

# The Effect of Teaching Two Science Units Using Probing Thinking Strategies on The Academic Achievement of Primary School Students

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## Abstract

The current research was based on the assumption that ((Since thinking is a mental skill that can be taught and trained, we can develop the thinking skills of our students and teach them the foundations of scientific thinking through specific strategies that take responsibility for presenting the Study materials and present them to students no matter how difficult it is. probing thinking in teaching science on the academic achievement of the research sample. And for the purpose of verification, the researcher prepared and built a summative test for selected units of science for the sixth grade of primary school, and in preparing it, the researcher took into account the usual scientific steps to obtain tools that have sufficient validity and reliability. Al- Ezza Elementary School for Girls) numbered (29) female students, divided into (14) female students for the experimental group and (15) female students for the control group. Ed design ((control group with post-test only)). After the trial period, which amounted to (12) weeks, the two groups were subjected to the post-test. Then the study data was analyzed by adopting a number of statistical treatments, the results indicated the efficiency of (probe thinking strategies) in training the experimental group members to use more complex thinking skills such as inference, generalization, imposing hypotheses, explaining, examining and testing them, as the results of this group indicate their superiority over the control group.

## Keywords

Teaching Strategies, Probing Thinking, Academic Achievement.

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## Research Problem

In light of the explosion of knowledge, technological progress and rapid change that characterizes our current era, a responsibility has been imposed on education by focusing on teaching young people how to develop new knowledge stemming from their previous experiences instead of teaching them a huge number of unfixed facts and stuffing their minds with other people's perceptions of these concepts, and to accustom students to do a One group of the active mental processes that are based on thinking instead of the shell in the framework of memorization and retrieval. A close look at the methods and methods of teaching common in most educational institutions makes us realize that the prevailing system in them is a picture of educational dictatorship systems owner in which the teacher is the teacher of knowledge and the main source of it. These systems usually produce classrooms filled with boredom, submission, negativity and misery, and deprive the learner of practicing the intellectual and behavioral skills that enable him to adapt to the changing world of knowledge. Accordingly, it required us to think of new approaches to education that restore the learner's humanity, and develop his thinking skills, which is what the current study seeks. The teaching of science in particular faces many problems, arising from the teaching methods and the content of the prescribed curriculum books, which are characterized by their accumulation of information, which makes students face difficulties in their understanding of scientific concepts and their applications, which often Leads students to resort to memorization and do not show enthusiasm towards science subject, so students seek to obtain At the highest grades, regardless of how they learn, as the work of students and parents has become to focus on keeping their children for the largest amount of information that qualifies them to obtain the highest grades, regardless of the education goal of preparing the individual who is able to think. And in view of the reality of science teaching in our schools, it is noted that the focus is still on teaching information in a way that does not develop thinking for learners, and that knowledge is taught sufficiently in itself and in a non-functional manner. (Al- Najdi, 2003)

And through the educational reality that the researcher touched through her visits to some primary schools and interviews with a number of teachers who teach (science) for the purpose of communicating with the reality of the teaching reality, as she noticed the prevalence of traditional methods that have become useless and the dependence of most teachers on speech and interrogation in teaching science, which led to weak tendencies of students and their attitudes towards science, which in turn leads to a decline in achievement.

And the way to confront the educational reality is by adopting the strategies of probing thinking as a method of teaching science in all its branches and making it a living experimental environment for training students, and a workshop that urges learners to give their maximum in the educational situation in order to learn. And here the researcher found herself facing a great responsibility that necessitated shedding light on the intellectual side of her students by using the Prober Thinking Model, as an attempt to prove it empirically in raising the level of achievement and maintaining its impact on the fifth-grade students, and from here crystallized the problem of the current research, which can be formulated in the following question:

**What is the effect of teaching using probing thinking strategies in teaching the two science units on the academic achievement of a sample of sixth grade female students?**

## Research important

Based on what was stated in the context of the researcher's presentation of her research problem, the importance of the current study is reflected in the theoretical additions and contributions applied in the field of developing thinking skills and raising the level of achievement in science using the probe thinking model, which can be summarized by the following points:

1. The research constitutes from an applied point of view a modest scientific attempt that seeks to raise the level of achievement in science by presenting it according to the strategies of the probing



thinking style that tries to raise students' thinking to the highest levels and is not satisfied with superficial treatments of matters and situations.

2- Due to the importance of the measured academic achievement in the student's academic life, it is the method adopted in distributing them and their transfer to the different academic stages, and academic achievement is concerned with the information, skills and attitudes that the individual learns in school, and what he perceives of the relationships between that information and the facts he deduces from it that are reflected in his performance on a test placed according to certain rules. (El Zayat, 2010)

3- Educational plans, and the reports of specialists in the field of education, abound with many theoretical and ideal goals and objectives that do not rise to the level of practical and empirical application. Objectives: Taking off the traditional methods of teaching (the lecture) and replacing it with approaches to teaching thinking, so that teaching students the basics of scientific thinking constitutes the most important objectives of this course.

4- The current research derives its importance from the importance of the primary stage as the main crossing point for joining the intermediate stage, as well as from the importance of the childhood stage, as it is the stage in which mental development is distinguished, as late childhood constitutes the beginning of abstract thinking practice, the growth of the ability to understand logic, and understanding the repercussions of things. All of them are characteristics that need a rich environment for their development, and accordingly the current study constitutes a field to provide such environments concerned with developing thinking skills, by providing teachers with specific strategies that can be employed to teach any subject through which students are provided with mechanisms to control and enrich their thinking processes.

5- The current research drives its importance from this distinguished thinking method that seeks to provide individuals with the keys to scientific knowledge, especially middle school students as they are the future generation on which society depends for its advancement and construction.

6- Proper thinking supports active and student-centered learning, facilitates inquiry-based learning, helps the learner build knowledge, helps the learner develop problem-solving skills, and improves long-term information retention (Fuller, 2011).

7- In addition, we find that there is a clear lack of studies and research that dealt with the problem of teaching thinking in general, and probing thinking in particular - according to the researcher's knowledge. Profound thinking in developing thinking and its impact on academic achievement in science for the research sample.

research aims:

1- Building an achievement test for science in the units designated for the study to determine the level of academic achievement of the sample members.

2- Recognizing the effect of teaching using probing thinking strategies on the academic achievement of the science subject among the study sample.

In order to verify the objectives of the research, the following hypotheses were formulated:

Research assumes:

First Hypothesis / There are statistically significant differences between the average scores of the experimental group and the average scores of the control group in the post measurement of academic achievement measured by the objective achievement test, in favor of the experimental group.

The second hypothesis/ "There are statistically significant differences between the degrees of the post-measurement and the degrees of follow-up measurement measured by the achievement test of science for the members of the experimental group and in favor of the post-measurement."

The third hypothesis: There are statistically significant differences between the degrees of post-measurement and the degrees of follow-up measurement measured by the achievement test of the members of the control group and in favor of the post-measurement.

The fourth hypothesis/ "there are statistically significant differences between the average scores of the experimental group and the average scores of the control group in measuring follow-up for academic achievement and in favor of the experimental group."

The limits of the research: The limits of the current research were represented in the following limits:

Time limits: the first semester of the 2018/2019 academic year.

- Spatial boundaries: Al- Azza Primary School for Girls / Basra Governorate Center.

- Human limits: represented by (29) female students of the sixth grade of primary school, divided into two groups (14) female students for the experimental group and (15) female students for the control group.

- Objective limits: the lessons covered by the experiment from the science book for the sixth grade of primary school, which included two units, each with two chapters, which are.

Definitions terms:

### **First - Teaching strategy:**

It is the teaching procedures that the teacher plans in advance, so as to help him implement the teaching in the light of the available capabilities to achieve the teaching goals of the teaching system he is building, and with the maximum effectiveness possible. (Shaheen, 2011) Literature review Probe Thinking

### **2) Definition (Qatami, 2014):**

That is) the in-depth, contemplative and analytical thinking of phenomena, which requires sophisticated mental processes such as: attention, perception, organization, recalling stored experiences, linking them to new experiences, integrating them with the knowledge structure, storing them and recalling them when needed, and transferring or generalizing them when facing a new experience. (Qatami, 2014) Proper Thinking Strategies:

### **4) Procedural definition.**

They are the strategies (which collectively make up the (probe-thinking) strategies, which include three main strategies: the strategy of (accommodating the concept, interpreting the information, applying the principles) that the researcher will use to teach specific topics from science for the sixth grade of primary school.

### **Second - (academic achievement):**

Definition of (Al-Khalidi, 2003).

(The student's mental and cognitive activity as inferred from the total scores he obtains in his performance of the study requirements). (Al-Khalidi, 2003)

procedural definition

(It is the total score obtained by the examinees in the experimental and control groups on the achievement test prepared by the researcher in selected units of the science curriculum).

Theoretical background and previous studies

First, the theoretical background:

- Probe Thinking:

It is a mental process through which the learner can process, understand, acquire and integrate information with his cognitive structure and retrieve it easily when needed.

1- Concepts of cognitive structure.

2- Cognitive representations.

The cognitive trend has structure that the cognitive structure is the one that develops as a result of the interaction between the student and what he encounters and not what he is taught to, and that the mental process is a process that a child is born with and is provided with. (Al- Ayasra, 2011)

Classes of Probing Thinking: Probing thinking is classified into four classes:

1- Prompting: It means that the learner's initial or original answer to the teacher's question is wrong or that he lacks it. The teacher asks a question that reminds him of the correct answer or gives the learner a hint or a small indication of the answer.

2- Clarification thinking, which means that the learner's answer is ambiguous or that the learner's understanding of the concept of the question is not specific?

3- Probe-reflective thinking: It means that the teacher wants to enrich the learner's understanding of the subject, as he means that it is a means to help the learner discover the complex thing in the subject of discussion.

4- Probing Refocusing Rc - Focus: It means that the teacher asks the learner to link his answer to another idea or topic. This type of probing requires the learner to look at the problem from another point of view or different points of view, or to draw the learner's attention to seeing things according to their correct relationships or It connects two unrelated elements (Fuller, 2011; Ibrahim, 2005)

Proper Thinking Requirements:

Proper thinking requires complex operations, which are:

1- Attention: It gives learners the opportunity to give open answers.

2- Perception: It is the ability to distinguish between things and the similarities and differences between them.

3- Organizing: It is the skill of creating a mental or intellectual framework that the learner uses to organize information.

4- Recall of stored experiences: Learners differ in their abilities to store and recall information.

5- Linking new experiences with previous experiences: it helps the learner to maintain and activate the information.

6- Experience coding: translating information into mental representation and storing it in memory.

7- Recording Experience: It is the skill of recording important information in a short and written manner.

8- Accommodating experience: the learner's ability to receive and understand information.

9- Internalization of experience: that is, it shows the personality of the learner.

10- Integration of experience with its knowledge structure, storage and retrieval: that is, it becomes among his stored experiences

The learner can retrieve an experience when needed. (Al- Ayasra, 2011) Proper Thinking Strategies:

Proper thinking strategies consist of three main strategies. Each main strategy is divided into three sub-strategies, which are as follows in Figure (2):

NS	main strategy	Sub-strategies
First	concept comprehension strategy	1- Counting and remembering 2- Putting things into groups and categorizing them 3- Labeling and addressing.
Secondly	Information interpretation strategy	1- Determine the existing relationships. 2- Discover new relationships. 3- Inference formulation.
Third	Principles application strategy	1- Formulating hypotheses and predictions. 2- Explanation and support of hypotheses and predictions. 3- Test and check hypotheses and predictions.

Figure (2) shows the main and sub-probes thinking strategies

(Qatami, 2014) Define terminology for Proper Thinking Teaching Strategies:

1- Concept strategy understanding

This strategy aims to excite students mentally, to expand the space of their conceptual system by processing the information that they have, and this strategy can be achieved through three sub-strategies:

A - enumeration and remembering

At this stage, the teacher asks his students to list the groups of things that are included in the lesson material.

b- Putting things into a group and categorizing them:

Here, the students classify the materials or objects in lists into groups so that they include general characteristics. After obtaining the required information, the teacher prepares retrieval tables.

C- Naming and Addressing:

At this stage, the teacher asks the students to give a title or a name for each of the groups that were previously classified.

2- Information interpretation strategy:

This strategy is built on mental processes that include: interpretation, reference, and generalization. In light of the available information summarized in the retrieval tables, the students explain the paragraphs, link them to a relationship, and explain that relationship by identifying its causes. It also ensures access to the inferences that lie behind those negative relationships. This strategy is usually motivated and provoked by the teacher's questions, and it includes three strategies:

A- Determine the main existing relationships:

The teacher's questions and the stimuli he presents lead the students to identify certain features and characteristics in the information, which in turn leads to identifying the relationships between the observed objects.

b- Discovering new relationships:

This strategy depends on the hypothesis that "the things that exist are related to relationships, and when we can explain them, we must discover the relationships between them."

The formulation of inferences:

This strategy is based on the hypothesis: ((The learner, with his knowledge and experiences related to the things he observes or interacts with, tends to develop inferences of different levels in order to reach a state of balance and knowledge)).

3- The strategy for applying the principles:

It is the last stage, and it requires higher mental operations, effort and more time. This strategy is achieved after the learner has mastered the skills mentioned in the previous strategies. It consists of three sub-strategies:

A- Formulation of hypotheses and predictions:

This strategy includes a number of operations: (predicting results, explaining unfamiliar phenomena and formulating hypotheses). This stage also requires students to form predictive inferences, depending on the information contained in the retrieval table or bypassing it to reach new hypotheses and formulations.

b- Explanation and support of hypotheses and predictions:

The main objective of this strategy is to provide students with multi-predictive experiences as well as the opportunity to use generalizations that have been developed in new situations with their reinforcement and deepening of their meanings.

C- Testing and examining hypotheses and predictions:

At this stage, the students focus on verifying the validity of the hypotheses. These strategies provide for the theoretical or practical verification of the assumption made by the teacher or student, by collecting data to support or reject the hypothesis according to the data, information or experiences he collects. (Nabhan, 2008)

In view of the importance of questions and their role in learning situations, specialists have been working on providing several classifications for them to identify their types, and among those classifications is the classification presented by (Tishman, 2008) based on the function of questions, which are:

1- Focusing Questions

2- Prompting Questions

3- Probing Questions

The probing questions are the pattern by which the learner can be reached, in order to identify all the concepts, generalizations and skills he knows about the subject of the lesson.

(Al- Najdi, 2003) (Abdel Hadi, 2009)

Second: Previous studies:

### 1) The study of (Al- Abayji, 2004)

(The effect of an educational program in developing methods of teaching probing thinking among students of Teachers College)

The aim of the research is to build a program to develop some patterns of probing thinking, as well as to measure the impact of the program on the teaching method of applied students in primary schools. The educational program was built based on the Saber thinking model. An observation form was also prepared for the purpose of evaluating the teaching style of the applied students after they



had undergone the program. The results showed that there were statistically significant differences between the experimental group and the control group, and the results also showed that there were statistically significant differences in the experimental group in the post observation in favor of Females. nature of females and their ability to discuss, ask questions and interact with students.

(Al- Abayji, 2004)

## 2) (Ibrahim, 2005)

(The effect of using the probe thinking model on the acquisition of concepts and the development of innovative thinking among primary school students)

The study aimed to identify the effect of the probing thinking model on the acquisition of concepts and the development of innovative thinking among primary school students in Qalyubia Governorate in Egypt. The sample for the study consisted of (90) male and female students who were divided into two groups, experimental and control, each group includes (45) male and female students. SPSS) was statistical and the results showed the existence of a statistically significant effect at the level (0.01) of the experimental group members and in favor of probing thinking. (Ibrahim, 2005)

## 3) (Al- Khatib, 2015)

(The effect of teaching according to probing thinking on the achievement of biology and basic thinking skills for fifth-grade students of science)

The study aimed to identify the effect of teaching according to probing thinking on the achievement of biology and basic thinking skills for fifth-grade female students in Baghdad. The research sample was represented by the students of the fifth scientific grade in (Al- Qanat Preparatory School for Girls) in Baghdad, and it amounted to (55) female students, with (28) female students representing the experimental group and (27) female students representing the control group. paragraph) and testing basic thinking skills (41 items) after the experiment, the data was statistically analyzed by adopting the T-test for two unequal independent samples. scientific, in favor of the experimental group. (Al- Khatib, 2015)

## 4) Study of (Abdel-Fattah, 2016)(The effect of using the probe thinking model in developing some scientific concepts for a pre-school child)

The study aimed to measure the effect of using the probe thinking model in developing some scientific concepts for a pre-school child. The study used the descriptive method. The study tool consisted of an illustrated scientific concept test for pre-school children. The study sample consisted of (70) male and female children from the second level kindergarten in the New Valley. The probe thinking model and its strategies were used and the role of the teacher in developing scientific concepts for children, and the study concluded by referring to the most prominent results it reached, including the presence of statistically significant differences for the children of the experimental group before and after the experiment in favor of the dimensional application. Advances in concept development. The study recommended the necessity of using the probe thinking model in kindergartens to contribute to the development of appropriate scientific concepts for children at this stage. (Abdel-Fattah, 2016)

### Discussing previous studies:

Previous studies varied in the number of sampled individuals, gender and school stage according to their objectives, and all studies that dealt with the use of probing thinking showed its impact on the dependent variables that were involved with it. achievement in science for sixth graders.

## Methodology, Research And Procedures

### Research Methodology:

In order to achieve the research objectives and hypotheses, the researcher followed the appropriate experimental design.

## Search procedures

### First, the experimental design:

In order to achieve the objectives of the research in measuring the effect of probing strategies on achievement among primary school students, the researcher chose the experimental design with partial control (the post-test for two experimental and control groups) because it is one of the designs that can protect itself from sources that threaten internal safety. It is able to control the influence of maturity factors, dating and tests. It is also a design that includes an experimental group that is subjected to experimental treatment (probe-thinking strategies) and a control group that is not exposed to experimental treatment, as it (learns in the traditional way) and then exposes both groups to a dimensional measurement to compare their results. Figure (1) illustrates this.

the group	parity	independent variable	dependent variable
Experimental	chronological age. Academic achievement for the first semester	Probe Thinking Strategies	. Academic achievement
control	profession Parents' academic achievement	traditional way	achievement

**Figure (1)** The experimental design of the research

Second: The research community was appointed by:

#### 1- Research community:

The researcher chose (5) primary schools for girls in the center of Basra Governorate from the same geographical reality, and they are (Al- Multaqa, Umm Abiha, Al- Nibras, Al- Azzah, Al- Bashaer) they were chosen intentionally to represent the research community.

The total number of schoolgirls for the sixth grade of primary school reached (416) female students.

#### 2- Research sample:

##### A- Method of selecting the basic research sample (experimental sample)

The researcher released on one of the random selection methods, represented by (the way of mixing), and accordingly, the choice was made on the (Al- Azza Primary School for Girls), the number of sixth-grade students reached (33) students, and they were divided into two groups (experimental and control) and by (16) students in the experimental group and (17) A female student in the control group, and before the end of the experiment, the sample lost some of its elements from the two groups when applying the achievement test as a result of her absence, and thus the group size was reduced to (14) female students for the experimental group and (15) female students for the control group, and Table No. (1) shows this:

**Table No. (1)**

It shows the distribution of the sample of the experiment in light of the type of group and the losses in the experiment.

Total	the number	wastage	Total
experimental group	16	2	14
control group	17	2	15th
Total	33	4	29



b- The method of selecting a construction sample

For the purpose of constructing an achievement test for sixth-grade students in the units prescribed for the experiment from the science curriculum, it was required to withdraw a sample from the original community for the of building the tool, and the purpose resorted to adopting the method of selecting the intentional sample when choosing this sample, and that sample included the sixth-grade students in my school Al- Bashaer and the Forum, which are located within the spatial boundaries of the research, and their number is (362) female students, and the construction sample for the achievement test was drawn, and its size was (100) male and female students.

Third: Control procedures:

The researcher focused on using the information form to identify the descriptive variables, which have a direct impact on the dependent variable, in order to control and neutralize their effect.

Group party

To overcome the defects of the experimental design with a single group, experimental designs that include more than one group are usually used, and this is what the researcher released on designing her research experiment, so she resorted to using two methods to achieve this equivalence:

1- Random selection of the sample members.

2- Equality between groups by using statistical treatments for the variables affecting the dependent variable, except for the independent variable.

It proceeded to make parity between the two groups and to balance them in some of the factors that may affect the safety of the experiment, which were contained in the information form. After applying it to the members of the two groups and unpacking, the researcher used the chi-square test to find out the differences between the two groups, so the values of the chi-square on the descriptive variables were as follows: (age 0.250), (mother's occupation 0.750), (father's occupation 1.750), mother's academic achievement, 3,250), (the father's academic achievement is 4.750), (the student lives with 0.167) and by comparing those values with the tabular value at the degree of freedom (2) and at the level of significance (0.01), which is (9.21). We note that all of them were less than the tabular values, which indicates that there are no statistically significant differences between the two groups (experimental and control). The following is an explanation of the statistical equivalence procedure between the two groups (experimental and control), as shown in Table No. (2):

**Table No. (2)**

(Descriptive variables, group type, sample frequencies for each variable, chi-square value, degrees of freedom, tabular value, significance level and type of differences)

NS	Variables	chi-square value	degree of freedom	tabular value	Significance level of differences
1	Age	0.250			The differences are not statistically significant at the level of 0.01
2	mother's job	0.750			
3	Father profession	1.750	2	9.21	
4	economic level	3.250			

5	The father's academic achievement	4.750
6	Mother's academic achievement	3.250
7	The student lives with	0.167

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**Fourth:** Sixth: Research Requirements:

The current research required the preparation of a set of requirements to implement the research procedures as follows:

1- Determining the scientific subject: The researcher determined the scientific material that she will teach to the students of the two groups (experimental control) during the period of research and the experiment in the first semester of the academic year (2018-2019) from the science book for the sixth grade of primary school, which included two units and each A unit with two chapters, which is as follows:-

The first unit: characteristics of living organisms, and includes:-

Chapter one: Natural reproduction in plants.

Chapter Two: Artificial Reproduction in Plants.

The second unit: the human body and its health, and includes:-

Chapter Three: Organs in the human body.

Chapter Four: The sense of man.

**2- Formulating Behavioral Objectives:**

After analyzing the content of the scientific material to be taught during the duration of the experiment, and accordingly (60) behavioral goals were formulated, the adopted Bloom's classification study at its first three levels (remembering, understanding, and application). These behavioral goals were presented by a number of arbitrators. And specialists in the field of education, psychology and teaching methods, Appendix (1) to indicate their opinions about the accuracy of their formulation and their suitability to their levels of knowledge, and after taking into account the proposals and opinions of the arbitrators and in the light of their responses, all goals were approved with an amendment in the formulation of some goals, and these purposes were adopted in Preparing the teaching plans and formulating the appropriate paragraphs for the achievement test, and the agreed objectives were distributed over the study subjects, Table (3)

**Table (3)**

Behavioral objectives according to Bloom's classification of the cognitive domain

Bloom's "Three" Levels					
NS	behavioral purposes topics	to remember	comprehend	Application	Total
1	Natural reproduction in plants	4	5	2	11
2	Artificial reproduction in plants	3	6	2	11
3	organs in the human body	2	4	2	8
4	Nervous, skeletal and muscular system	3	5	4	12
5	Members of sense in human	3	4	3	10
6	The structure and functions of the skin	3	3	2	8
	Total	18	27	15th	60

**Table No. (4)**

"The specification table shows the achievement test for some units of science for the sixth grade"

Objectives Article content	Knowledge 30%	to understand 50%	Application 20%	number of paragraphs
(natural reproduction in plants) Number of servings = 16 stakes Concentration rate = 28.57% The number of test items = 38 The number of paragraphs of the unit = 10.857 (10-11) paragraph	(3-4) Paragraph	(5-6) paragraph	(2-3) paragraph	11 paragraphs
(artificial reproduction in plants) Number of servings = 16 stakes Concentration rate = 28.57% The number of test items = 38 The number of paragraphs of the unit = 10.857 (10-11) paragraph	(3-4) Paragraph	(5-6) paragraph	(2-3) paragraph	11 paragraphs
(nervous system, skeletal and muscular) Number of servings = 16 stakes Concentration rate = 28.57% The number of test items = 38 The number of paragraphs of the unit = 10.857 (10-11) paragraph	(3-4) Paragraph	(5-6) paragraph	(2-3) paragraph	11 paragraphs
(human sense organs) Number of servings = 8 stakes Concentration rate = 14.28% The number of test items = 38 The number of paragraphs of the unit = 5.426 (5-6) paragraph	(1 - 2) a paragraph	(2 - 3) a paragraph	(1 - 2) a paragraph	5 paragraphs
number of paragraphs	14	17	7	38



### **1- Preparing teaching plans:**

The researcher prepared a set of teaching plans for the students of the experimental and control groups in light of the classroom content to be taught for the sixth grade in science (2018-2019), and the researcher organized (12) teaching plans for the experimental group according to (probe-thinking strategies) and (12) A teaching plan for the control group according to the usual method, and samples of the plans were presented to a group of arbitrators and specialists in the field of methods of teaching science and education, Appendix (1), to indicate their views on it, and after taking a look after reviewing their observations and opinions, an 80% agreement came on The tool is honest and measures the desired characteristic of it, which is a percentage that invites us to accept it with confidence.

### **2- Auxiliary tools and activities used:**

To implement the study plans based on the prober thinking strategies, a number of tools were used, including: (color cards, computers, display screen, PowerPoint presentations, video clips). Among the main activities that the researcher used are (motivational probing questions, explanatory questions, and all kinds of probing questions, explanation and clarification, encouragement and reinforcement, cooperative education, graphics, imitation and role playing).

Fifth: The search tool:

To achieve the objectives of the research, the researcher used a scientific tool with a degree of honesty and reliability, which are:

### **Achievement test:**

To achieve the second goal of the research, which includes determining the level of academic achievement of the sample members in the subject of science, the researcher built an achievement test with the prescribed subject and in light of the basic steps for building tests.

### **Analysis of test items:**

After the preparation of the 38 test items, the researcher applied it to (100) female students who were selected from among the construction sample. The results are as follows:-

1- Regarding the first question, which has 20 paragraphs, the percentage of the paragraph's ease level ranged between (38.88% - 88.88%), while the difficulty level ranged between (0% - 61.11%), as the researcher corrected the guess, and its percentage ranged between 16.66% - 100%) as the proportion of the discriminatory ability of the paragraphs of the first question between (0% - 80%) ranged see (Al- Najdi, 2003) that paragraph ranging difficult between (25% (49%) is acceptable to a paragraph, while the level of ease sees that the level of (50%) is considered one of the best levels of ease, as he sees that the discriminatory ability of the paragraph if it ranges between (40) % - 60%) has a medium discriminatory ability, and the paragraph that is more than (50%) From (100%), this indicates an excellent ability to distinguish. (40, pp. 408 - 421) and accordingly, the researcher kept the paragraphs that had a disccriminating ability from (40% - 80%) and the paragraphs that had a difficulty level of (16.66% - 61.11%) and with this reservation - the sixth - the Eighteen - ten - eleven - fifteen - sixteen - eighteen - twenty) on their positions in the first question of the test, and table (5) explains that

**Table No. (5)**

It shows the level of ease, the level of difficulty, the percentage of guessing correction, and the discriminatory ability of the paragraphs of the first question.

paragraph number	Ease level	Difficulty level	guess correction	discriminating ability
first	88.88%	11.11%	83.33%	20%
the second	77.77%	22.22%	66.67%	40%
the third	44.47%	55.55%	16.67%	80%
the fourth	44.44 5	55.55%	16.67%	60 5
Fifth	100%	zero %	100%	zero %
Sixth	72.22%	27.77%	58.33%	20%
Seven	38.88%	61.11%	8.33%	60%
eight	50%	50%	25%	60%
the ninth	61.11%	38.88%	41.66%	40%
tenth	38.88%	61.11%	8.33%	20%
eleventh	61.11%	38.88%	41.66%	40%
Twelfth	72.22%	27.77%	58.33%	20%
Thirteenth	94.44%	5.55%	91.66%	zero %
fourteen	88.88%	11.11%	83.33%	20%
fifteen	83.33%	16.66%	75%	40%
sixteen	77.77%	22.22%	67.66%	60%
seventeen	88.88%	11.11%	83.33%	zero %
Eighteenth	44.44%	55.55%	16.66%	40%
nineteen	44.44%	55.55%	16.66%	20%
twenty	77.77%	22.22%	66.66%	40 %

1- As for the paragraphs of the second question, which is (10) paragraphs, its ease rate ranged between (33.33%-100%), and its difficulty level was between (0%-66.66%), and the guesswork was corrected at a rate between (0%-100%), and by extracting the discriminatory power of the paragraphs, this ability ranged between (0%-80%), and by adopting the same criteria specified by (Nabil Abdel- Hadi 2001), the paragraphs (first - third - fifth - sixth - tenth) maintained their positions in the second question and table No. (6) illustrates this:-

**Table No. (6)**

"It shows the level of ease, the level of difficulty, the percentage of guessing correction, and the discriminatory ability of the paragraphs of the second question."

paragraph number	Ease level	Difficulty level	guess correction	discriminating ability
first	33.33%	66.66%	70%	60%
the second	83.33%	16.66%	75%	zero %
the third	88.88%	11.11%	83.33%	40%
the fourth	33.33%	66.66%	zero %	60%
Fifth	83.33%	16.66%	75%	zero %
Sixth	88.88%	11.11%	83.33%	40%
Seven	72.22%	27.77%	58.33%	zero %
eight	94.44%	5.55%	91.66%	20%
the ninth	100%	zero %	100%	zero %
tenth	66.66%	27.77%	52.77 %	80 %

1- As for the paragraphs of the third question, which amounted to (8 paragraphs), its ease rate ranged between (5.55% - 100%), while the difficulty was between (0% - 94.44%), and by correcting the guess, its percentage ranged between (4.88% - 100%).) the discriminatory ability ranged from (0%

- 60%), and the adoption of the same criteria as mentioned in point No. (1) Maintains paragraphs (second, third, fourth, sixth, eighth) on their positions in the third question table (7) shows that:

**Table No. (7)**

"It shows the level of ease, the level of difficulty, the percentage of guessing correction and the discriminatory ability of the paragraphs of the third question"

paragraph number	Ease level	Difficulty level	guess correction	discriminating ability
first	83.33%	16.66%	81.5%	zero %
the second	5.55%	94.44%	4.88%	20%
the third	66.66%	33.33%	63 %	60%
the fourth	72.22%	27.66%	69.16%	60%
Fifth	100%	zero %	100%	zero %
Sixth	66.66%	33.33%	75.33%	60%
Seven	100%	zero %	100%	zero %
eight	55.55%	44.44%	50.66%	40%

#### Test stability:

The researcher released on the split-half method to extract the reliability coefficient. By analyzing the data of (35) female students, the researcher divided the test into two parts, the first refers to the individual items and the other refers to the even items, and by using the statistical treatment of Pearson's correlation coefficient, the correlation coefficient between the two halves of the test reached (0.50), with a correction This coefficient, by means of the Spearman-Brown equation, obtained a correlation coefficient of (0.66), and based on what was proposed by (Al- Najdi, 2003) Regarding the reliability coefficients, where the highest stability coefficient of the test is (0.75), while the stability coefficients that are limited between (0.50-0.74) are reasonable. (Abdel Hadi, 2009) And based on what was mentioned, we find that the achievement test has a reasonable degree of stability.

#### Fifth: Steps to carry out the experiment:

The researcher started applying the experimental procedures based on the following steps:-

- 1- Agreeing with the school administration to organize the science lesson schedule for the two groups, as the two groups were taught on the same days and time.
- 2- The tribal tests were applied to reward the experimental and control groups with the variables (prior knowledge and intelligence test) in the first week and before the actual procedures of the experiment.
- 3- The researcher started to apply the experiment to the students of the two (experimental) groups who are taught according to using the strategies of (probe thinking) and (control) which are taught according to the usual method on 10/13/2018 with two lessons per week for each of the two groups for the two years and continued throughout the first year The academic year 2018/2019 and the experiment ended on (5/1/2019).
- 4- After the sample for the experiment, the achievement test was applied to the final application the two groups on 13/1/2019. All students were informed a week ago of the date of the achievement test.
- 5- The experiment lasted (12 weeks) with (2) sessions per week for each group.

#### Sixth: Statistical Meanings:

The results were analyzed and processed statistically using the SPSS statistical program.

Chapter Four: Presentation and discussion of the results.

First, show the results:



The results of the research will be presented in this chapter according to the hypotheses that were presented::

### The first hypothesis: -

There are statistically significant differences between the average scores of the experimental group and the average scores of the control group in the post measurement of academic achievement measured by the objective achievement test, in favor of the experimental group.

A closer look at the values of the arithmetic means, and the standard deviations of the results of the two experimental and control groups, we stopped those qualitative differences between the results of the two groups, and to identify the quality of those differences and the level of their significance, the processed data using the T-Test for two independent samples, so the value of  $t = (6.279)$ , and a researcher by comparing that value with the tabular value at the degree of freedom (27) and the Level of significance (0.05) for a one-ended test of (1.703), the calculated value was greater than the tabular value, which indicates that there are statistically significant differences between the experimental group that was studied according to Proper thinking strategies and between the control group that studied using the traditional method (the lecture), note that the differences were recorded in favor of the experimental group and Table No. (8) illustrate this.

### Table No. (8)

It shows the values of arithmetic means, standard deviations, t-value, degrees of freedom, and the level of significance of the difference between the experimental and control groups on the objective achievement test in the post-measurement.

The group	SMA	standard deviation	value (t)	degree of freedom	difference significance level
experimental group	23.29	3.38	6.279	27	the difference D level 0.0 5
control group	11.8	6.41			

### The second hypothesis:-

"There are statistically significant differences between the degrees of the post-measurement and the degrees of follow-up measurement measured by the achievement test of science for the members of the experimental group and in favor of the post-measurement."

For the purpose of determining the extent of the continuity of the effect of learning by the Prober Thinking Model, and the experimental group members retaining the information and not forgetting it, the researcher resorted to measuring the achievement level of the members of that group after four weeks after the end of the experiment, and by extracting the values of the arithmetic averages and standard deviations of the two standards, we note that there are differences between them, and to stand On the quality of these differences and their level of significance, the researcher used the statistical treatment of the significant significance test of the difference between the correlated variances, where the value of the correlation coefficient between the two measurements was (0.94). When comparing the value of the correlation coefficient with the tabular value at the degree of freedom (12) and the level of significance (0.05) for a one-ended test of (0.458), we note that the calculated value of the correlation coefficient is greater than the tabular value, which indicates that there is a positive and statistically significant correlation between the two measurement scores, and after Obtaining the value of the correlation coefficient and the variances of the two measures that were employed in obtaining the value of the t- test for the correlated variances, so the calculated t-value amounted to (0.939). Table No. (9) shows this:

**Table No. (9)**

It shows the values of the arithmetic means, standard deviations, the value of the correlation coefficient, the t-value, and the level of significance of the difference between the two post-measurements and the follow-up for the two experimental groups on the objective achievement test.

Measurement	SMA	variance	Correlation coefficient value	value (t)	difference significance level
Telemetry	23.29	3.38	0.94	0.939	The differences are not statistically significant at a level of 0.05
Follow-up measurement	20.71	2.81			

By comparing this value with the tabular value at the degree of freedom (12) and the level of significance (0.05) for a one-ended test of (1.782), we note that the calculated value is less than the tabular value, which indicates that there are no significant differences between the two standards, which in turn means that the achievement of the group members The experimentalists maintained the same level so that their answers were not affected in the follow-up measurement, which confirms the effectiveness of this method in retaining information for a longer period of time because it is based on strategies based on more complex levels of knowledge such as understanding, analysis, synthesis and synthesis, which makes the information presented in this method difficult to forget because the student It represents it and makes it part of its knowledge structure, and thus the researcher must reject the alternative vector hypothesis because it is incorrect.

**The third hypothesis:-**

"There are statistically significant differences between the degrees of the post-measurement and the degrees of follow-up measurement measured by the achievement test of the members of the control group and in favor of the post-measurement"

In order to determine the effectiveness of the prevailing lecture method in teaching and its role in retaining information for the members of the control group for a period of one month, the researcher measured their level of achievement by adopting the test adopted in this research, and by obtaining the values of the arithmetic averages and standard deviations of the two standards that indicate the existence of clear between them. On the quality of these differences and their level of significance, the researcher used the statistical treatment of the significant significance test for the difference between the correlated variances, where the value of the correlation coefficient between the two measurements was (0.93) and when comparing the value of the correlation coefficient with the tabular value at the degree of freedom (12)) and at a level of significance (0.05) for a one-ended test of (0.458), we note that the calculated correlation coefficient value is greater than the tabular value, which indicates that there is a positive and statistically significant correlation between the two measurement scores, meaning that the control group scores in the follow-up measurement close to the scores that Record it in the dimensional measurement, and after obtaining the value of the correlation coefficient and the variances of the two measurements It was employed to obtain the value of the t-test for correlated variances, so the calculated t-value amounted to (3.04). Table No. (10) illustrates this:

**Table No. (10)**

"It shows the values of the arithmetic means, standard deviations, the value of the correlation coefficient, the t-value, and the level of significance of the difference between the two post-measurements and the follow-up for the control group on the objective achievement test"

Measurement	SMA	variance	Correlation coefficient value	value (t)	difference significance level
Telemetry	11.8	6.41	0.93	3.04	The difference is D 0.05. level
Follow-up measurement	7.8	5.40			

By comparing this value with the tabular value at the degree of freedom (13) and at the level of significance (0.05) for a one-ended test of (1.771), we note that the calculated value is greater than the tabular value, which indicates that there are significant differences between the two measurements, noting that the difference was recorded in favor of the dimensional measurement. This, in turn, means a low level of achievement of the control group members in measuring follow-up, which confirms that the information provided to students by adopting the lecture method is liable to be forgotten after a period of time has passed because it is one of the traditional methods that focus heavily on developing the faculty of memorization and neglect advanced levels of knowledge, which makes the information provided with this method, it is liable to be forgotten with the passage of time until it becomes useless for the student due to the absence of its purpose associated with passing the exam and achieving success. Thus, the researcher has to accept the alternative vector hypothesis because it is true.

**The fourth hypothesis:-**

There are statistically significant differences between the average scores of the experimental group and the average scores of the control group in measuring follow-up for academic achievement and in favor of the experimental group"

We looked at the values of the arithmetic means and standard deviations of the experimental group and the control group computed from the sample data on the follow-up test, with clear differences between the results of the two groups. The T-value, which amounted to (8.383). Table No. (11) illustrates this:

**Table No. (11)**

"It shows the values of arithmetic means, standard deviations, t-value, degrees of freedom, and the level of significance of the difference between the experimental and control groups on the objective achievement test in the follow-up measurement"

the group	SMA	standard deviation	value (t)	degree of freedom	difference significance level
experimental group	20.71	2.81	8.383	27	The difference is significant at the 0.05. level
control group	7.8	5.40			

By comparing this value with the tabular value at the degree of freedom (27) and the level of significance (0.05) for a one-ended test of (1.703), the calculated value was greater than the tabular



value, which indicates that there are Statistically significant differences between the scores of students in the experimental group and the scores of students in the group The control group measured the follow-up, and the follow-up were recorded in favor of the experimental group, whose level of achievement in science was not significant affected a month after the end of the experiment.

### **Second: Interpretation of the results:**

The research path that the researcher made, despite her difficulties, resulted in the emergence of differences between the experimental and control groups and in favor of the experimental group that was studied using probing thinking strategies in achievement, which may be attributed to the following:

- 1- The use of probing thinking strategies helped in providing the students with capable knowledge and active participation in the classroom, which created positive trends towards follow-up of the lesson and increased class interaction.
- 2- Proper thinking helps students to organize their thoughts in a way that makes them able to find connections scientific concepts presented to them.
- 3- Also, the existence of differences between the members of the two groups and for the sake of the experimental group is due to the students' exposure to many different techniques and strategies that belong to the strategies of probing thinking, as there are many discussions taking place during the application of these strategies.
- 4- The results showed the efficiency of teaching with probing thinking strategies in raising the level of academic achievement in science subject for the research sample, and its effectiveness in increasing the students' absorption and retention of information.
- 5- The use of probing thinking strategies increases the learner's efficiency in practicing his mental operations and increasing his cognitive experiences by focusing on the learner's vitality, activity and interaction in order to build his cognitive abilities in depth by focusing on the developmental stage at this age stage.
- 6- The use of prober thinking strategies helps the learner to build his knowledge in depth through complex mental skills such as (attention, listening, perceiving, organizing, recalling and encoding previous experiences, and then recalling them when needed).

### **Third: Recommendations:**

Based on the results and conclusions of the current research, the researcher recommends the following:

- 1- Activating in-service training programs to integrate teachers in general and science teachers in particular, in training courses and qualification programmes, concerned with raising the level of teachers and raising their performance efficiency to practice the teaching process by following the strategies of probing thinking, and informing them of its advantages in raising the level of academic achievement of their students.
- 2- Issuing a (teacher's guide) for organizing science units for the sixth grade in the light of probing thinking strategies and making it accessible to science teachers.

### **Fourth: Suggestions**

- 1- In light of the positive results of the current study, the researcher suggests expanding the circle of this model by applying its strategies to other study subjects and through the different stages of education.
- 2- Conducting empirical studies to effectively cut models and other methods to teach thinking skills such as problem-solving method, critical thinking method, creative thinking method, and methods of stimulating imagination, in teaching science.

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### Supplement No. (1)

The names of the experts and arbitrators consulted by the researcher are arranged according to the scientific title

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- Prof. Dr. Ayad Ismail Saleh - University of Basra - College of Education for Human Sciences - Department of Psychological Counseling and Educational Guidance
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