

"The effectiveness of the mantle of the expert strategy in probe thinking among fourth-grade scientific level students Biology."

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Abstract

The research aims to identify the effectiveness of the mantle of the expert strategy in investigating the thinking of the fourth-grade students of biology, where the research sample included two groups, one of them is the experimental group and the number of its students is (33). And the other student represents the control group and the number of students is (34) male and female students by random drawing method. The researchers selected (Almashrue Preparatory School for Boys) from the research community represented by the secondary and middle schools affiliated with it. Babel Education Directorate / Kutha District. The researchers selected the experimental design to control the research variables, and before starting the experiment the researchers rewarded the two research groups. For the purpose of obtaining accurate results with the following variables: (chronological age obtained in months, previous achievement of students, and Daniels test of intelligence), and after making parity between the two research groups, the researchers prepared the application requirements of plans, objectives and tests for the two research groups, and after completing the application of the experiment, the researchers applied their research tool on the two research groups, as the researchers obtained data for the two research groups, as these data were performed statistically by means of a t-test for two independent samples.

Keywords: The mantle of the expert strategy, probing thinking, fourth-grade students of science, biology.

INTRODUCTION

First : The research problem:

Biology is still captive to traditional methods that emphasize theoretical aspects, preservation and indoctrination rather than thinking. Most of the methods used in teaching do not develop probing thinking, so the researcher thought to experiment with a modern teaching strategy is (the strategy of the mantle of the expert), which may help students increase their thinking probing the subject of biology. The results of many educational studies and research in the field of probing thinking as a study (Khazal ,

2021) and (Al-Issawi , 2017) indicated the existence of a low level of probing thinking among students and at all stages of study and their adoption of low levels of thinking. These studies concluded that traditional teaching methods that pay attention to scientific knowledge do not arise from their use of signs of behavioral changes that have a clear significance with regard to thinking skills and different patterns and the development of students' ability to practice probing thinking in the classroom or outside and in addressing the problems facing them . Hence the basic problem of research, where there is an urgent

need to educate an educated generation that depends on integrated thinking skills through the development of students' minds and their probing thinking .

The research problem is thus the answer to the following question:

(What is the effectiveness of the mantle of the expert strategy in probing thinking among fourth-grade scientific students With biology?

Second: The importance of research:

Recently, many modern strategies and methods of teaching have emerged that take care of the student and place him/her at the center of the educational process instead of the content of the subject or the teacher himself/herself. Thus, the educational process has come to emphasize the student's learning by himself/herself through active participation instead of relying on the teacher (Samaritan and its benefit, 2018 : 79), as well as stressing on helping the teacher to successfully manage the educational situation and help students to think about several aspects and in all directions when they are exposed to a problem to reach different answers by asking questions and providing them with the opportunity to express their opinion in an atmosphere of freedom and work to send ideas without interruption (Hamdan, 2018 : 22)

It is known that there are many modern teaching strategies, but there is not always an ideal strategy, as these strategies differ according to the goals to be achieved, which were developed for them, as they varied to suit the education of individuals and groups to match the conditions and potentials of the educational process, as well as with the ages of learners and their mental and physical abilities and in the prevailing conditions and potentials in the school community (De Bono, 1997:372))

The learner under the mantle of the expert strategy participates with the learners and has different roles through drama, imagination, embodiment and representation of the experts' location, which leads them to cover the topics well, study them, identify the most important questions that are asked, discuss them and

involve them in the responsibilities of the task in an interesting and enjoyable way within the educational position in light of the teacher's guidance (Heathcott,2013: 59). The mantle of the expert strategy is characterized by being able to employ a variety of topics in the curriculum in an integrative manner, including exploration, investigation and asking questions so that the learner can reach the maximum His learning abilities, which enable the learner to face problems energetically, identify and solve them (Sayers, 2011) and he (Alyan, 2010) sees that this great interest in the strategy of the mantle of the expert came as a result of what he achieved from employing it in the classroom educational position of the learners, as it expands their learning through experience and direct experience, instead of the method of negative indoctrination, where teaching shifted to the horizons of research, investigation and discovery, and the development of scientific trends, such as: curiosity, search for the causes of phenomena, and the ability to self-learn, as well as providing the learner with positive trends towards the environment, and preserving it maintenance, and improvement, and this helps to solve the problems he faces inside or outside the environment, and the impact of the the mantle of the expert strategy shifts to other educational situations (Alyan,2010: 63). The theorists in their various fields worked hard to develop strategies that help the student to develop his thinking by all available and possible means regardless of the specialization he is studying (Abu Jada and Muhammad, 2007: 25).

In the sense that the development of students' thinking has become one of the main objectives of the educational process, and as long as the goal is of such importance, those concerned and those involved in the teaching process, including teachers and university professors, must pay attention and focus on teaching thinking and its skills in order to form a student who is a thinker and creative who is the best nucleus for building his homeland (Barakawi, 2014 :13), in order to teach thinking skills in all its forms in general, and probing thinking skills in particular. Probing thinking is an advanced mental process, which can be

employed in a variety of mental fields, and enables the student to benefit from the content of the study material, and develop his knowledge, experiences and ideas, to be able to generate new ideas and subject them to analysis and criticism in order to improve his performance to reach advanced stages of creativity (Al-Asra, 2011: 486-487).

Third: The goal of the research and its hypothesis:

The research aims to identify the effectiveness of the mantle of the expert strategy in probing thinking among fourth grade scientific students in biology, and to achieve the goal of the research, the researchers formulated the following zero hypothesis: (There is no statistically significant difference at the level of significance (0.05) between the average scores of the experimental group students who will study biology according to the mantle of the expert strategy and the average scores of the control group students who will study the same subject according to the usual method in testing probing thinking prepared for the purposes of this research).

Fourth: The limits of the research: Identifies the current research as:

1. Spatial boundaries: preparatory and secondary schools of the Babylon Education Directorate/ Kotha District.
2. Temporal Limits: The first semester of the academic year (2021-2022).
3. Human boundaries: fourth grade scientific students.
4. Cognitive Limits: The Book of Biology for the Fourth Grade of Science.

Fifth: Definition of terms:

Second: The mantle of the expert strategy defined it:Awadallah (2013) as: "An approach based on the interesting drama in the learning and teaching process, and the basic idea includes that they learn by assuming special responsibilities" (Awadallah, 2013 :5).

Probing thinking is defined by him (Al-Aziz, 2013) as: "Thinking that requires complex and

sophisticated mental processes such as attention, perception and organization, reminding stored experiences and linking the old with the new ones, coding the learner's experience and recording it in the brain, so absorbing it, adding it to the personal character, integrating it into the learner's cognitive structure, storing it, calling it when needed, or transferring it when facing new experiences" (Al-Aziz, 2013, 122).

Procedurally, the researcher defines it as: It is a higher cognitive mental process that is based on the outcome of the processes that fourth grade scientific students have acquired, such as recall, abstraction, generalization, discrimination, comparison and reasoning, with the aim of improving their performance in the subject of biology and is measured through responding to the probing thought test prepared for this purpose .

Theoretical framework and previous studies

The first axis: Theoretical framework:

Active learning: Active learning is a pattern of teaching that depends on self-activity and the positive participation of the student through scientific activities and processes such as observation, hypothesis development, measurement, data reading and conclusion in order to reach the required information by himself, and under the supervision of the teacher, his guidance and evaluation. Studies indicate that active learning makes the student able to acquire skills and knowledge by himself (Watson ,S.B., 1991:386).

Active Learning Strategies: Active learning strategies are many and branching and the two researchers will mention (the mantle of the expert strategy) as being related to the research topic.

The strategy of the mantle of the expert: The use of the policy of indoctrination is a barrier between the student and his creativity, and those in charge of the educational process must free the student from these restrictions to find a generation capable of facing the problems of

life. Educators confirm that the teaching of curricula is no longer traditionally transferring knowledge to the student, preserving and retrieving it with a process that is concerned with thinking and activating the student's previous knowledge, and building, acquiring, understanding, retaining and using knowledge, from the perspective of the student's mental, emotional and skill development, and the integration of his personality in its various aspects, and in the context of social narrative (Zeitoun, 2007 :42), and despite the agreement of educators on the importance of this, But there is no agreement among them on how to develop these skills, many strategies have emerged to develop skills, and among these strategies is the mantle of the expert strategy of the British expert Dorothy Heathcote, which aims to move the learner from his place to the adjacent growth area, and this strategy is an integrated approach that works to equip students with the skill of cognitive interconnection, and sees any event in front of him in multiple aspects, instead of that the mantle of the expert strategy emphasizes the interconnectedness of the types of knowledge (Saeed,2016: 10) Dorothy Heathcote, the owner of the concept of the mantle of the expert It is a strategy based on Drama in the teaching-learning process, and the basic idea is for students to learn together to produce as if they were a group of experts who discovered their learning and taking responsibility (Jarrah, 2003 : 52).

Probing thinking: Probing thinking is defined as one of the highest thinking skills, which includes the use of higher and complex mental processes, which in turn help us to interpret, analyze and address information to answer a question or solve a problem that cannot be solved using minimal thinking skills, making judgments and expressing opinions, and using multiple simulations to reach the result (Gibran , 2013 : 12).

Probing thinking enjoys a high level of mental processes such as imagining, remembering, reasoning, inference and extrapolation, and mental content is what the mind empties of experiences and information , it is not like simple thinking or superficial thinking that

does not require a complex level of mental processes, or a deep mental level of knowledge , and it is not limited to a level of simple mental processes such as attention and perception only, but requires complex mental processes to close its intellectual circle, and to develop the immature idea into an absorbed, organized and mature experience that the individual can do by practicing it in subsequent life situations, and that the increase in the retention time of experience is due to the increase in the time taken to interact with it. (Al-Shammari and Ihsan, 2018 : 120).

The second axis: Previous studies:

By exposing the researcher to the educational literature, and after conducting a survey of scientific databases and research engines specialized in Arab and foreign studies, and after correspondence with a number of Iraqi and Arab universities, he found that there is a small number of previous studies that dealt with the strategy of the mantle of the expert in the subject of biology, the researcher used studies in different subjects because of their suitability for the procedures and methodology of this study, and these studies were arranged as follows:

Phili Study 2020: The impact of the strategies of the mantle of the expert and the problem tree on the achievement of geography and the development of creative thinking among fifth grade literary students.

Research Methodology and Procedures

First: Experimental design: The selection of experimental design is one of the important things carried out by the researcher. It helps the researcher in determining the factors surrounding the experiment so that the researcher can know what is happening and what he is doing. Since the current research includes three variables: one is an independent variable represented by the strategy of the mantle of the expert , and the dependent variable (probing thinking), the researchers have chosen the experimental design with partial adjustment as shown in Figure (1).

group	The independent variable	Dependent variable	Search Equipment
Experimental group	The mantle of the expert Strategy	Reasoning	Probing Reasoning Test
Control group	The usual way.		

Figure (1) : *Experimental Design*

Second: The research community and its sample:

1. The research community: The current research community represents the secondary and preparatory schools for boys only, which are affiliated with the Directorate of Babylon

Education/Kotha District. The researchers visited the General Directorate of Babylon Education/Kotha District to identify preparatory and secondary schools for boys that have two or more divisions, which are located in Kotha District, as they numbered (10) schools, and Table (1) shows this.

Table (1) *Preparatory and secondary schools for boys that have two or more divisions for the fourth scientific grade/Kotha District in Babylon Governorate for the academic year (2021-2022)*

No .	School Name	Gender	Number of students in the fourth scientific grade	Number of divisions for the fourth grade of science	POSITION
1	Baghdad Secondary School	Males	65	2	Al rissala Neighborhood
2	Sons of the Nation High School	Males	67	2	Al-Zubaidi Village
3	Al-Falah High School	Males	85	2	Al-Zubaidi Village
4	Al Hilal Secondary School	Males	68	2	Al-Baqer District
5	Nahrawan High School	Males	43	2	Al Rashayed Village
6	Al ibtikar Prep	Males	134	3	Al-Baqer District
7	Kotha Junior High	Males	103	3	Imam Ali District (P)
8	Al-Haidari Prep	Males	110	3	Al-Haidari Village
9	Al mashro Preparation	Males	107	3	Al-Askari neighborhood

2. The research sample: The research sample is divided into:

1) Sample schools: The two researchers (project preparatory for boys) in Kotha district, Babylon governorate, intentionally chose to conduct their research for the following reasons: (The principal and owners of the school cooperated with the researcher in completing the experiment in support of the educational process and keen to know the results, and the school's proximity to the researcher's location, as the location of the researcher and the school are located in one geographical area, which makes it easier for him to reach the school and prepare the trial procedures.

2) Sample of students: After the researcher (the project preparatory for boys) chose to apply the experiment, the researcher visited the selected school, and found it contains two divisions, and the number of students in the two divisions reached (70) students with (35) students in Division (A) and (35) students in Division (B), the researcher chose a division (B) in a random way to represent the experimental group that will study the subject of biology according to the strategy of the expert's mantle, and in the same way he chose a division (A) to represent the control group that will study the same subject in the usual way, and the failed students of (3) students were excluded because they have experience in the subject, and thus they affect

the results of the research and the exclusion was statistical as shown in Table (2).

Table (2): *Distribution of the research sample to the experimental and control group before and after exclusion*

No.	group	Number of students before exclusion	Number of students excluded	Number of students after exclusion
1	Experimental group	35	2	33
2	Control group	35	1	34
Total		70	3	67

Third: The equivalence of the two research groups: The researchers were keen to conduct the equivalence with the following variables: (the students' chronological age calculated in

months, previous academic achievement of students, previous information, intelligence test), and the following is a table showing the equivalencies above:

Table (3): *The arithmetic mean and standard deviation and the calculated and tabular values of the variable (chronological age, previous achievement of students, intelligence test) for the two research groups*

Variable	group	Number	arithmetic mean	standard deviation	Variance	Standard error	Freedom degree	Lost Values		sig
								Calculated	tabular	
Chronological age	Experimental group	33	171.486	12.258	150.258	2.072	68	0.997	2 000	Statistically nonfunctional
	Control group	34	174.934	16.451	270.635	2.781				
Student Past Achievement	Experimental group	33	54.757	16.916	286.151	2.859		0.189		
	Control group	34	53.885	15.657	245.141	2.646				
Intelligence test	Experimental group	33	27.771	7.814	61.058	1.321			0.758	
	Control group	34	29.143	7.277	52.954	1.230				

Fourth: Control of extraneous variables: The two researchers controlled all extraneous variables that affect the experiment, including (sample members, physical factors, duration of the experiment, scientific material, research requirements, and study classes: The two

research groups studied according to the prescribed quotas for biology by two quotas per division per week, and according to the distribution of the school administration quotas shown in the following table).

Table (4): *Weekly lessons for students of two research groups*

AIYaum	The two research groups	Class time	Class time.
Sunday	Control group	(2:30-3:10)	PM
	Experimental group	4:45 - 5:25	
Tue	Experimental	1:00 - 1:40	

	group		
	Control group	1:45 - 2:25	

Fifth: Research requirements: Before applying the experiment, it is necessary to prepare the basic requirements of the experiment, which are:

1. Determining the scientific material: The researchers identified the scientific material that will be taught to the students of the two research groups during the duration of the experiment, and the scientific material included two units of the Biology Book for the fourth scientific grade, 1st grade, 2019, written by Muhammad Qasim Aziz and others, and Table (5) shows this:

Table (5): *Topics to be taught during the trial period*

No.	Terminations	Class Title
1	The first	Classification of living things
2	Second	Ecology and Ecology
3	The third	Food Chain and Element Cycle in Nature
4	Five	Factors affecting the environment
5	Six	Adaptation of the animal to the environment

Formulating behavioral goals: The two researchers formulated (100) behavioral goals based on the general goals, and the content of the material to be studied in the experiment, distributed among the first three levels in Bloom's classification: (remembering, understanding, applying).

Preparing teaching plans: The researchers prepared teaching plans for the topics of biology that will be taught during the experiment, in light of the content of the planned book and the behavioral goals formulated, and according to the strategy of the mantle of the expert for the students of the experimental group, and according to the normal method for the students of the control group.

Sixth: The research tool: The research tool is the test of probing thinking. The following is a detailed preparation of the tool: (Preparing the test of probing thinking): The researcher

prepared a test of probing thinking according to the following steps:

Identifying the goal of the test: This test aims to find out the probing thinking of the research sample, which is the fourth grade scientific students.

Determining the skills of probing thinking: I identified the skills dealt with by the probing test, which are suitable for fourth grade scientific students, so the skills included in the test were (census skill and remembering, the skill of grouping, the skill of identifying key relationships, the skill of discovering new relationships, the skill of reaching inferences, the skill of predicting results and formulating hypotheses, the skill of explaining predictions and supporting hypotheses, the skill of verifying and verifying predictions or hypotheses (experimentation or testing) .

Formulation of test items: A probing reflection test was prepared consisting of (30) test items of a multi-selection type consisting of the origin of the paragraph and four alternatives, one of which is correct and three of which are wrong to measure the levels of probing thinking among fourth grade scientific students, as the test was presented to a number of experts and arbitrators in the field of education and methods of teaching them, and through their directives, some paragraphs were modified and some paragraphs were deleted ready for implementation

Correction of the test: Before testing the test in a survey, the researcher prepared special instructions to correct it as follows: (One grade is given to the student when he answered correctly to each paragraph, zero score is given to the student when he answered wrong to each paragraph, the answer is wrong if the paragraph is left without an answer or when choosing more than one alternative, and thus the test score ranged between (zero) as the lowest grade and(30) as the highest grade.

Test validity: The apparent validity of the test was extracted to test the probing

thinking , which is as follows: (Apparent validity: The test was presented to a group of experts and specialized arbitrators in the field of education and teaching methods to express their views on its validity for use in this research and the researcher used the K box to analyze the opinions of experts and adopted an agreement rate (80%) and the most test paragraphs obtained the approval of experts and specialized arbitrators on its validity and suitability for the purpose for which it was set, so the test paragraphs remained (30 paragraphs).

Applying the probing thought test to the exploratory sample:

The first reconnaissance sample: The test was applied to a reconnaissance sample of (30) students from the Nahrawan Preparatory School for Boys. Through the researcher's supervision of the application, he noticed that the instructions of the answer and the test paragraphs were clear through the lack of students' inquiry about how to answer. The test time was calculated by finding the average time taken by all students of the first reconnaissance sample, which was represented by (43) minutes by adding the times taken by all students after recording the response time for each student on his answer sheet, and by adopting the following equation:

Average Time = first student answer time + second student answer time..... etc ÷ total number of students

(Al-Khatib and Al-Khatib, 2011: 96)

Average time = $\frac{1286}{30}$ =42.8 minutes, 43 minutes

The second exploratory sample (the sample of statistical analysis): The probing thinking test was applied to a sample of (100) students from the (project preparatory for boys) school, and he supervised the application of the test himself in cooperation with the teacher of the subject. After correcting the students' answers, the scores were arranged downward from the highest grade and were (29) to the lowest grade and were (5) and the discriminatory force and the stability

coefficient were extracted, then the upper and lower extremist samples were chosen by (27%) as the best groups to represent the entire sample, and in the following is an explanation of the procedures for the statistical analysis of the test paragraphs:

Difficulty coefficient: When the researcher calculates the difficulty coefficient for each of the test items, he found it to be limited between (0.33 – 0.65), and thus it is considered acceptable difficulty factors, as research in tests and measures indicates that the test is good if the difficulty coefficient of its paragraphs is limited between (20% -80%) (Al-Najjar, 2010: 258).

Paragraphs discrimination coefficient: When calculating the strength of discrimination of each test paragraph, the researcher found that it is limited between (0.33 – 0.59) , which means that all test paragraphs are good, as (Abdul Majid, 2019) indicates that the test paragraphs are good if the strength of its distinction is (0.20) and more (Abdul Majid, 2019: 130), so the paragraphs of the scale are all valid for their ability to distinguish between students.

The effectiveness of the wrong alternatives: Students' answers to the paragraphs of the probing thought test were arranged, and distributed between the two research groups (upper – lower). After calculating the effectiveness of the incorrect alternatives, it was found that they were confined between (-0.07 – 0.33-), which means that the incorrect alternatives have attracted more students from the lower group than from the upper group, and thus it was decided to keep the incorrect alternatives as they are.

Test reliability: The reliability of the internal consistency of the test was calculated in the objective paragraphs using two methods as follows:

Half-split method: The researcher extracted the Pearson correlation coefficient between the test scores of (0.83), and when corrected using the (Cyberman-Brown) equation, it reached (0.907), which is a good and reliable stability coefficient that he sees

(Al-Nabhan, 240:2004), if the stability coefficient is (0.70) or more, this indicates that the stability coefficient is high (Alama, 543:2009).

Method (Qoder-Richardson20): The researcher extracted the stability coefficient and found that it is equal to (0.87), and this is an acceptable stability coefficient according to what researchers and workers in the field of psychological and educational measurement indicated, so all test items were retained and the test was ready for application in its final form for the research sample.

Seventh : Statistical means: The researchers used the statistical bag SPSS program for statistical analysis:

Table (8): Results of the T-test for the students of the two research groups in the final probing test scores

group	Num ber of sam ple mem bers	Arithmetic mean	standard deviation	Variance	Freedom degree	T value		Significan ce level
						Calculat ed	tabular	
Experim ental group	31	20.838	3.597	12.938	61	3.589	2 000	Statisticall y D
Control group	32	17.656	3.441	11.840				

The above table shows that the average scores of the students of the experimental group in the probing thought test (20,838) and the standard deviation (3,597), while the average scores of the students of the control group (17,656), and the standard deviation reached (3,441), using the equation of the T-test for two independent samples, shows that the calculated T-value (3,589) is greater than the tabular value at the level of significance (0.05) and a degree of freedom (61), which is equal to (2,000). This means that the students of the experimental group are superior to the students of the control group in the post-probing thinking test, rejecting the first hypothesis and accepting the alternative hypothesis, i.e. there is a statistically significant difference between the average scores of the experimental group and the average scores of the control group and in favor of the experimental group.

Presentation and interpretation of results

First: Presentation of the results: The researchers prepared a probing test for the subject of biology, and it was applied to the two research groups. After applying the test, the researchers corrected the papers of the two groups and recorded the grades of the students of the two groups. The mean of the grades of the students of the two research groups and the standard deviation was calculated, and then the t-test was applied to two independent samples, as shown in Table (8).

Second: Interpreting the results: Interpreting the results related to the null hypothesis: Teaching according to the strategy of the mantle of the expert has had a positive impact in understanding scientific information and facts through cooperating groups and what students discuss, and this leads to raising their scientific level and raising their level of achievement.

Conclusions:

In light of the experience carried out by the two researchers and the results obtained and the reasons that resulted from the research, the two researchers reached the following conclusions: The strategy of the mantle of the expert has a positive impact in increasing the thinking of fourth grade scientific students in the subject of

biology and increasing their abilities in understanding information, facts and knowledge and raising their academic level.

Recommendations:

After presenting and interpreting the results, the researchers recommend the following: The strategy of the mantle of the expert in teaching the subject of biology for the primary and intermediate stages should be adopted, and an invitation to the Directorate of Education of Babylon to establish a training course and teaching programs for teachers of the subject of biology for the purpose of providing them with modern teaching methods in general and with the strategy of the mantle of the expert in particular to benefit from it in raising the level of students, as well as providing schools with modern methods because the usual method has become useless.

Proposals:

In light of the results of the research, the two researchers propose measures such as the following: Conducting a similar study using the strategy of the mantle of the expert in other variables (gender, divergent thinking, creative thinking, reflective thinking).

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