

## The Effectiveness of (Predict- Observe- Explain) Strategy on the Attainment and Developing the Scientific Processes among the Female Students of Fourth Scientific class in the Subject of Biology

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The current study aims at investigating the effectiveness of ( predict- observe-explain) strategy in the attainment and developing scientific processes among the female students of the fourth scientific class in the subject of biology. The research sample consisted of (70) student in Jumana secondary school of girls selected intently. It was divided into two group (35) student in experimental, which studied biology according to the strategy( predict- observe- explain) and (35) student in the control group that studied the same material according to . The two groups were equalized in anumber of variables. An objective test consisting of (40) items of multiple-choice type was prepared . In addition, a test of scientific processes was made up of (24)items of multiple-choice type that include skills (observation, classification, measurement, inference, prediction, communication, use of numbers, use of spatial and temporal relationships). Their authenticity and reliability were confirmed . Data were treated statistically using (t-Test) of two independent samples, Holsti–equation , Person correlation coefficient and, Chi-square. The results showed that the experimental group was superior to the control group in the achievement and in the scientific processes test. The research recommended using a strategy (prediction-observation- explanation) in teaching biology in secondary school.

**Key words:** *Effectiveness, (Predict- Observe- Explain)Strategy, Scientific Processes.*

### Chapter 1: Research Problem

Many countries in the world, even developed countries, suffer from a clear decline in the teaching of science due to the focus on information as a main objective through the use of traditional methods of teaching and the failure of teachers to apply the theories of educational psychology, which necessitates helping them to apply these theories and have a basis Strong in theories of learning and strategies and teaching methods (Nasr, 1999: 66-72) is still the general philosophy of the school and the objectives of education is based on the process of transmission and communication of information rather than on the generation of knowledge, especially as scientific knowledge in science books emphasize the facts The concepts are in their final form without paying attention to the methods of obtaining them, while specialists in the field of education and teaching methods emphasize that the best way to teach and develop science lies in the use of scientific method based on research and experimentation

and the use of reason to solve problems instead of using traditional methods in teaching that leads This leads to a low level of achievement in science and leads learners to not understand scientific concepts deeply and does not link them to cosmic phenomena and save them without understanding and assimilation and bear negative attitudes towards science and their weak motivation to learn science (al-Huwaidi, 2005: 297-300) The fact that the inclusion of biology in various concepts and ideas makes it a constant need to apply methods through which the teacher can deliver the material to the learner easily and thus obtain a good education contributes to the development and prosperity of the community and its members (Druze, 2000: 34). During the researcher on the results of studies that pointed to the existence of weakness in achievement as well as the survey of the views of some supervisors and teachers of science and the researcher noted the difficulties faced by scientific materials, including biology in different educational stages and the lack of application of modern methods and methods of teaching that emphasize that the Learn is the focus of the educational process of learning, and raises his motivation towards learning, so the researcher tried experimenting strategy (prophesy - note - explain) in teaching biology for the fourth grade scientific desire to keep abreast of everything new in the field of education and teaching methods. The problem of the current research is determined by the following question: What is the effectiveness of the strategy (prophesy - note - explain) in the collection and development of science processes for fourth grade students in biology.

The importance of research: The methods of teaching are the first step in the creation of generations with the ability to creativity and discrimination, especially since the teaching of science aims to acquire learners a structured amount of information in a particular field to develop the ability of students to solve the problems associated in this area (Al Banna, 2000: 661) The current emergence of many modern philosophies that are the basis for a number of methods and strategies used in teaching, including constructivist philosophy that is concerned with the pattern of building knowledge and steps to acquire among learners and emphasize that the request for knowledge is a permanent learning, and its contribution to building their knowledge in a coherent cognitive template. It is not a set of abstract ideas about knowledge, but a realistic thought in good educational practices (Gordon, 2009: p. 39). Moreover, constructivism helps them solve problems they face in understanding difficult scientific concepts and the ability to apply and analyze scientific thinking skills and increase their educational attainment. The focus has shifted from external factors affecting student learning such as teacher variables, curriculum and pairing to focus on what is happening inside the mind of the learner when exposed to educational situations such as prior knowledge and ability to remember and process information and motivation for learning and thinking patterns and all that makes learning has Meaningful (Hossam El-Din, 2004: 62) (Zeitoun, 1988: 83-87) is a strategy (prophesy - note - interpret) and symbolized by poe)) one of the strategies that contribute to the use of structural thought in teaching, which derived from the constructivist theory that employed Several models and strategies in teaching, including: Learning Cycle Model, Concept Maps, Form V, Structural Analysis Model, Realistic Model, Collaborative Learning Strategy.

The teaching of science in the current era has received a great and continuous attention to keep pace with scientific development and the explosion of scientific knowledge, and this interest derives its origins from the nature of science and its operations as each branch of knowledge has its own nature distinguishes it from other branches of knowledge and this nature includes the structure of science, methods and processes and research methods Thinking (Zeitoun, 1999: 21) Science processes represent the gateway to success and development in scientific education and a major objective of teaching science, since scientific thinking and science processes are the basis on which the programs for the preparation of individuals and school programs after which tools to build scientific culture Inside and outside the school through which problem-solving and troubleshooting are identified (Said, 1999: 324) (Al-Balooshi, 2009: 61)

Objectives of the research: The current research aims to know: 1 - the effectiveness of the strategy (prophesy - note - interpret) in the collection of fourth grade students in biology. 2 - the effectiveness of the strategy (prophesy - note - interpret) in the development of some science processes students fourth grade scientific in biology.

Research hypotheses: 1 - There are no statistically significant differences at the level of significance ((0.05) between the average scores of the experimental group students and the average scores of the control group students in the post achievement test.

2 - There are no statistically significant differences at the level of significance ((0.05) between the average scores of the experimental group students and the average scores of the control group students in the test of the development of science operations.

**Search Limits:** The current research was limited to the following limits:

1- A sample of the fourth grade female students / Jumana secondary school for girls in Baquba district.

2 - The second semester of the academic year 2016-2017

3 - The last four semesters of the fourth grade scientific book, the fifth edition, the year 2014.

Search terms: Effectiveness: defined (Shehata & El Nagggar, 2003) as the effect of experimental treatment as an independent variable in one of the dependent variables (Shehata & El Nagggar, 2003: 203).

And defined by the researcher procedurally: as educational outputs achieved by the strategy (prophesy - note - interpret) in teaching biology to students of the experimental group.

A strategy of "prophesy - note - explain" (White & Gunstone, 1996) defined it as a method of teaching in which the student accomplishes three tasks: a justified prediction of the results of a given situation, followed by observing what is happening and then eliminating the

discrepancy between prediction and recorded observations. (291-299: p. (White & Gunstone, 1996

The researcher defines them as teaching the content of the study scheduled for the experiment according to sequential steps based on the skills of prediction, observation and interpretation. Achievement: (Obeid, 2004) defined as: the knowledge, skills, methods of thinking, and problem solving skills that learners acquire as a result of studying specific content. (Obeid, 2004: 307)

He defined him (Aderman, 2007) as: the ability to accomplish what he had gained from the educational experiences that were developed for him. (101) Aderman, 2007: p.

The researcher defines him procedurally as: the level of efficiency of the performance of the student through the information acquired for the content of the study that I learned according to strategic steps (predict - note - interpret) and measured by the student's grades in the achievement test, which is prepared for this purpose.

Science processes: known (Olimat and Abu Jalala, 2001): those processes conducted by researchers in order to access new scientific knowledge. (Olimat and Abu Galala, 2001: 209) He defined it (Najdi et al., 2002) as: the activities or practices of scientists in reaching the possible results of science on the one hand, and while judging these results on the other. (Najdi et al., 2002: 70)

The researcher defines them procedurally as: the mental practice carried out by fourth grade students using the processes of science (observation, classification, measurement, reasoning, communication, prediction, use of numbers, the use of spatial and temporal relationships) prepared as educational attitudes within the test of science processes prepared by the researcher.

## **Chapter Two: The First Axis: Theoretical Background**

Strategy (prophesy - note - interpret): The strategy (prophesy - note - interpretation) aims to identify the ideas owned by learners and encourage them to discuss, and shows their link to constructivism based on their view of learning as a process by which the learner constitutes his cognitive structure based on his previous knowledge Meaningfulness requires reviewing and correcting the knowledge that it possesses. Thus, the development of the tribal perceptions of learners is important in any approach to teaching science based on constructivist view, thus encouraging constructivist teacher to reveal the concepts held by their students, and to provide experiences They are in the construction of their current perception of the world around them (Gunstone & White, 1996: p. 291-299). The tasks involved in the prophesy, note, and interpretation strategy when used in individual or

collaborative learning help to discover and justify individual learners' ideas, especially In the prediction stage, each of them also reviewed their initial ideas, especially if the observation phase resulted in some contradiction with the predictions made by the learner. (Kearney & Treagust, 2004: p. 61) Strategic stages (prophesy - note - interpret):

- The first stage Prediction: It means the use of previous information to predict the information is not known to learners as they are required at this stage to describe the phenomenon under study and predict what happens to their previous knowledge about them and work in collaborative work teams, and here each participant in the expression (Al-Khalili et al., 1996: 265).

- The second stage Observation Observation: It is a deliberate organized and controlled attention to phenomena and events for the purpose of discovering the causes and laws, and requires planning by the learner, and need practical training by the learner using his senses or the use of different tools and devices. (Abdel-Hadi and Ayyad, 2005: 152-153) (Zeitoun, 1994: 102) At this stage, the groups are asked to carry out experiments to validate expectations. The learner will associate his expectations with direct experience. If the results are consistent with his predictions, his confidence is enhanced by his previous knowledge. If the predictions are contradictory because of the previous misconception, it leads to an intellectual disorder that leads to the modification of his misconception and its replacement with a new one.

- Phase III Explanation: At this stage groups are required to explain the results based on their previous theories, and the role of the teacher at this stage to deliver learners to the correct understanding consistent with scientific knowledge. (Khalili et al., 1996: 174)

Science processes: Classification of science processes: Educators classified science processes into several classifications, but agreed to classify them into: Basic operations included (observation, classification, measurement, communication, prediction, the use of numbers, inference, the use of spatial and temporal relationships) and integrative processes included (control Variables, procedural definition, hypothesis formulation, experimentation, graph, data interpretation, modeling, investigation). (Al-Huwaidi, 2005: 26-35)

The importance of science operations: Science processes contribute to the achievement of important goals of science education in various stages of public education, including that it gives learners a positive role in the educational process and develop a love of scientific research and reconnaissance and many scientific trends develop the capabilities of critical and innovative thinking among learners as well as gaining tendencies and interests Scientific and positive attitudes towards the environment and their improvement. (Najdi et al., 2003: 66-67)

Axis II: Previous Studies: First: Studies that dealt with the strategy (predicted - note - interpret)

1- (Al-Muhtaseb Study, 2008) The study aimed to identify the effectiveness of using the strategy (predicted - note - explain) in the acquisition of physical concepts and performance skills among students of the private University of Isra in Jordan consisted of a sample of (36) male and female students. Prepared for the purposes of the study: Testing the physical concepts and the performance skills observation card The results of the study showed that there was a statistically significant difference in both tests of acquiring physical concepts and performance skills in favor of the experimental group. (Calculated, 2008: 79-87)

2 - Study (Abu Hijleh, 2013) The study aimed to identify the impact of the model (prophesy - note - interpretation) in the achievement and treatment of alternative concepts among seventh grade students. The sample of the study consisted of (202) students (100) in the experimental group and (102) in the control group. The results showed the existence of alternative concepts in the seventh grade students about some of the concepts contained in the study content and the presence of statistically significant difference in achievement and reduce the number of alternative concepts for the benefit of the experimental group. (Abu Hijleh, 2013: RP)

3 - Study (Kabbajah, Ziad Mohammed and Mohsen Adas, 2014) The study aimed to identify the effectiveness of the use of the strategy (prophesy - note - interpretation) in the acquisition of ninth grade students of the concepts of physical. The sample of the intentional study consisted of (114) male and female students. Arithmetic averages, standard deviations and triple covariance analysis were used as statistical methods. The results of the study showed that there were statistically significant differences in favor of the experimental group and no statistically significant differences in the students' acquisition of physical concepts due to the interaction between the group and sex and the previous level of achievement in the subject of science. (Kabbajah, Ziad Mohammed and Mohsen Adas, 2014: 85-114) Balancing previous studies of the first axis:

1- The study (Al-Muhtaseb, 2008) aimed to identify the effectiveness of a strategy (prophesy, note, explain) in the acquisition of physical concepts and performance skills, while the study (Abu Hijleh, 2013) aimed to define the model (prophesy-note-interpretation) in the collection and treatment of alternative concepts The study (Kabbajah, Ziad Mohammed and Mohsen Adas, 2014) aimed to identify the effectiveness of the strategy (prophesy - note - interpret) in the acquisition of physical concepts. The present study has targeted the effectiveness of the strategy (prophesy - note - interpretation) in the achievement and development of science processes.

2 - (Al-Muhtaseb, 2008) was conducted on university students, while (Abu Hijleh, 2013) and (Kabbajah, Ziad Mohammed and Mohsen Adas, 2014) secondary school students, while the current study was conducted on the fourth scientific students (preparatory).

3- The sample size was (36) students in (Al-Muhtaseb, 2008), (202) students in (Abu Hijleh, 2013) and (114) in (Kabbajah, Ziad Mohammed and Mohsen Adas, 2014). The current sample size is (70) students.

4- Prepared in the study (Al-Muhtaseb, 2008) a test of the physical concepts and the card to observe the performance skills, while in the study (Abu Hijleh, 2013) prepared a test of prior knowledge and a post-test and a guide for the teacher and in the study (Qabaja, Ziad Mohammed and Mohsen Adas, 2014) prepared a test to acquire Physical concepts. In the present study, he prepared an achievement test and a test of science operations.

5- The results of the study (Al-Muhtaseb, 2008) showed the superiority of the experimental group in both tests of acquiring physical concepts and performance skills. The study (Abu Hijleh, 2013) showed the existence of alternative concepts for some of the concepts contained in the study content and the presence of statistically significant difference in achievement and reduce the number of alternative concepts for the benefit of the experimental group, while the study (Kabbajah, Ziad Mohammed and Mohsen Adas, 2014) showed the superiority of the experimental group in acquiring The students study the physical concepts and the absence of statistically significant differences in their acquisition attributed to the interaction between the group, sex and the previous level of achievement in the subject of science. The present study will present the results in the fourth semester.

## **Axis II: Studies Dealing With Science Processes**

1 - Study (Suwaidi, 2010) The study aimed to identify the level of mastery of the ninth grade students in the basic science operations in science subject to sex variable, the sample consisted of (100) male and female students from Yemeni schools. Data were treated statistically using the SPSS statistical program. The results of the study showed the low level of mastery of the ninth grade students for basic science operations and the absence of statistically significant differences due to sex. (Swedish, 2010: 210-230)

2- The study (Al-Harashseh, 2012) aimed to identify the impact of similar strategy in the acquisition of scientific concepts and the level of performance of basic science operations of the fifth grade pupils. Data acquisition was performed statistically using ANCOVA. The results of the study showed a statistically significant difference in achievement and in testing the basic science processes for the experimental group. (Al-Harashseh, 2012: 412-414)

3 - Study (Anzi, 2014) The study aimed to identify the availability of science processes in science books developed middle school. Prepared a list of science operations that should be available in science books and the preparation of a content analysis card in the light of science processes, consisting of (8) basic operations. The results of the study showed a convergence in the total iterations of the basic science processes in the three rows, the focus of the developed science books on the observation and conclusion processes for the basic science processes, and the processes of data interpretation, graphical and procedural definition for integrative science processes and the low level of handling of measurement and

spatial and time relations for the basic operations. And the imposition of assumptions for integrative processes. (Anzi, 2014: c)

### **Budget of the Previous Studies of the Second Axis**

1- The study (Al-Suwaidi, 2010) aimed at identifying the level of mastery of the ninth grade students in basic science operations in science. The study (Al-Harahsha, 2012) aimed at identifying the effect of similar strategy in acquiring scientific concepts and the level of performance of basic science operations while studying Al-Enezi, 2014) to know the availability of science processes in science books developed intermediate. The present study aimed to identify the effectiveness of the strategy (predicted - note - interpret) in the collection and development of science processes.

2- The study (Al-Suwaidi, 2010) targeted the seventh grade students, while the study (Al-Harahsheh, 2012) targeted the fifth grade pupils. The current study targeted the science textbook for the third grade of primary.

3 - The sample size in the study (Suwaidi, 2010) (100) male and female students in the study (Harrahshah, 2012) (64) students. The study was (Anzi, 2014) books science middle school. The current study was the science textbook for the third grade of primary.

4- Prepared in the study (Suwaidi, 2010) a measure of science processes consisting of (22) paragraphs while in the study (Harrahsha, 2012) prepared a test for the acquisition of scientific concepts and a test of the level of performance of science operations. In the study (Anzi, 2014) prepared a list of science processes that Should be available in science books and prepare a content analysis card consisting of (8) basic operations. The present study has prepared an achievement test and a test of science processes.

5 - The results of the study (Swedish, 2010) showed the low level of proficiency of ninth grade students in basic science processes and the absence of statistically significant differences attributed to sex. While the study (Al-Harahsha, 2012) showed the superiority of the experimental group in the collection and testing of basic science processes. (Al-Enezi, 2014) showed a convergence in the total iterations of the basic science processes in the three grades, and the focus of the developed science books on observation and conclusion processes for the basic science processes, and two interpretations. Data, charts, procedural definition for integrative science processes, low level of handling of measurement, space-time relationships for basic operations, and hypothesis for integrative processes. The present study will present the results in Chapter 4.

Chapter 3: Society and sample: Jumana High School for Girls was chosen in a deliberate way because the school of biology entrusted with the application of the experience is scientifically empowered, as well as the cooperation of the school administration with the researcher, the school selected two sections and the number of students (75) students, and after the exclusion of failures The sample was divided into an experimental group and a control group, each

consisting of (35) students, after ensuring that the students of the two groups are equal in a number of variables as shown in the tables below:

Table (1) test results (Ca 2) of the achievement variable for the parents of the students of the two research groups

**Table 1:** test results (Ca 2) of the achievement variable for the parents of the students of the two research groups

Judgment	Significance level	Value of Ca 2		Achievement				the group
		Tabular	Calculated	Diploma and above		is reading	Mom	
<b>Is a function</b>	<b>0.05</b>	815,7	61.3	10	05,0	And he writes	7	Experimental
				21	4	9	4	Control

**Table 2:** Test results (Ca 2) for the achievement variable for the mothers of the students of the two research groups

Judgment	Significance level	Value of Ca 2		Achievement				the group
		Tabular	Calculated	Diploma and above		is reading	Mom	
<b>Is a function</b>	<b>0.05</b>	<b>7.815</b>	<b>0.693</b>	<b>14</b>	<b>11</b>	<b>4</b>	<b>6</b>	Experimental
				<b>15</b>	<b>8</b>	<b>7</b>	<b>5</b>	Control

**Table 3:** T - test results of two independent samples according to biology subject variable in the mid - year exam

Judgment	Significance level	T value		Standard Deviation	Mean Arithmetic	Number	the group
		Tabular	Calculated				
<b>Is a function</b>	<b>0.05</b>	<b>2.000</b>	<b>0.344</b>	<b>10.788</b>	<b>67.961</b>	<b>35</b>	Experimental
				<b>15.271</b>	<b>69.057</b>	<b>35</b>	Control

**Table 4:** T - test results of two independent samples according to intelligence variable

Judgment	Significance level	T value		Standard Deviation	Mean Arithmetic	Number	the group
		Tabular	Calculated				
Is a function	0.05	2.000	1.926	8.760	23.500	35	Experimental
				10.427	27.971	35	Control

**Table 5:** T - test for two independent samples according to the age variable in months

Judgment	Significance level	T value		Standard Deviation	Mean Arithmetic	Number	the group
		Tabular	Calculated				
There is a statistically significant difference	0.05	2.68	1.90	43.07	187.885	35	Experimental
				54.623	191.057	35	Control

Research Material: Determination of scientific material: The scientific material to be taught from the book of Biology (fifth edition 2014) to be taught for the fourth grade of the scientific year 2016-2017, and includes the last four chapters and specify the concepts of those chapters in table (5) below:

**Table 6:** The content of the last four chapters of the book of biology of the fourth scientific

Subject	the classroom
Adaptation of the plant to the environment	VIII
Adaptation of animals and plants to lifestyles in the environment	Ninth
Relationships between living organisms, behavior and environmental succession	The tenth
Environmental pollution	eleventh

Determining the behavioral objectives: The researcher formulated the behavioral objectives table (6) according to the first three levels of the Bloom classification (remember, comprehension, application, analysis) in order to be adopted in the teaching plans of the two research groups and in the construction of the paragraphs of achievement test has been presented to a group of experts in methods Teaching to reflect their opinion on them and their

compatibility with the content of the article and in the light of their views and proposals have been modified.

**Table 7:** shows the behavioral objectives distributed over the last four chapters of the book of biology of the fourth scientific and according to the first four levels of the classification Bloom

Total	analyzing	Implementation	Understanding	remember	Objectives seasons
62	9	8	20	25	VIII
27	3	3	10	11	Ninth
42	7	7	13	15	The tenth
44	7	6	15	16	eleventh
175	26	24	58	67	Total

Preparation of Study Plans: The teaching plans were prepared according to the strategy (prophesy - note - interpretation) to teach the experimental group and commensurate with the behavioral purposes for each lesson. Also, the teaching plans were developed for the same classes to teach the control group in the usual way (3). Models of teaching plans were presented to a group of arbitrators and specialists (Appendix 4) to ensure their suitability and measurement of the objectives formulated and in the light of their opinions and proposals were amended to be finalized and the rest of the teaching plans were prepared.

Research Tools: 1- Achievement Test: The Achievement Test aims to measure the achievement of fourth grade students in biology. The final test consists of (40) items of multiple choice mode (1). Of the experts and specialists in the methods of teaching, measurement and evaluation Appendix (4) to benefit from their views and observations. All paragraphs were considered valid after making some amendments to it and adopted the rate of 80% or more criterion for the validity of paragraphs.

Statistical analysis sample: For the purpose of checking the psychometric characteristics of the test paragraphs and to identify the clarity of its paragraphs and instructions and calculating the time taken to answer by the students, the test was applied to a sample of (50) female students of the fourth grade in the secondary school Adnaniya for girls, and it was found through the application The test instructions were clear, the time taken to answer all paragraphs was (40) minutes, and the coefficients of difficulty, differentiation and effectiveness of alternatives were found in order (0.59, 0.54, negative value) and all values were within acceptable range so all test items were retained.

Stability of the test: The stability coefficient of internal consistency was calculated using the Koder-Richardson method and its value was (80) 0, which is a good correlation coefficient.

2 - Testing the processes of science: To achieve the goal of the second research (measurement of science processes in the research sample) prepared a test of science processes consisting of (24) paragraph of the type of multiple choice after reviewing the literature and previous studies as its paragraphs were distributed equally on the basic science processes A science process took three test paragraphs and four alternatives for each paragraph. The test paragraphs were presented in their preliminary form to a number of experts and specialists in the field of teaching methods and educational psychology (Appendix 4) for their views on the soundness and appropriateness of the paragraphs. In light of this, a set of test paragraphs have been amended, thus making the science operations test valid

Statistical analysis sample: For the purpose of checking the psychometric characteristics of the test items and to identify the clarity of the paragraphs and instructions, the test was applied to a sample of (50) fourth grade female students in Adnaniya secondary school for girls. (0.52, negative value) within the acceptable range, thus retaining all test items.

The stability of the test: The stability of the test of the science processes was found using the Koder Richardson equation.

Statistical means: - Equations of coefficients of difficulty and the power of discrimination and the effectiveness of alternatives. Coder-Richardson equation - T-test of two independent samples - Pearson correlation coefficient - Holste equation.

#### Chapter 4: Chapter 4 Deals With the Presentation and Interpretation of Results

First: Presentation of the results: a- For the purpose of verifying the first research hypothesis which states that (there are no statistically significant differences between the average scores of the experimental group students and the average scores of the control group students in the post-achievement test), the arithmetic mean and the standard deviation of the scores of both groups were calculated. Experimental and control in the post-achievement test, as shown in the table below:

**Table 8:** Test (C) for the differences between the mean of the experimental and control groups in the achievement test

Judgment	T value		df	Standard Deviation	Mean Arithmetic	Number	the group
	Tabular	Calculated					
<b>Statistically</b>	<b>2,000</b>	<b>4.793</b>	<b>68</b>	<b>7.182</b>	<b>33.314</b>	<b>35</b>	Experimental

<b>function</b>				<b>26.983</b>	<b>26.085</b>	<b>35</b>	Control
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The above table shows that the mean scores of the experimental group students (33.314), while the average scores of the students of the control group (26.085) and applying the T-test equation for two independent samples, the calculated T value is (4,793) which is greater than the tabular value of (0002.) At the level of significance (050.) therefore reject the first zero hypothesis, that is, there are significant differences between the two groups in the average scores for the benefit of the experimental group studied according to the strategy (prophesy - note - interpret).

B- For the purpose of verifying the second research hypothesis which states that (there are no statistically significant differences between the average scores of the experimental group students and the average of the students of the control group in the science operations test), the arithmetic mean and the standard deviation of the scores of both the experimental and control groups in the test were calculated. Science processes, as shown in the table below:

**Table 9:** Test (C) for the differences between the averages of the experimental and control groups in the science operations test

Judgment	T value		df	Standard Deviation	Mean Arithmetic	Number	the group
	Tabular	Calculated					
<b>Statistically function</b>	<b>2.000</b>	<b>5.17</b>	<b>68</b>	<b>4.75</b>	<b>22.69</b>	<b>35</b>	Experimental
				<b>6.42</b>	<b>16.000</b>	<b>35</b>	Control

The above table shows that the average scores of the experimental group students (22.69), while the average scores of the students of the control group (00016.) By applying the T-test equation for two independent samples, the calculated T value was (5.17) which is greater than the tabular value of (0002.) at Significance level (050.) Therefore rejects the first zero hypothesis, that is, there are statistically significant differences between the two groups in the average scores for the benefit of the experimental group studied according to the strategy (predicted - note - interpret).

Second: Interpretation of Results: 1- Results related to the first research objective: Teaching according to the strategy (prophesy - note - interpret) provides an opportunity to learn from peers with different levels of achievement in small groups, mixed cooperative groups are an important factor in giving the best results to learners and achieve Higher levels of cognitive thinking and more effective learning (Graham, 1997: p.149). Giving students an opportunity to analyze the work compared to what they expected and observed while giving the reason contributed to a proper understanding of the content of the study and make the student more

interactive and consistent with the subject and the course of the lesson. Reflected positively on Heselha school districts in the material. However, the problem with working on this strategy is that the common views among students have been formed in the past due to the prediction of several situations and events, which makes the process of eliminating the discrepancy between students' predictions and observations is not an easy issue, so it is assumed that more experiments and tasks are proposed From the teacher (Pabellon, 2005: p.15) This result is consistent with the results of the study of each (Kabbajah, Ziad Mohammed and Adass, Mohsen, 2014) and (Abu Hijleh, 2013) and (Al-Muhtaseb, 2008).

2 - Results related to the second research goal: Teaching according to the strategy (prophesy - note - interpret) contributed to the development of science processes due to the inclusion of the strategy of some skills of science operations such as prediction, observation and interpretation, which encouraged students to use their parents from previous experiences in new learning. As well as the practice of students of science processes included in the strategy (prophesy - note - interpret) make students in their groups in a state of competition among themselves and eager to know the results of what they predict it, by observing what happens during their activities and reach the pleasure of competition in learning when students interpret By guiding the school what they have observed and by linking it to reality and the realization of the learner meaning that learning becomes meaningful. The results of the current research are consistent with those of Al-Harahsheh, 2012 and Al-Enezi, 2014.

**Chapter Five: First: Conclusions: In the light of the results of the research, he concluded the following:**

1. The effectiveness of a strategy (predicted - note - interpret) in the collection of fourth grade students in the subject of biology.

2. The possibility of applying a strategy (prophesy - note - interpret) in teaching biology for the fourth grade scientific 3. The effectiveness of strategy (prophesy - note - interpret) in the development of science processes in teaching biology for the fourth grade of science.

Second: Recommendations: In the light of the research results I recommend the following:

1. Holding training courses for teachers of biology for the preparatory stage to train them on the use of modern models and strategies in teaching, including strategy (prophesy - note - interpret).

2. Creating a suitable educational environment for teaching biology in secondary schools, including educational devices and means to facilitate the application of modern teaching models and strategies in general and the strategy of (prophesy, note, interpret) in particular.

Third. Proposals: To complement the current research, the researcher proposes the following:

1. Conduct a study similar to the current research for other stages of study and other subjects.

2. Conducting a study similar to the current research with other dependent variables such as: scientific thinking, life skills, knowledge economy.

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