2- The age of time is calculated by months: The age of female students is calculated by months until the day of the start of the experiment (22/9/2024). The age is calculated after obtaining their age from the school records. The two groups are found to be equal in this variable, as in Table 3.

3- IQ test: Raven's test of successive matrices is a rationed test on the local environment, it is characterized by a degree of honesty and stability after being applied to it, it is also an easy test for being non-verbal and contains (60) A paragraph of non-verbal fees, fits ages of (5-65) years, and after applying the tests to the search samples before the start of the experiment and after statistically processing the data, the two groups were found to be equal in the IQ variable, and table No. (3) which shows this.

**Table (3) Research groups' equivalencies**

Statistical significance	T value		Free degree	Standard deviation	Arithmetic average	Sample size	Group	Parity variables
	Tabular	Calculated						
No Function	1,99	0,87	82	9,66	73,07	42	Experimental	Previous achievement
				8,71	74,83	42	Control	
	1,99	0,97	882	3,10	140,14	42	Experimental	Chronological age
				2,72	139,52	42	Control	
	1,99	0,55	82	5,03	49,80	42	Experimental	IQ test
				5,20	50,42	42	Control	

**B. External safety of experimental design (control of extraneous changes):** to provide external safety conditions and to adjust extraneous variables that are thought to affect the experiment Some variables that are outside the specialization of female students are adjusted: (measurement tools, subject teacher, sample selection, study subject, duration of experiment, experimental breakdown, class distribution, confidentiality of experiment)



#### 4- Search requirements: One of the research requirements is to do the following:

1- Determination of the scientific subject: The scientific subject which will be studied during the duration of the experiment is the classes (first, second, third, fourth) of the scheduled mathematics book, which was studied during the first semester for students of the second average for the academic year (2024-2025).

2- Formulation of behavioral purposes: One of the first steps to be taken when preparing the test as well as the requirements for preparing the study plans is to identify behavioral purposes that must be easy, clear and easy to measure, so the two researchers have derived a number of behavioral goals for math subjects and have reached (104) behavioral purpose according to Bloom's cognitive classification of levels (knowledge, understanding, application) They were presented to a group of specialists in mathematics teaching methods and subject teachers to determine their relevance. (104) Behavioral purpose distributed to chapters (I, II, III, IV), (29) behavioral purpose of knowledge and (41) behavioral purpose of understanding and (34) behavioral purpose of application, as in Table No. (4) Agencies:

**Table (4) shows the distribution of behavioral objectives**

Total	Behavioral purposes in the field of cognition			Semester Content
	Applying	Understanding	Knowledge	
18	9	6	3	First
31	10	12	9	Second
30	8	13	9	Third
25	7	10	8	Fourth
104	34	41	29	Total

3- **Preparation of study plans:** A series of teaching plans for the research groups (experimental and control), a model of which was presented to a group of arbitrators, was prepared to benefit from their experiences and suggestions in their validity. It was amended as they indicated and proposed, and it became final.

#### Sixth: Search tool:

The objective and hypothesis of the research requires the preparation of a lateral thinking test for the students of the research sample. The presentation of the procedures followed in the preparation of this test comes:

1- Setting the test target

The lateral thinking test aims to measure the level of lateral thinking among female students of the two research groups in the subject of mathematics after their teaching the classes (first, second, third and fourth) of the math book of the second grade average.

2- Identification of the number of subparagraphs of the lateral thinking test: after consultation with a group of teaching experts, some of the competent arbitrators drafted the subparagraphs, reaching (25) a paragraph of the multiple choice type, where each skill included five paragraphs.

3- Preparation of test instructions: The instructions for the lateral thinking test in the current research are formulated clearly and accurately. The instructions include how to answer, where to





answer and read the paragraphs well, not to leave any paragraph unanswered, and not to choose more than one answer to the single paragraph. The instructions for correction of the test also included the distribution of grades, namely to obtain a score (1) Correct answer for each test paragraph, plus score (0) for the wrong, empty or more than one answer per test paragraph.

4- Test sincerity:

"The measure shall be valid for measuring the phenomenon or trait to be measured". (Al-Badawi, 2007:345). To ensure the veracity of the test, two types of honesty were based on the factual honesty and sincerity of internal consistency, as follows:

**1- Apparent honesty:**

The preliminary lateral thinking test, consisting of a number of thematic multiple selection-type paragraphs, is presented to a number of experts in mathematics teaching methods for their views and observations on the clarity and drafting of the paragraphs and any other observations.

**2- Sincerity of internal consistency:** One of the procedural methods by which it is possible to verify the sincerity of the construction of a measure of what is internal truthfulness, and to ensure internal truthfulness, researchers apply a correlation transaction to judge or delete the paragraph's survival. (Spring, 2013:118), to verify the sincerity of the internal consistency of the test was found:

**A- The paragraph's relationship with the area:**

To find a correlation of each paragraph to its own field, the Pearson correlation equation was applied and the correlation rates ranged from 0.867 to 0.945, which is greater than the tabular value of Pearson's correlation factor at 0.05, which was 0.217.

**B- The field's relationship to the overall degree of testing:**

Correlation rates ranged from 0.734 to 0.889 and are higher than Pearson's tabular coefficient value, indicating that the correlation is high between the field and the overall degree of testing.

**C- The paragraph's relationship to the overall degree:**

The correlation rates between the subparagraph and the total test score ranged from 0.785 to 0.909, where they represent a high correlation, i.e. all the paragraphs are associated with the test, they represent the trait to be tested.

**3- Exploratory application of the test:**

**A- Application of the first survey:**

To ascertain the clarity of the paragraphs of the lateral thinking test, its instructions and the time taken to answer it, the test was applied to an initial reconnaissance sample of 45 students selected at random from (Middle Amna Bint Wehb) on Tuesday.

(17/12/2024), the test paragraphs and instructions were found to be clear, and the average time taken to answer was calculated at 40 minutes.

**B- Second exploratory application:**

For the purpose of statistically analyzing the paragraphs of the lateral thinking test, the test was applied on Monday, 23/12/2024, to a second survey sample of 90 female students (average boys'



mother for girls). All female students reached one week before the test date, and after the responses to the survey sample were corrected, the grades were arranged downward, and the two groups were then analysed:

#### **1- The difficulty factor of the paragraphs:**

Correct answers were calculated and the difficulty factor equation applied for each test paragraph ranging from (0.39 - 0.74), and the paragraphs are acceptable if they range from (20% - 80%). (Al-Kubaisi: 2007:170)

#### **2- Factors of discrimination of paragraphs**

Through the use of a statistical formula for the substantive paragraphs, discriminatory factors were calculated for the test paragraphs, and were found to range from 0.36 to 0.77, which means that the paragraph is acceptable in terms of discriminatory capacity.

#### **3- Effectiveness of wrong alternatives:**

Good false alternatives are chosen by the number of respondents in the lower group above the respondents in the upper group. (Safety, 1995:235), so the results of this equation must be negative so that alternatives are effective. (Abdul Rahman and Zankanah, 2007:113), all alternatives to lateral thinking test paragraphs were found to be effective, as transactions for the effectiveness of all alternatives were negative, thus being kept unchanged.

#### **4- Test stability**

The consistency of the test is defined as "a test that delivers close results or the results themselves if applied more than once in similar circumstances." (Hariri, 2008:144), test stability was calculated by retest method. The test was applied to the reconnaissance sample First and two weeks later the test was reapplied to the same sample. The two researchers calculated the correlation coefficient between the first and second test application using the Pearson correlation coefficient.

#### **Final Lateral Thinking Test**

On Monday (30/12/2024), the final test was applied to the search samples (control and experimental), where the test consisted of (25) a multiple selection-type paragraph.

#### **Seventh: Statistical means:**

Results are analysed and processed statistically using Microsoft Excel and SPSS statistical software. A number of appropriate statistical methods are used for research as follows: (t-test) for two separate groups, the difficulty coefficient of the two test paragraphs, the distinction coefficient of the two test paragraphs, the effectiveness of the wrong alternatives, the Pearson correlation coefficient, the ETA size equation)



## Chapter IV/Presentation and interpretation of results

### First: view the results

#### Results of zero hypothesis

The hypothesis reads as follows: "There is no statistically significant difference at the indicative level (0.05) Among the average grades of the pilot group students (who study according to the NARDO developer model) And the grades of the control group students (who study according to the usual method) in the lateral thinking test in mathematics) After statistically analysed the data, the average scores of female students in the control group and the experimental group as shown in Table No. 5 of the agencies ":

**Table 5 test results (t-test) for my Sample students research groups in lateral thinking test.**

Statistical significance	T test		Free degree	Standard deviation	Average arithmetic	Sample size	Group
	Tabular	Calculated					
Function	1,99	7,29	82	1,46	22,57	42	Experimental
				2,34	19,45	42	Group

To determine the statistical difference between the two research groups, the T test of two separate samples was applied. The calculated T value (7,29) was found to be greater than the tabular T value (1,99). This means that there is a statistically significant difference at an indicative level (0.05) and to a degree of freedom (82) in favor of the pilot group students.

- The size of the impact of Nardo's developer model in lateral thinking

To reveal the size of Nardo's model developed in lateral thinking, the ETA square equation has been applied to calculate the impact size between two separate samples, as shown in Table No. (6) below:

Table (6) ETA box value for impact size

ETA square	Calculated T value
0,393	7,29

From the above table it is clear to us that the value of the Eta square is (0.393), which indicates a large impact size, as the ETA square value indicates a large impact size if it reaches (0.14 more).

#### Discussion and interpretation of results:

Research results showed outperformance of the experimental group that was studied by the Nardo developed model in the lateral thinking test, The researchers attribute this excellence to the fact that the use of the developed Nardo model contributed to the development of lateral thinking skills by helping female students discuss and seek solutions to problems in creative ways. Where the problem is seen from multiple quarters and from non-traditional patterns, It also helped to motivate female students by searching for information and getting the right calendar during the lesson. In addition, it has made female students the focus of the educational process through their active participation in the lesson and the work of analysing information in a sequential and sequential manner and applying appropriate solutions.

**Conclusions:**

1- In the light of the research's findings, the following can be concluded:

The effectiveness of Nardo's model of lateral thinking in mathematics in female students in the second grade.

2- Modern models, such as Nardo's developer model, have contributed to the revitalization of middle second graders and the organization and development of key ideas for them.

3- This model provided an opportunity to make female students the focus of the educational process and to make the teacher in the role of supervisor, evaluator and guider of the educational process by providing an opportunity for female students to think, implement and discuss and then find appropriate solutions to the problem of the lesson.

**Recommendations:**

In the light of the research findings, a number of recommendations can be made:

1- Work on the establishment of training courses for teachers of mathematics for the middle stage so that they have the ability to teach students the skills of lateral thinking and development.

2- The inclusion of programmes for the preparation of students in faculties of education, especially in mathematics departments at all levels of study, which develop modern models and are interested in side thinking skills.

3- Care to create the right atmosphere in the lesson. This will stimulate the motivation of learning and raise it in students and thus raise the level of lateral thinking.

**Proposals:**

A number of proposals can be made in the light of the results of the research:

1- Further studies using the NARDO model developed in different classes and phases.

2- Further empirical studies that reveal the impact of Nardo's developed model in other study variables (such as mathematical thinking, motivation, inclination,... etc.).

3- A comparative study of Nardo's developed model with other teaching models.

**References**

1. Al-Badri, Usaida Yassin Taha Warun (2016): Lateral Thinking in PrepCoral Students and Its Relationship to Motivation towards Mathematics, Tikrit University Journal of Humanities, vol. 23, Issue 9. p. 472-506.
2. Al-Badawi, Muhammad Ali (2007): Methods and Methods of Social Research, 2, Alexandria Lake Press.
3. Hariri, Rafda (2008): Educational Calendar, Curriculum House for Dissemination and Distribution, Oman.
4. Haidari, supporter of Kazim (2017): The effect of the systemic entrance model in teaching mathematics in lateral thinking in students of scientific fourth. Educational Studies, Volume 10, Issue 40, p. 213-230.
5. Khater, Ahmed Khadir and Abd al-Amir, Zina (2024): The impact of the Nardo model on the achievement of students in the second grade average in the subject of Arabic grammar, Journal of the Faculty of Basic Education - Mostaseriya University, Issue 30/p. 594-609



6. Khazrji, Nidal Taha Khalifa (2021): Impact of obstetric learning strategy on lateral thinking and cognitive motivation of mathematics in middle school students, *Journal of Faculty of Basic Education*, vol. 27, issue 113, p. 463-482.
7. Rabi, Mohammed Shehata (2013): *Standards of Personality. 3*, Al-Masirah Publishing and Distribution House, Amman.
8. Zair, Saad Ali and akhil sama Turkey : *Modern Trends in Arabic Language Teaching*, The Methodological Publishing House, Oman.
9. Zair and Others, Ali Saad (2017): *Contemporary Educational Encyclopedia*, t2, Safa Publishing House, Oman.
10. Zubaidi. Ahmad Mohammed (2010): *The impact of the previous questions on the acquisition of engineering concepts in students of the middle grades (unpublished master's thesis)*, Baghdad University, Faculty of Education, Iraq.
11. Zahran, Hamid Abdelsalam (1995): *Developmental psychology "Childhood and adolescence"*, p. 5, Cairo Bookworld, Egypt.
12. Salama, Hassan Ali (1995): *Methods of teaching mathematics between theory and practice*, Dawn Publishing House, Cairo.
13. Saho, sohad Abdulnabi Salman (2018): *The impact of teaching mathematics according to the I, P.A.G.A. model on evidentiary thinking and achievement among third-grade middle students. Journal of Faculty of Education for Fundamentals., vol. 24, No. 102, p. 107-132.*
14. Abdul Haq, Hassan Mohammed Hassan (2023) *Developing Creative Thinking Skills in Mathematics for Middle School Students*, Penha Journal of Humanities, Issue 2 Part 3. p. 219-242.
15. Abdul Ghafar, noha Mahmoud Mohammed (2016): *Lateral thinking and its relationship to the ability to solve problems in university students*, *Journal of Scientific Research in Education*, Ain Shams University, Issue 17. C 1, p. 1-16.
16. Abdulrahman, Anwar Hussein wazankanah, Adnan Haqqi Shihab (2007): *methodological patterns and their applications in the humanities and applied sciences*, Dar al-Hakma, al-Wefaq Company, Baghdad.
17. Obeid, William (2010): *Teaching mathematics to all children in light of the requirements of standards and culture of thinking*, 2, March for publishing, distribution and printing, Oman, Jordan,
18. Arafah, Mahmoud Salah al-Din (2006): *Thinking without Borders (Contemporary Insights in the Teaching and Learning of Thinking)*, Dar Alam al-Bookshop, Helwan University, Egypt.
19. Al-Kubaisi and Hip (2007): *Measurement, Evaluation, Renovations and Discussions*, Greer Publishing house, Oishers, Oman.
19. allowance. Shafiq (2002): *Training sixth students on some problem-solving strategies and its impact on verbal sports issues*, *Journal of the Federation of Arab Universities for Education and Psychology*, Syria, p. 87-104.
20. Al Kubaisi, AbdulWahid Hamid Thammer (2013): *Lateral Thinking (Workouts and Practical Applications)*, Debono Think Education Center, Oman.
21. Al-Kubaisi, Wahib (2007): *measurement and calendar renovations and discussions*, i 1, Greer Publishing and Distribution House, Oman.



22. Karamanah, Mohammed Saleh and Abu Seneh, owdah Abdul Jawad (2022): The impact of the use of six thinking caps in achievement and trends towards mathematics for basic sixth grade students in Jordan. *Studies of pedagogical sciences*, vol. 47, No. 3, p.252-264.
23. Mohammed, Fayez Mohammed Mansour (2019): The use of cognitive apprenticeship strategy in teaching mathematics to encompass lateral thinking skills and unravel math anxiety among middle grade pupils. *Journal of Educational and Social Studies*, vol. 27, No. 25, J2, p. 13-74
24. Mohammed, Mohammed Abbas (2019): Lateral thinking and its relationship with attention control among university students. *Center for Psychological Research*, Volume 30, Issue 3, p. 563-602.
25. Al Masoudi, Zahur bint Adil bin Farajallah and Al Maliki, Abdul Malik bin Mesfar bin Hassan (2021): The extent to which female secondary mathematics teachers use the skill to generate new realizations is one of the skills of lateral thinking in Saudi Arabia. *Scientific Journal of Scientific Publishing*, No. 27, p. 274-291
26. Al-Najdi, Ahmed and Others (2005): *Recent Trends in Science Education in the Light of Global Standards and the Development of Thinking and Constructive Theory*, 1, Dar Al-Arabi Thought, Cairo, Egypt.