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THE EFFECT OF USING OPEN-ENDED ORAL QUESTIONS ON THE ACADEMIC ACHIEVEMENT OF PHYSICS FOR FOURTH-GRADE STUDENTS AND THEIR CREATIVE THINKING

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ABSTRACT

The current research aims to identify (the effect of open-ended oral questions on achievement and creative thinking) for the academic year (2019-2020) for students of the fourth grade of science at Fatima Al-Zahra High School for Girls in Anbar Governorate. It consisted of (50) items of a multiple-type test, and theresearchers adopted the two researcher's creative thinking test (Khairallah, 1975).

The results of the study showed the superiority of the experimental group over the control group in achievement and creative thinking. In light of these results, the researcher recommended that physics teachers should pay attention to open-ended oral questions and limit the use of closed-ended oral questions.

The Research problem

This daily increasing development affects all aspects of a person's life, thus changing the mentalities, strategies and methods of teaching and thinking, which brought about an important change in their goals, this calls on educational institutions to take their role in

facing the various challenges of all societal institutions, including educational ones, and their process of continuous change (Adair, 2018). Educational institutions are working hard to face this change and the consequent obstacles that did not exist before and the need appeared. The diamond is to think of new, non-traditional strategies. As for the negative attitude towards all aspects of life, it lags behind and its level is low.

Therefore, the educational goal has become not limited to providing students with knowledge and known facts, but rather to how to increase their ability to think and provide them with skills in how to deal with all this broad and accurate information step by step, and it has to update and develop curricula and teaching strategies become necessary to achieve real learning. The meaningful one (Khawaldeh, 2012). physics is one of the important subjects in general education that needs attention Large, and it is one of the mainstays of any scientific progress, It is one of the most important and vital study materials because it contains the knowledge and skills that help students to think properly to face different situations, as it occupies a prominent place among other school subjects for several considerations. Most importantly, its study contributes to the development of multiple types of thinking and the mental abilities of its students and gives them some physical skills that help them study other materials, as well as their direct or indirect applications in different life situations (Mason & at.al. 2010 Nevertheless, physics suffers from weakness in its achievement, especially (the fourth scientific grade).). Physics is one of the most important study subjects in our era, as it is the science on which other sciences are based, and it represents the summit of abstract thinking that transforms sciences into symbols and symbolic relationships. And the various fields of knowledge that contribute to building human civilization, so physics is taught in public education with no less than three lessons per week (Al-Kubaisi and Awad, 2011).

the two two researchers have noticed during their frequent visits to a number of male and female teachers for the subject of physics and many of them do not prepare the questions in advance and leave them to chance and spontaneity so that they come according to the course of things or based on the questions received from the students, and they do not use them. To an adequate degree, it is used to emphasize the simple, superficial information that does not deserve this attention and regarding creative thinking. This type of thinking needs well-prepared teachers that qualify them to deal with this pattern of thinking at various levels of education, and it also needs an educational environment that achieves a balance between indoctrination. And spontaneity, between stimulating the ability to achieve and succeed, and stimulating creativity and self-confidence (Ibrahim, 1988, p. 254) and the current research wants to arouse the attention of physics teachers to some methods that can contribute to stimulating creative thinking

The Importance of Research

The importance of research:. The question and methods of investigation are among the necessary requirements for developing thinking skills, and due to their importance in all school subjects, their importance for the Arabic language lessons is more, because these materials are full of many experiences that carry different perspectives in their interpretation and analysis. Students can be taught the art of questioning if the appropriate classroom climate is available from: -

1. The patient teacher who gives the students enough time to formulate their questions.

2. The teacher who does not allow sarcasm or underestimation of questions or ideas that lack eloquence.

3. Accept strange questions or ideas for discussion.

4. Accepting and encouraging the spirit of fun.

5. The teacher's vitality and presence at every question.

6. Reviewing the types of questions that he addresses to students, and he may need to pause with himself to evaluate his questions and amend them, if he is concerned with developing the creative thinking of his students. (Jarwan, 1998, pp. 339-400)

From the foregoing, the importance of the current research is reflected in the following:
1- The study dealt with the impact of the quality of open-ended classroom questions on achievement and the development of creative thinking, and this study integrates with its predecessor in drawing the attention of workers in the educational field, including physics teachers, supervisors and authors of its books, to the importance of this area, which they should pay more attention to than in the field of rote education. We, through the field of creative thinking, develop a culture of thinking that makes the educated student and society happy through the contributions of his creative children.

2- The field of creative thinking is one of the important educational fields that should have a sufficient degree of study and research due to the importance of this field in building citizenship

3- The results of this study may benefit those in charge of preparing physics teacher programs and draw their attention to the importance of paying attention to this field and giving it the importance it deserves.

4- Knowing the relationship between creativity and achievement and open-ended oral questions can contribute to achieving new goals or draw attention to these new goals. Hence the importance of the current study.

Research objectives:

The current research aims to:

1- Knowing the effect of using open-ended oral questions on the achievement of fourth-grade students of science in the subject of Physics.

2- Knowing the effect of using open-ended oral questions on the level of creative thinking of fourth-grade students of science in the subject of Physics.

3- Knowing the nature of the relationship between achievement and the level of their creative thinking among fourth-grade students.

research assumes :

1- There are no statistically significant differences between the achievement of students who studied with open-ended oral questions, and the achievement of students who studied in the traditional method in the physics teaching course at a significance level (0.05).

2- There are no statistically significant differences in the level of creative thinking among students who studied with open-ended oral questions. Female students who studied in the traditional way, in the physics teaching course at a significance level (0.05).

3- There is no statistically significant correlation between fourth-grade students 'scientific achievement and their creative thinking level at a significance level (0.05).

Search Limits

- Fourth graders of science at Fatima Al Zahraa High School in Anbar Governorate for the academic year 2019-2020.

The first four semesters of Physics.

Search terms:

First: Collection

- "Qawrah" defines it as (the student's achievement in a specific subject, and a group of study subjects amounting to degrees) (Qurah, 1970, p. 5)

- "Sane" defines it as "a level of tool or proficiency in school or academic work evaluated by teachers or by standardized tests) (Aqil, 1971, p. 5).

Procedural definition of collection

As for the procedural definition of achievement for the current study, it can be defined as the extent to which fifth-grade literary comprehension of the history subject of what they have studied or learned from certain experiences, which has been presented to them in the History Teaching Methods course, based on the scores they obtain in the post-achievement test assigned to the research.

Second: Open-ended questions

- Zaytoun knows it: as (questions that have many different answers, and lead to reaching various individual answers) (Zaitoun, 1999, p. 249).

- And "Mahmoud" defines it as "questions that allow multiple acceptable answers that reach to stimulate students' thinking and creativity) (Mahmoud, 1996, p. 43).

- Howeidi defined it as (questions that require higher thinking skills from the student, such as analysis, synthesis and evaluation, and have more than one answered shouting) (Howeidi, 2002, p. 112).

Third: Creative Thinking

Khairallah 1981 defines it as the learner's ability to produce productively characterized by the greatest ability of intellectual fluency, automatic flexibility, originality and distant repercussions as a response to a problem or an exciting situation (Khairallah, 1981: 178)

- Adas 1996 as the thinking through which we reach new ideas and results that no one has previously reached by the creative person with independent thinking (Adas, 1996: 33)

- Torrance 200 defined it as a process in which the educated individual becomes sensitive to problems and thus is the process of realizing gaps, imbalance in information, missing elements, and inconsistency for which there is no educated solution, then searching for evidence and indicators in the situation and what information the individual has, making hypotheses about it and testing the validity of these assumptions and linking Show the results and perhaps make adjustments and re-test the hypotheses, and then present his results at the end of the matter (Al-Mutababa, 200: 72)

- Procedural definition: It is the ability of fifth-grade literary students to produce a product that is distinguished by fluency, flexibility and originality, and is measured by the student's overall grades on the Torrance Test for Creative Thinking Verbal Picture (A)

Procedural definition

It is the method used by the two researcher in teaching the experimental group relied upon as the focus of the educational process, and on closed questions that the textbook is a source for, and in which the student is a future of knowledge not participating in its manufacture or production.

Natri framework and previous studies

First: A theoretical framework / questions: Questions are one of the basic skills in the teaching process, and they constitute a large part of the learning and teaching process,

Benefits of Questions

Questions are the focus of classroom teaching activity and a driving force for it towards its goals and have many benefits that can be summarized as follows:

1- Assist the teacher in revealing the amount of facts and information that students know that constitute their knowledge balance before the lesson.

2- Assisting the teacher to involve the largest number of students in the lesson and to develop cooperation between them on the one hand, and between them and the teacher on the other hand.

3- The teacher achieves his evaluation goals to uncover students' weaknesses, the difficulties of his work, and the weakness of his teaching methods and methods.

4- It develops among students peaceful attitudes towards life and change and the desire for research.

5- Students are encouraged to discuss.

6 - Students' attention is directed to the important parts of the lesson with questions that require careful thought and careful response.

7 - It is useful for students to review and repeat, with the aim of fixing facts and concepts in their minds.

8- Examining students ’level of understanding of the learning subject and the validity of their knowledge about it.

9 - Get students to apply their information and link it to the new lesson - the goal of learning -.

10- Assign students to critically and comprehensively analyze texts and ideas.

11- Provide students with feedback on correct and wrong answers. (Muhammad, 1991, p. 148)

12 - Directing students to appreciate materials, ideas and people and provide them with opportunities to practice making their own judgments. (Jaber, 1967, pp. 134-136), (Al-Yaseen, 1974, pp. 90-93).

Questions Objectives

1- Social goals: These are those related to students, their personal status, their relationships with their colleagues, and to confirm and strengthen the social relationship between them and their teachers.

2- Psychological goals: This type of question is concerned with confirming students' self-confidence, work, topics, tendencies and attitudes, and encouraging them to speak out and disclose their views on an issue or a specific situation, and the teacher's goal is to strengthen students and strengthen their feelings and push them to contribute positively to the lesson and create a healthy atmosphere of emotional relationships And the academy. (Al-Samaritan, 1994, pp. 134-135)

3- Educational goals: The questions are divided according to their purpose on:

A- Learning questions characterized by the following:

1- Leads the learner to discover the principles, rules and concepts of the learning topic.

2- They can be modified and adapted according to students' needs and preparations.

3- Assist the teacher in analyzing students' mistakes and their weaknesses, in order to try to correct them.

B- Evaluation questions characterized by the following:

1- It is used at the end of the teaching process to measure students ’learning.

2- Demonstrate students' learning of principles and facts.

3- Assist the teacher to know the students ’mistakes, to determine their abilities and equipment for the year.

4- It has great value in programs aimed at knowing the needs and needs of students. (Muhammad, 1991, p. 149).

• Principles in asking questions

1- The correlation of the level of the questions with the subject of teaching and the students ’realistic experiences, which guarantees their success and increases their educational outcomes.

2- Focusing on the most important matters, experiences and knowledge when asked, not focusing on their margins.

3- The equitable distribution of questions to students enables each of them to participate, give and participate in classroom education

4- Asking an appropriate number of questions in the lesson opens horizons for students to think properly and to give rational answers

5- Not referring or hinting directly to the intended answer in the question prompts students to think seriously and work productively, and instills in them confidence in their own ability to give.

6- Giving students the opportunity to think after asking the question and the second before moving on to another question, so that the previous one takes a truth from the mature conscious answer.

7 - Asking questions directly after each educational paragraph, to achieve more learning and remembering the subject

8- Directing questions to raise the attention of some students and return them to the lesson and participate in various activities

9- Clarity of the questions using correct Arabic in grammar and morphology achieves a direct answer without speculation or hesitation

10 - Accustom the students to the accuracy of listening to the classmate's answer and to avoid judging him quickly

11- Choosing the student who answers with a name strengthens the relationship between the teacher and his students and reveals his interest in them (Saad, 1990: 139)

Second / Creative thinking: it is difficult to define creative thinking in specific words, as we cannot define Poetry, beauty, genius, and other great concepts, so thinking is defined as the willingness and ability to produce something new, or that it is a process through which the product is achieved, or that it is a new solution to a problem, or that it is the

realization of a new and valuable production for the sake of society and there are those who believe that there are basic factors Independent of the creative ability, without which we cannot talk about the existence of creativity, the most important of which are:

Fluency: that is, the ability to produce the largest number of creative ideas in a relatively short time. The creative person has a high degree of fluidity of ideas and the ease of generating them and their flow completely freely in light of a number of related ideas

Flexibility The ability to change the state of mind by changing the situation and this is evident among the geniuses who innovate in more than one field or form, especially among the artists and writers who succeed in various creative fields and are not limited to one frame

• Sensitivity to problems. A creative person has the ability to see many problems in one situation, so he feels the problems sensitively.

Authenticity is the skill that is used in order to think in unusual or unique ways and responses, meaning that the creator does not repeat the ideas of others, so they form new ideas and deviate from what is common or traditional

• Maintaining and continuing the trend, as the creator has the ability to focus on a specific goal and to overcome any obstacles and distractions that keep him away from him.

Characteristics of creative thinking:

It is a mental process, not mental production

- It aims to achieve the benefit of the individual or society

- It is a process that leads to the production of new, different and distinct things that are unique to the creative person, whether these things are in verbal, sensory or sample form

Creative thinking comes from starting thinking, but coherence and the ability to solve ordinary problems come from limited thinking

Creativity is one of the methods of human thinking and not a synonym for intelligence, which includes mental capabilities added to thinking

- Creative thinking qualitative thinking, meaning that it is related to magazines, there is verbal creativity and the creativity of a photographer, artistic or musical

The ability to acquire creative thinking depends on the individual's ability to acquire information that is acceptable to him

- Creative ability is one of the forms of imagination controlled in one of the artistic, literary, musical or abstract fields, such as drawing a beautiful painting or producing a new musical piece (Al-Samir, 2003: 18).

• previous studies

- A study on 1997: The study was conducted with the aim of identifying the effect of diversity in methods of asking questions in the classroom in the subject of psychology at the secondary stage on students 'achievement and their attitudes towards the subject and their love for curiosity. The study sample was distributed to three groups. The pupils participate with the teacher in asking questions, and the third is in which the pupils ask questions, and the teacher is only receiving them. The results showed that asking questions led to the growth of academic achievement among the students more than other methods of asking questions (Ali, 1997: 118).

- Study Saqr Study 200: The study aimed to reveal the effectiveness of using questions of higher levels of knowledge in teaching on the development of achievement and critical thinking among third-grade students in the subject of physics. The study sample consisted of 80 students divided into two groups, a control group, which was taught using the teacher's guide. Prepared by the prevailing traditional method and without asking questions of higher levels of knowledge for students, and the results showed that the experimental group was better in achievement and critical thinking than the control group, as well as showed a statistically significant correlation between critical thinking and achievement in the subject of physics (Saqr, 200: 64).

- Quality study 2019: The study aimed to identify the effect of open-ended oral questions on achievement and creative thinking among students of the Department of Arabic Language at the College of Education. The research sample consisted of (100) students who were randomly assigned to two groups. The experimental group studied with open-ended oral questions and the control one. It was studied in the usual way, and to verify the validity of the research hypotheses, the two researcher relied on two achievement test tools prepared by the two researcher consisting of 50 items of a type of multiple choice and the Torrance Test tool for creative thinking in its verbal form. The results showed the superiority of the experimental group over the control group in achievement and creative thinking and to the absence of a correlational relationship Statistical significance between achievement and creative thinking, and in light of the research results, the two researcher recommended that Arabic teachers should pay attention to open-ended questions and limit the use of closed-ended oral questions. (Quality: 2019,224)

Search Procedures

Experimental design: The two researchers adopted the experimental design with partial control and post-test for two equivalent experimental and control groups, Table (1).

Table 1. Search Procedures

The Group	Independent Variable	Dependent Variable
Experimental	Open-ended questions	Collection
Control	Normal Method	Creative Thinking

The research sample: The research sample consisted of 68 female students distributed randomly into two groups of 30 students for each group, and (5) female students were

excluded from the experimental group and (3) female students for the control group for not adhering to the time schedule (2).

Table 2. Study time Schedule.

The Number of Students After Exclusion	The Number of Students Excluded	The Number of Students Before Exclusion	Group	The Group
30	5	35	A	Experimental
30	3	33	B	Control
60	8	68		Total

Equivalence of the sample (the two groups of research): researcher carried out some equivalence measures between the two groups, namely (intelligence, previous achievement) Table (3).

Formulation of behavioral goals:
after the two researchers familiarized themselves with the general and special educational goals of physics for the fourth scientific grade, they derived a number of behavioral objectives in the study subject, and the number reached (160) objectives. The percentage of agreement between them was based on (80%) or more according to Cooper's equation, and in light of their opinions and observations some of the objectives were reformulated and the level they measured was amended and the objectives were kept in their final form on (160) behavioral objectives, Table (4) and all of them were included in the daily teaching plans

Table 4.

The Classroom	Memory	Comprehension	Application	Analysis	Meta	Total
The First	9	7	8	9	2	35
The Second	18	28	8	7	4	65
The Third	8	13	6	2	3	32
The Fourth	13	10	3	1	1	28
Total	48	58	25	19	10	160

The daily teaching sequence: The two researchers in the teaching department prepared the research.
The two search tools: construct the achievement test
- Preparation of the test map (specification table): the specification table for each chapter of the book, as in Table (5)
Specifications table for the achievement test (test map).

Table 5.

Weighing behavioral purposes			Weighing behavioral purposes		100%	100%	100%	Weighing behavioral purposes
Topic	The number of classes	percentage	To Remember					
chapter one	8	22%	3	3	1	1	1	9
Chapter II	10	27%	3	4	2	1	1	11
Chapter III	14	38%	4	5	2	2	1	14
the fourth chapter	5	13%	2	2	1	1	0	6
Total	37	100%	12	14	6	5	3	40

The second tool: the creative thinking test: The two researchers looked at many tests to measure the creative thinking of the research sample, and adopted the Torrance test for creative thinking modified on the Arab environment by (Khairallah, 1975) in measuring creative thinking, for the following reasons:

- Suitable for the Arab environment
- Valid for the academic stage

It is used by most researchers in measuring creative thinking skills. It consists of twelve tests distributed in three batteries: the verbal battery, the formal or pictorial battery, and the audio battery. Experts and specialists in measurement and evaluation, educational psychology and methods of teaching science, and the two researchers adopted an 80% agreement of the arbitrators' opinions, as shown in the table showing an accurate description of the illustrated battery.

Table 6. Pictured battery description.

Figure	**Examination (Student)**	**Skills**	**Time Taken**
The Shape	Build An Image	Fluency, Flexibility, Authenticity	10 Minutes
Black Shaded Curve	Complete The Missing Shapes	Fluency, Flexibility, Authenticity	Minutes 10
Missing Lines And Shapes	Create Themes	Fluency, Flexibility, Authenticity	Minutes 10

Circles	Examination (Student)

The researcher have adopted the three skills (fluency, flexibility and originality) especially that there is near consensus by two researchers and educators on these skills as basic components of creative thinking, as fluency represents the quantitative aspect of it, i.e. the multiplicity of ideas or the calling of the largest possible number of appropriate responses towards a specific problem in a period of time. A specific time, and flexibility represents the qualitative aspect of it, i.e. the diversity or difference of ideas that the student brings, and the originality that is, the renewal or the isolation of the ideas that the student brings in comparison with the ideas of his colleagues.

- Validity of the test: To ensure the validity of the test, the two researchers decided to present it to a group of arbitrators and experts who supported the validity of its use in measuring the creative thinking of the students of the research sample.
- The first exploratory application of the test

To verify the clarity of his instructions and paragraphs and the method of answering them, the two two researchers applied the test to a random sample of (30) female students from Al-Khalediah Secondary School for Girls.

- The second exploratory application of the test: the test was applied to a second exploratory sample, other than the research sample, consisting of (50) female students from HalabintKhuwailid high school, in order to calculate:
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Test correction: The test was corrected according to its components, which are:

1 - The degree of fluency: It is measured by the student's ability to mention the largest number of appropriate answers, as the two two researchers gave one score for each answer.

2 - The degree of flexibility: It is measured by the student's ability to vary the appropriate answers, as the greater the number of various answers, the greater the degree of flexibility.

3- Authenticity: It is measured by the student’s ability to mention answers that are not common among the students ’answers. The idea is original if its statistical frequency is little. (Al-Zayat, 2009: 216)

• Torrance has put the percentages to estimate originality, as shown in Table (7).

Repetition percentage	degree of authenticity
less than 20%	4
20 – 40	3
41 – 60	2
61 – 80	1
81 and over	zero

(Torrance,1974:55)

And since every creative idea, regardless of the degree of its frequency, expresses the ability to think creatively in the sense that there is no zero, so the two researcher (KhairallahSayyid) referred to in (Abu Jadu and Muhammad, 2007)

Amending the estimate as follows, as shown in Table (8).

Estimate degrees of originality.

The percentage of repetition of the idea	the degree of originality
Less than 20% 5	5
% 40 -20	4
% 60 -41	3
% 80 -61	2
%100-81	1

(Abu Jadu and Muhammad, 2007: 221)

Thus, the total score of the student on the test is measured by the sum of the degrees of fluency, flexibility and originality in the test units.

Presentation and interpretation of results

The first hypothesis.Table (9)

Degree of Freedom	Standard Deviation	Arithmetic Mean	Number of Students	Group	T-Calculated	Tabular	-Value Statistical Significance at A Level (0,05)
Empirical	30	72,30	12,44	58	241	2	Function
Control	30	63,73	14,91				

In light of this result, the first null hypothesis is rejected, which

indicates that the method adopted for teaching open-ended oral questions is better than the usual method based on closed-answer questions in achievement. Table (9) This can be explained by the nature of open-ended oral questions that motivate students to study the material in a form. It is good to understand this material and express it in various forms, as well as to enrich and expand the information of the book.

Students' perceptions and encouragement to practice higher mental processes that make them seekers of knowledge and innovators for it, as it requires divergent thinking that leads to active interaction and fruitful cooperation between learners. This result was in agreement with Saqr and Ali's study, which all indicated the effectiveness of open-ended questions at higher levels in increasing the level of achievement.

The second hypothesis: Table (10)

Group	Standard Deviation	Arithmetic Mean	Number of Students	Degree of Freedom	T-Value Calculated	Tabular	Statistical Significance at A Level (0,05)
Empirical	30	77,96	12,78	58	2,89	2	2 Function
Control	30	66,40	17,72				

The results presented in Table (10) above showed that there is a statistically significant difference between the two groups in favor of the creative thinking of the open-ended group of questions, and therefore it rejects the second null hypothesis. Thinking of any kind.

The third hypothesis: Table (11)

Correlation Value	T-Value, Computation	Tabular T-Value,	Statistical Significance
0,139	1,39	2	non-significant

The third hypothesis: The results presented in the table indicated that there was no statistically significant correlation between the fourth students 'academic achievement and their level of creative thinking. The result could be explained by relying on Taylor's point of view, as he says that efficiency in school information is not sufficient to be a condition for achieving creativity, as it was found through his study of some Creative scholars that the correlation is weak between their achievement and their scientific production (Saad, 1992: 197). This result did not agree with the results of Saqr's study, which indicated that there is a positive correlation between achievement and creativity. Table (11).

Recommendations

- The necessity for physics teachers to pay attention to open-ended oral questions and to limit the use of closed-ended oral questions

The need to give the educated women freedom to express their ideas with the utmost courage, as tolerance and flexibility are the basis for nurturing and encouraging creative thinking in contrast to the forced atmosphere that kills creativity and prevents its appearance

- The necessity to accept the ideas of students, no matter how trivial or absurd they seem, because the creative ideas produced by creative people were strange and naive in the beginning.

- The need to pay attention to the development of creative thinking among the learners because the interest in this type of thinking serves the learner and thus serves creativity through the new and original ideas that come with it, as the future of the state depends on its children, and whenever these creative people contribute to its renaissance and development

Teachers should pay attention to the fact that school information sourced from established textbooks is not sufficient by itself to be a condition for achieving creativity. Rather, creativity is achieved through the multiplicity of its sources and the diversity of its development methods.

Proposals

- Conducting a study similar to the current study on other variables.

- Conducting a study similar to the current study in other stages of study and on different study subjects.

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