

## **Level of Contribution of Physics Teachers in Developing the Skills of Scientific and Creative Thinking of Applied Preparatory Stage Students**

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### **- Abstract**

The research aims to investigate (Level Of Contribution Of Physics Teachers In Developing The Skills Of Scientific And Creative Thinking Of Applied Preparatory Stage Students) by answering the following two questions:

- 1- What is the level of the contribution of physics teachers in developing scientific thinking skills among applied preparatory students?
- 2- What is the level of the contribution of physics teachers in developing creative thinking skills of applied Preparatory students?

The researchers used the descriptive analytical approach, the research community consisted of all students of the applied preparatory stage in the General Directorate of Education in Thi Qar Governorate for the academic year (2018-2019) numbering (927) male and female students, and the research sample consisted of all applied Preparatory students in the departments of education (Al-Shatrah, Al-Rifai, and Qala'at Suker), whose number is (654).

The researchers built and applied the scale (scientific thinking skills, creative thinking skills) after they were presented to experts and specialists in the field of education, psychology, measurement and teaching methods. The results showed that the level of the contribution of physics teachers to the development of scientific thinking skills, with (51) items that were of an mean level with an mean (3,11) and a standard deviation (0,90). As for the second question, the results showed that the level of the contribution of physics teachers in developing creative thinking skills, with (67) items, the mean score was (3.03) and a standard deviation (0,87). In light of the research results, the researchers reached a number of conclusions, the most important of which are : Incorporation of thinking skills in the academic content contributes effectively to improving students' thinking. In light of these results, the researchers recommended: Urging students to generate creative ideas by looking at the problem from different perspectives.

**Key Words:** Physics Teachers, Skills, Creative Thinking, Scientific Thinking.

## **Chapter One / General Research Framework**

### **- The Research Introduction**

Education is an inseparable twin, one of which complements the other, and it is one of the acquired components of the learner and thus this reflects positively on his personality; Because education and its priorities remain more important than education, and the responsibility of modern education cannot be limited to one team or institution, whether it is a teacher or an educational institution (Hallaq, 2011: 14), so it has become one of the most important goals of modern education to teach learners how to think, how to infer and how they face problems Their lives are to be enjoyed in school, but also outside it, and education scholars believe that thinking can be developed and trained in it, as there are many means and programs available for its activation and development (Shakshak, 2008: 60). Teaching thinking is a necessity imposed by the current era, and education of thinking skills has become a response to the requirements of facing the challenges of globalization and its manifestations In various aspects of the life of societies (Katame, 2003: 70).

Given the importance of physics, developed countries have noticed the need to reinforce this science in the hearts of learners, and therefore they have worked hard to find the best way to transfer this science from one generation to another in order to keep pace and communicate and prepare scientists who contribute to more scientific discoveries, and physics is one of the most important scientific materials The basic stage of the preparatory stage, in addition to its usefulness in achieving general goals for teaching science such as developing scientific and creative thinking, it aims to help learners to understand the natural phenomena surrounding it, and to study scientific laws that express the relationships between these phenomena and the factors and variables affecting them as the development of thinking Scientific and creative is one of those goals (Abdel Salam, 2006: 16).

The researchers believe that the new standards adopted by the Iraqi Ministry of Education to develop and update general education curricula for pre-university education are based on adopting the trend of developing thinking skills in a way that helps the learner to use his acquired knowledge in different life situations, which enables him to solve problems and use logical thinking in all situations that Facing it; In order to keep abreast of rapid developments in all fields so that it reflects on learners and their competencies that relate to thinking, learning and good citizenship, one of the most important features of modern science curricula at the global level is its interest in the qualitative (qualitative) aspect of teaching science, which is represented in focusing curricula on skills Science operations, problem-solving skills, and creative and scientific thinking skills and the methods and methods leading to the development of different thinking patterns (Atifa, 2010: 369).

### **The Research problem**

The goal of developing thinking among learners is one of the main goals that the subject of science in general and physics in particular seek to achieve as a result of its prominent role in building the personality of the learner who is able to deal with life's problems and pressures of different kinds by solving those problems and analyzing the available information and data

logically to determine their sincerity and take an appropriate decision on it, by providing the learner with different life skills.

Focusing on developing thinking is the ultimate goal that advanced educational systems work on with all its different institutions, so a real change must be made to break the minds of the learners and unleash creative thinking in line with the changes taking place in the educational curricula in all its stages. Therefore, those in charge of educational affairs must work with a mentality Give me a creative teacher, give you a creative teacher.

The researchers see that the teacher has a profound impact on the availability and implementation of various activities to develop thinking skills among learners, and also has a pivotal role in employing the school environment that stimulates the development of all kinds of thinking, by providing open opportunities for learners to practice educational activities based on inquiry and experimentation, despite the teacher is the strongest link in the educational process and in achieving the goals of teaching physics. However, the reality of teaching this subject shows a contradiction between the goals that education seeks to achieve and the classroom practices of the teacher whose role is as a mentor and transmitter of information and scientific facts and the role of learners is determined by preserving and memorizing what the teacher repeats away from Interactivity, positive participation and reflection on the information presented; In order to validate the previous observations and determine the research problem, the researchers carried out the following procedures:

- Analyzing a number of models for preparing daily lessons for physics teachers in different classes in the preparatory stage, numbering three models. It was clear that the behavioral goals focus on the levels of knowledge and understanding and the absence of educational activities from asking questions or guiding learners to interpreting a scientific phenomenon or analyzing or evaluating it.
- Attending a number of classes for a sample of physics teachers in order to know the level of their practices of thinking skills in the course of teaching, and it was revealed to researchers that teachers neglected the skills of scientific and creative thinking and limited to displaying the subject matter and controlling boredom over learners.
- Conducting an exploratory study by directing an open questionnaire aimed at identifying the opinions of the previous sample of physics teachers on the importance of scientific and creative thinking skills and the necessity of using them in teaching physics.

Based on the above, and because the researchers work in the field of education, they sensed the problem of their research and focused their attention on defining the research problem in the following two main questions:

The first question: What is the level of the contribution of physics teachers in developing scientific thinking skills for applied Preparatory students?

The second question: What is the level of the contribution of physics teachers in developing creative thinking skills for applied Preparatory students?

### **The Research Aims**

1- Identify the level of the contribution of physics teachers in developing scientific thinking skills for applied Preparatory students.

2-Identify the level of physics teachers 'contribution to developing creative thinking skills for applied Preparatory students.

### **The Research Limits**

1- Physics students in the day preparatory schools for the departments of education (Al-Shatrah, Qala'at Sukkar, Al-Rifai) of the General Directorate of Education in Thi Qar Governorate.

2- Scientific and creative thinking skills of physics teachers and teachers in middle schools / general directorate for the education of Thi Qar Governorate.

3- Second semester of the academic year (2018-2019).

### **Defining the Terms:**

**First - Level of Contribution:** Defined by (Abu Muammar, 2009): As : Set of activities, behavioral patterns, tasks and responsibilities that the employee or educational institution takes within the framework of a social organization within the place of the assigned position (Abu Muammar, 2009: 10).

**Second - Scientific Thinking Skills:** Define by (Zaitoun, 1986): as the set of special abilities and processes necessary to properly apply methods of science and scientific thinking (Zaitoun, 1986: 61).

*Procedural definition of scientific thinking skills:* active mental processes and behavioral manifestations by teachers of physics and physics in teaching subject to middle students; To enable students to use observation, classification, summarization, explanation, comparison, application and evaluation; In response to a problem or a confusing situation, it can be measured by answering these students on the scale of scientific thinking prepared for this purpose.

**Third - Creative Thinking Skills:** Defined by (Attia, 2015): As A complex, flexible, and original cross-sectional mental activity that aims to produce unprecedented new solutions and the apparent information contained in the problematic situation cannot be presented to deal with what arouses the individual and feels the need for a solution (Attia , 2015: 204).

*Procedural definition of creative thinking skills:* active mental processes and behavioral manifestations by teachers of physics and physics in teaching material to middle school students; To produce the largest possible number of ideas that are fluent, flexible, original and sensitive to their problems as a response to a problem or a confusing situation, and can be measured by answering these students on the scale of creative thinking prepared for this purpose.

## Chapter Two

### Skills Of Thinking:

**1- Scientific thinking Skills:** science operations are a type of skill that the scientist or researcher uses during his research and investigation of the truth, and scientific thinking skills are a set of specific mental processes that we practice mostly in the laboratory in order to reach the results of science and verify the validity of these results and judge them. In the current research, the two researchers relied on seven basic skills of scientific thinking which are (observation, classification, summarization, explanation, comparison, application and evaluation) in accordance with the research procedures (building the scale), and the following is a definition of each of them:

1- Observation: It is the skill used to acquire information about objects, issues, events, or patterns of behavior of persons; Using the five different senses (Saadeh, 2003: 49).

2-Classification:is the ability to group things into groups according to the similarities and differences between them, so that each group includes units with common characteristics (Alawi et al., 2008: 33).

3- Summarization: It is the ability to delete unimportant aspects of the topic and express key ideas briefly and clearly.

4- Explanation: It is the skill of imparting meaning on our life experiences or extracting meaning, and previous experience of the learner plays a fundamental role in developing the skill of interpreting the available information as it helps to deepen understanding, clarity of meaning and reach new knowledge by linking between current experience and previous experience. (Al-Arian, 2011: 53)

5- Comparison: As a skill of identifying the different elements involved in the existence of the phenomenon, and by comparing the phenomena together, we note the similarities and differences between them in certain relationships, their conformity or contradiction, and thus our knowledge of the phenomenon becomes more accurate and enables us to distinguish its characteristics (Al-Taiti, 2004: 85).

6- Application: It is the use of concepts, laws and facts previously learned to solve a problem that the individual is exposed to in new situations, and the application is an educational goal, as it raises the individual to the level of employing the information (Olives, 1993: 58).

7- Evaluation: It is the ability to evaluate the idea and accept or reject it, distinguish between primary and secondary sources, strong and weak arguments, and pass judgment on the adequacy of the information (Al-Atoum et al., 2009: 79).

### Second - creative thinking skills:

Most educators agree to classify creative thinking skills into five skills:

1- Fluency: It is defined as the ability of the learner to produce or generate many alternatives or ideas in a fixed unit of time, which is essentially a process of remembering and recalling

optional data or experiences previously learned and divides fluency into four sub-capabilities: fluency of verbal words, fluency Meaning, expressive fluency and idea fluency (Alexander, 2007: 21).

2- Flexibility: It is defined as the ability to produce different ideas that are not the type of familiar ideas and transform the course of thinking with changing stimulus, and flexibility is the opposite of mental immobility.

3- Originality: It is the renewal and uniqueness of ideas, and originality differs from fluency and flexibility in that it is based on qualitative value, and avoids what others repeat.

4- Elaboration: It is the ability of the learner and his capabilities to give additions or provide new increases for a specific idea.

5-Sensitivity to problems: means feeling the presence of problems or elements of weakness in the environment or the situation, as observing the problem differs from one person to another and checking its presence in the situation and searching for a solution to it (Al- jamal, 2005: 50-52).

In the current research, the two researchers relied on four basic skills (originality, fluency, flexibility, sensitivity to problems) in line with his research procedures (building the scale).

### Chapter Three

**Research Methodology:** The two researchers followed the descriptive analytical approach that focuses on studying reality and describes it accurately and expresses it qualitatively or quantitatively, the first is interested in the phenomenon and highlights its characteristics, while the other gives a digital description that shows the amount and size of this phenomenon and the extent of its association with other different phenomena (Obeidat, 2010: 191).

- **The research community:** The research community consists of all preparatory students in the General Directorate of Education in Thi Qar Governorate for the academic year (2018-2019) of (927) students.

- **Research sample:** The current research sample was represented by preparatory stage students in the education departments of the districts (Al-Shatrah, Al-Rifa'i, and Qala'at Suker) of the General Directorate of Education in Thi Qar Governorate for the academic year (2018-2019) who reached (564) students according to data These districts, i.e. (60.84%) of the original community, and Table (1) shows the distribution of the individuals in the research sample.

Table (1) shows the distribution of individuals in the research sample

S	Departments directorates	Students	Female Students	Total
1	Al-Shatrah District	96	128	224
2	Al-Rifa'i District	79	96	175
3	Qala'at Suker District	75	90	165
	Total	250	314	564

- **The Research tools:** One of the factors that depend on the accuracy of the results of any research is the accuracy of the tools used in collecting data, and the nature and objectives of the current research require the availability of two tools:

**First- the scale of scientific thinking skills:** The researchers built a scale of scientific thinking skills practiced by physics teachers in teaching fourth-year preparatory students; And that after examining the literature and previous studies that are directly related to the subject of the research, following the following **steps:** **1- The aim of the scale:** The scale aims to measure the scientific thinking skills available to physics teachers who are studying fourth-year preparatory students, and after studying the previous standards that researchers can see In addition to soliciting the opinions of experts and specialists in the field of education, psychology, measurement and evaluation, and teaching methods to determine the dimensions that collectively formed the scientific thinking skills, namely: observation, classification, summarization, explanation, comparison, application and evaluation.

**2- Formulating Items of Scale:** The scale consists of (51) items that include seven domains and each field ranges between (6-9) items. The researchers took into consideration the conditions for writing scales, as they used the five-digit Likert scale (very high, high, middle). Weak, very weak); Because it is more suitable for students' ages (the research sample), and each of these options was given a specific level by which to deal with the statistics statistically, and as follows: very high (5) degrees, high (4) degrees, middle (3) degrees, low (2) Two degrees, very low (1) one degree, and thus the maximum degree for the student is (255) degrees and the minimum degree is (51) degrees.

**3- Validity and reliability of the scale:** The researchers used "validity of the content" where the scale was presented to the previous expert committee to express their opinions and observations on the validity of the scale items for the purpose of the research and the conformity of these items with its seven fields and they agreed that all of them are easy and clear meaning and measure the scientific thinking skills of the research sample, the researchers used the (Cronbach's alpha) laboratory to extract the reliability, which reached (0,90) by applying the scale to (50) male and female students from the research community and without a sample, and thus the scale is objective because the level of reliability obtained by the two researchers is a high level (Al Gharib, 1981 : 853), as in tables 2 and 3.

**Second: The scale of creative thinking skills:** The researchers built a scale of creative thinking skills practiced by physics teachers in teaching fourth-year middle students; And after reviewing the literature and previous studies that are directly related to the research topic, following the following steps:

**1- The aim of the scale:** The scale aims to measure the scientific thinking skills available to physics teachers who are studying fourth-year preparatory students, and after studying the previous standards that researchers were able to see in addition to seeking the opinions of experts and specialists in the field of education, psychology, measurement, evaluation, and previous teaching methods ; In order to determine the dimensions that collectively formed creative thinking skills: fluency, originality, flexibility, and sensitivity to problems.

**2- Formulating Items of Scale:** The scale consists of (62) items that included four fields, and each field ranges between (12-18) items. The researchers took into account the conditions for writing scales in that. They used the five-likert scale (very high, high, middle, Low, very low); Because it is more suitable for students' ages (the research sample), and each of these options was given a specific level by which to deal with the statistics statistically, and as follows: very high (5) degrees, high (4) degrees, middle (3) degrees, low (2) Two degrees, very low (1) one degree, and thus the maximum degree for the student is (310) degrees and the minimum degree is (62) degrees.

**3- The validity and reliability of the scale:** The researchers used "validity of the content", where the scale was presented to the previous expert committee to express their opinions and observations on the validity of the scale items for the purpose of the research and the conformity of these items with its four fields and they agreed that all of them are easy and clear meaning and measure creative thinking skills, the two researchers has used (Cronbach's alpha) to extract reliability, which reached (0,89) by applying the scale to (50) male and female students from the research community and not from its sample, as the concept of persistence indicates that the test gives similar results or the same results if applied

more than once in similar conditions, and the reliability of the test is affected by its length. The higher the vertebrae, the better its reliability (Al-Jubouri, 2013: 170), as in Tables 2 and 3.

Table (2) shows the distribution of the research tools in its final form

S	scientific thinking skills	Number of items	Percentage	S	Creative thinking skills	Number of items	Percentage
1	Observation	7	%15,38	1	Fluency	15	%22,38
2	Classification	6	%11,53	2	Originality	17	%25,37
3	Summarization	7	%13,46	3	Flexibility	18	%26,86
4	Explanation	7	%13,46	4	Sensitivity to problems	17	%25,37
5	Comparison	9	%17,30	-	-	-	-
6	Applying	8	%15,38	-	-	-	-
7	Evaluation	7	%13,46	-	-	-	-
Total		51	%100	Total		67	%100

Table (3) shows Cronbach's alpha coefficient to measure the reliability of the research tools (N = 50)

S	Skill	Number of items	Cronbach's alpha	S	Skill	Number of items	Cronbach's alpha
1	Observation	7	0,90	1	Fluency	15	0,94
2	Classification	6	0,92	2	Originality	17	0,90
3	Summarization	7	0,94	3	Flexibility	18	0,86
4	Explanation	7	0,88	4	Sensitivity	17	0,88

					to problems		
5	Comparison	9	0,90	-	-	-	-
6	Applying	8	0,93	-	-	-	-
7	Evaluation	7	0,89	-	-	-	-
Total		51	0,90	Total		67	0,89

It is clear from table (3) that the two research tools have a high level of reliability (0.90) (0.89) for both the scale of scientific thinking skills and the scale of creative thinking skills respectively, and with this procedure the two tools are ready to be applied to the original research sample.

**The application of the research tools:** The research tools were applied in the first semester of the academic year (2018-2019) on the original research sample of (564) male and female students in middle schools for the education departments (Al-Shatrah, Al-Rifai, and Qala'at Suker) / General Directorate of Education in Thi Qar Governorate, these questionnaires were distributed over a period of four weeks, and this step was taken into account (clarifying the purpose of the research, how to answer the questionnaire, the importance of cooperation in the accuracy of recording information), which is used for scientific research purposes only, and after that these questionnaires were collected and reviewed And auditing it to ensure its validity for statistical analysis by encoding and emptying it electronically using the SPSS program, as the mean and the standard deviation for each of the research skills have been found, and to facilitate the explanation of the research results, the level of the answer to the items of each metric has been determined as shown in Table (4).

Table (4) shows the mean of the mean

S.L	Mean	Significance
1	1,80 - 1,00	Very Low
2	2,61 - 1,81	Low
3	3,42 - 2,62	Middle
4	4,23 - 3,43	High
5	5,00 - 4,24	Very High

## Chapter Four

**-Presentation and Discussion of the results:** This chapter deals with a presentation of the results reached by the researchers through the response of the members of the research sample about the level of the contribution of physics teachers to the development of scientific and creative thinking skills among preparatory stage students, according to the research questions and in light of statistically processing the research data the researchers reached to The following results:

**First - Results related to the first question:**

- What is the level of the contribution of physics teachers to the development of scientific thinking skills among preparatory students?

To answer this question, the mean and the standard deviation were calculated for the responses of the members of the research sample and for each skill of scientific thinking, as they were arranged in descending order according to the highest value of the mean and the lowest value of the dispersion represented by the standard deviation and determining the level of teachers' contribution to the development of each of the skills (summarization, Observation, explanation, classification, application, comparison and evaluation) and the details are detailed for each skill separately:

**Summarization skill:** To show the level of the contribution of physics teachers to the development of summarization skill among preparatory stage students, means and standard deviations for the expressed items were calculated, and Table (5) shows that:

Table (5) Means and Standard deviations for research sample responses (n = 564)

Tool Order	Items	Mean	Std. Deviation	Order	Level
5	Through their readings, students are called upon to form specific ideas for the images and scientific events presented to them.	3,67	1,01	1	High
6	Students are asked to provide a summary of their own style of contemporary theory, law or scientific event.	3,57	1,00	2	High
3	Invites students to describe a field scientific visit they made to a scientific institution.	3,49	0,98	3	High
4	Students are asked to reformulate the main theme of the lesson.	3,47	0,97	4	High
1	It helps students reach scientific conclusions through their study of scientific topics.	3,45	0,97	5	High
2	Students are directed to write a report on the laboratory experiments studied.	3,44	0,95	6	High
7	Students are encouraged to submit a report on a scientific television program in Physics.	3,40	0,95	7	Middle
Total Mean		3,49	0,97	-	High

It is clear from table (5) that the mean of the skill of summarization ranges between (3.40-3.67), as all items came in a high degree except for the last item came with an mean degree, and it is also clear that item (5) which states "invites students Through their readings to form specific ideas for pictures and scientific events presented to them "came first with an mean of (3.67) and a standard deviation (1.01). Perhaps this is due to the role of teachers in using

scientific images and various educational methods and expanding their knowledge horizons from By directing their ideas towards accelerated scientific developments and developments in all fields, which motivated students to give ideas and opinions about them, while item (7) which states "Encourages students to submit a report on a scientific TV program in physics" came in the last rank with an mean of (3.40), and a standard deviation (0.95) with an mean level of contribution, this can be attributed to the lack of assignment of students to extra-curricular activities outside of school and the lack of interest and follow-up by teachers in scientific programs related to physics, which was reflected in the weakness of the practice of this part of the summarization skill; This result may relate to the importance of educational technology and its positive impact on the education process.

**Observation skill:** To demonstrate the level of the contribution of physics teachers to the development of observation skill among students of the preparatory stage, means and standard deviations for the expressed items have been calculated, and Table (6) shows that:

Table (6) Means and Standard Deviations for Research Sample Responses (N = 564)

Tool Order	Items	Mean	Std. Deviation	Order	Level
1	Guide the Students to use their senses while studying physics.	3,51	0,99	1	High
3	Students are asked to observe a demonstration of a specific scientific phenomenon.	3,49	0,98	2	High
2	Students are encouraged to read external sources and scientific research.	3,44	0,95	3	High
6	It presents students with pictures and science films related to the physics curriculum.	3,41	0,98	4	Middle
7	Students are encouraged to watch and follow scientific phenomena.	3,30	0,93	5	Middle
4	It invites students to note scientists' discoveries of theories, phenomena and scientific events.	3,26	0,89	6	Middle
5	Students are directed to familiarize themselves with the life and biographies of scientists.	3,21	0,89	7	Middle
Total Mean		3,37	0,94	-	Middle

It is clear from table (6) that the mean for the skill of observation ranges between (3.21 - 3.51), as item (1) states that "students are directed to use their senses while studying physics" at the highest rank with an mean (3) (51) and a standard deviation (0.99) with a significant contribution in the first place. Perhaps this is due to the intelligence of teachers by clarifying abstract physical concepts and bringing them closer to reality through the use of examples from the surrounding environment and clarifying these concepts by applying experiments in

the laboratory and using illustrations of these experiments so that be more tangible than abstract. Observing and focusing are important in the learning process, and this is confirmed by the Holy Qur'an, given that the senses are the outlets through which knowledge and knowledge are communicated, while item (5) states that "students are directed to be familiar with the life and functioning of scientists." Subjectivity "on the lowest rank with an mean of (3.21) and a standard deviation (0.89) with an mean contribution level, and this indicates the emphasis of teachers on cognitive and skill aspects during the provision of daily lessons and neglecting emotional and emotional aspects that are difficult to measure and observe as well as characterized by a type of Generality.

**Explanation skill:** To demonstrate the level to which physics teachers contribute to the development of explanation skill for applied Preparatory students, means and standard deviations have been calculated for the items expressed, and Table (7) illustrates this:

Table (7) Means and Standard deviations for research sample responses (N = 564)

Tool Order	Items	Mean	Std. Deviation	Order	Level
6	Allow students to explain some of the information in the lesson.	3,70	1,04	1	High
2	Students are required to clarify the form of scientific laws.	3,23	0,98	2	Middle
3	It works to explain the physical phenomena that appear to students in the curriculum.	3,17	0,95	3	Middle
4	Students are asked to explain practical applications of laws and scientific theories.	3,14	0,89	4	Middle
5	Explains to students the importance of understanding each scientific term in the subject matter (physics).	3,10	0,82	5	Middle
7	Students are asked to explain the meanings extracted to any subject they have studied according to their experience.	2,64	1,13	6	Middle
1	Students acquire skills in interpreting new events and scientific phenomena.	2,63	0,67	7	Middle
Total Mean		3,08	0,92	-	Middle

It is clear from table (7) that the mean for the skill of explanation ranges between (2.63 - 3.70). Item No. (6) states that "allow students to explain some of the information in the lesson" on the highest arrangement with an mean (3.70) and a standard deviation (1.04) in the first place with a significant contribution, due to giving teachers the largest role for students in participation in line with the modern vision of learning theories and teaching and

modern teaching methods that make the learner a focus of the educational process and the role of the teacher is guidance and guidance while All items came with an mean level of contribution, and item (1) which states, "Students acquire skills in interpreting new events and scientific phenomena", got the lowest ranking with an mean of (2.63) and a standard deviation (0.67) with a middle contribution level; This confirms the weakness of teachers in interpreting new scientific events and phenomena by linking the cause to the outcome and knowing the real reasons behind these events, which has a positive impact on the learner.

- **Classification skill:** To show the level of the contribution of physics teachers to the development of classification skill among preparatory stage students, means and standard deviations for the expressed items have been calculated, and Table (8) shows that:

Table (8) means and standard deviations for the responses of the research sample (N = 564)

Tool Order	Items	Mean	Std. Deviation	Order	Level
5	Students gain the ability to classify (principles, concepts, facts, generalizations and procedures).	3,53	0,83	1	High
4	Students are directed to classify scientific concepts according to their awareness.	3,16	0,88	2	Middle
3	Students are directed to make groups of scientific events according to the period of their occurrence.	3,15	0,88	3	Middle
1	Students are asked to classify (theories, laws, and scientific concepts) from their properties and components.	2,99	0,86	4	Middle
2	Students are required to categorize scientific events according to the time period in which they occurred.	2,79	0,75	5	Middle
6	Students are asked to classify theories and laws in terms of their time period.	2,77	1,00	6	Middle
Total		3,06	0,72	-	Middle

It is clear from table (8) that the mean for classification skill ranges from (2.77 to 3.53), as item (5) states that "students gain the ability to classify principles, concepts, facts, generalizations and procedures" at the highest ranking with an mean (3.53) and a standard deviation (0.83) in the first rank with a significant contribution, due to the teachers 'interest in the content of the scientific curricula through explanation, clarification, and making comparisons between the various topics and the facts, concepts, principles, and laws that are contained in the textbook in the textbook. It takes a hierarchical form in the cognitive structures of the learner, while the rest of the items came with an mean level of contribution, as item (6) which states, "Students are asked to classify theories and laws in terms of their time period," got the last rank with an mean of (2.77) and a standard deviation. (1.00), and this can be attributed to the overlap of scientific theories among them due to the rapid

scientific development, as well as the difficulty of classifying these theories and laws and the way to perceive them, in addition to the lack of focus of teachers on the temporal factor in the development of theories and the formulation of scientific laws on physics.

**-Application skill:** To show the level of the contribution of physics teachers in developing application skill for preparatory students, means and standard deviations for the expressed items have been calculated, and table (9) shows that:

Table (9) means and standard deviations for research sample responses (N = 564)

Tool Order	Items	Mean	Std. Deviation	Order	Level
1	Instruct students to apply what they have learned in life situations.	3,17	0,95	1	Middle
3	Students are asked to provide practical, practical examples of what they have learned in the classroom.	3,16	0,88	2	Middle
2	Students are trained to solve every day and study problems in a scientific way using what they have studied in physics.	3,10	0,86	3	Middle
5	Students are trained to use scientific laws to solve problems.	3,09	0,87	4	Middle
6	Allow students to provide part of the lesson during class or in the laboratory.	3,08	0,77	5	Middle
8	Students are charged with conducting experiments as a homework assignment before conducting them.	2,99	1,09	6	Middle
7	Students are directed to employ scientific facts, laws, and theories as a reality that can be implemented in their daily lives.	2,95	0,93	7	Middle
4	Students are allowed to apply scientific experiments inside the laboratory.	2,93	0,9	8	Middle
Total Mean		3,05	0,91	-	Middle

It is clear from table (9) that the mean for application skill ranges between (2.93 - 3.17) and all items came with an mean level of contribution, as Item No. (1) stipulated that "students are directed to apply what they have learned in life situations "On the highest ranking with an mean (3.17) and a standard deviation (0.95), and the reason for this may be due to the employment of teachers in the application skill in facing the life problems facing the learner and how to solve them through teaching in school and the transmission of the effect of that learning in reality, while Item (4) which states, "Students are allowed to apply scientific experiments in the laboratory" got the lowest rank with an mean of (2.93) and a standard deviation (0.9). This can be attributed to the lack of junior schools in modern school

laboratories in addition to the shortage In preparing these experiences or teachers 'awareness of the danger of some scientific experiments on students and working to create devices and tools for those experiments, in addition to exaggerating the safety and security rules in the laboratory by teachers.

- **Comparative skill:** To show the level of the contribution of physics teachers to the development of the comparison skill among preparatory stage students, means and standard deviations for the expressed items have been calculated, and Table (10) shows that:

Table (10) Means and Standard deviations for the responses of the research sample (N = 564)

Tool Order	Items	Mean	Std. Deviation	Order	Level
8	It explains to students the facts, principles, laws, and theories that are associated with scientific phenomena.	3,40	1,02	1	Middle
4	It calls on students to compare concepts in one topic and not in another.	3.34	1,05	2	Middle
7	Instruct students to understand the difference in scientific laws according to scientific developments.	3,13	0,96	3	Middle
2	Students are directed to analyze two or more laws.	2,95	0,93	4	Middle
5	Students are asked to define the relationship between scientific events, past and present.	2,94	0,96	5	Middle
6	He calls on students to compare physics books for the different stages they have studied.	2,89	1,05	6	Middle
9	It helps students to compare scientific theories.	2,87	0,89	7	Middle
1	Students are asked to compare similar laws such as the laws of Newton I, II and III ..etc.	2,77	0,91	8	Middle
3	Students are encouraged to search for points of agreement and difference between scientific phenomena and events.	2,75	104	9	Middle
Total Mean		3,01	0,98	-	Middle

It is clear from table (10) that the mean of the skill of comparison ranges between (2.75 - 3.40) and all the items came with an mean level of contribution, as item (8) stipulated that "explains to students the facts, principles, laws and theories that are associated with scientific phenomena." On the highest ranking with an mean (3.40) and a standard deviation (1.02), this may be due to the teachers highlighting the interconnectedness and overlap between the results of science and understanding it in a cumulative way from easy to difficult, which makes it easy to compare them and thus understand them in a good way, while the item got (3) which states "Students are encouraged to search for points of agreement and the

difference between phenomena and scientific events" at the lowest rank with an mean of (2.75) and standard deviation (1.04), and this can be attributed to the weak awareness of teachers of the importance of stimulating student thinking And work to create a class environment that helps students to be creative as possible, as well as the lack of emphasis on effective participation in understanding scientific phenomena and thus this is reflected at the level of students in the process of devising similarities, differences and relationships between them.

- **The skill of evaluation:** To show the level of the contribution of physics teachers to the development of the skill of evaluation for students of the preparatory stage, means and standard deviations for the expressed items have been calculated, and Table (11) illustrates this:

Table (11) Means and Standard deviations for research sample responses (n = 564)

Tool Order	Items	Mean	Std. Deviation	Order	Level
5	invites students to appreciate the role scientists have played in their discoveries	2,91	0,91	1	Middle
3	Students are trained to make judgments about scientific problems.	2,84	0,83	2	Middle
2	Students are encouraged to express an opinion on the role of scientists and discoverers of phenomena and events in the field of physics.	2,83	0,89	3	Middle
7	Students are asked to estimate the greatness of God Almighty about scientific phenomena and events in general and physics in particular.	2,82	0,81	4	Middle
1	Allow students to express their opinions about the physics curriculum to be studied.	2,79	0,93	5	Middle
6	It allows students to make judgments about some new scientific issues.	2,77	1,00	6	Middle
4	Students are encouraged to discuss current scientific events related to curriculum topics reported by the media.	2,48	0,97	7	Low
Total mean		2,77	0,90	-	Middle

It is clear from table (11) that the mean of the comparison skill ranges between (2.48-2.91) and all the items came with an mean level of contribution except for the last item came with a low level as item (5) stipulated that "invites students to value the role What scientists did in their scientific discoveries "on the highest ranking with an mean (2.91) and a standard deviation (0.91) This is due to an attempt to instill values, attitudes, tendencies and appreciation in the souls of students and their personalities by teachers by showing the

importance of inventions and discoveries and their impact on society , While item (4) which states, "motivates students to discuss current scientific events related to curriculum topics and which are reported by various media", obtained the lowest rank with an mean of (2.48) and a standard deviation (0.97) with a low contribution level The reason for this is due to crowded classrooms preparing large students, and therefore it is difficult to adjust the class by giving students room for discussion and dialogue, in addition to teachers' adherence to the vocabulary of the curriculum and focus on completing the prescribed curricula, which leads to not enriching the scientific subjects sufficiently and clarifying them, and for the total Results The researchers arranged the skills descending and extracted the means and the standard deviations that measure the level of the contribution of physics teachers in developing the skill of scientific thinking among the preparatory stage students, and table (12) shows that:

Table (12): Ranking of the seven skills, means, standard deviations and the level of contribution as a whole

Tool Order	Items	Mean	Std. Deviation	Order	Level
3	Summarization	3,49	0,97	1	Middle
1	Observation	3,37	0,94	2	Middle
4	Explanation	3,08	0,92	3	Middle
2	Classification	3,06	0,72	4	Middle
6	Application	3,05	0,91	5	Middle
5	Comparison	3,01	0,98	6	Middle
7	Evaluation	2,77	0,90	7	Middle
Total mean		3,11	0,90	-	Middle

It is clear from table (12) that the means of the seven scientific thinking skills related to the estimates of the members of the research sample ranged between (2.77 - 3.49), and as shown in the above table in descending order, and based on the above, the results showed that most of the scientific thinking skills Physics teachers practice is the skill of summarization, which came in the first place, followed by the skill of observation that came in second, and the skill of evaluation that came in the last place, and they all came with an mean level of contribution and an mean (3.11) and a standard deviation (0.90 ). The researchers attribute the reason for the summarizing skill on other skills to the teachers 'interest in this skill through their practice of a number of aspects, including: forming specific ideas for images and scientific events presented to them, as well as providing summaries of contemporary theories, laws or scientific events in multiple ways by Students, in addition to describing field scientific visits undertaken by students to scientific institutions and other skills mentioned in table (12).

### **Second - The Results Related To The Second Question:**

**- What is the level of the contribution of physics teachers in developing creative thinking skills for applied Preparatory students?**

To answer this question, the mean and the standard deviation were calculated for the responses of the members of the research sample and for each of the creative thinking skills, as they were arranged in descending order according to the highest value of the mean and the lowest value of the dispersion represented by the standard deviation and determining the level of teachers' contribution to the development of each of the skills (fluency, Flexibility, originality and sensitivity to problems) and are detailed below:

- **Fluency skill:** To demonstrate the level to which physics teachers contribute to the development of fluency skill for applied Preparatory students, means and standard deviations for the expressed items have been calculated, and Table (13) illustrates this:

Table (13) Means and Standard deviations for the responses of the individuals in the research sample (N= 564)

Tool Order	Items	Mean	Std. Deviation	Order	Level
3	uses a variety of teaching methods and methods that make students the focus of class activities.	3,49	0,98	1	Middle
9	It prepares students for different situations to stimulate their attention.	3,47	0,97	2	Middle
14	Students express a single idea in more than one way of teaching.	3,45	0,97	3	Middle
1	It helps students to search for and understand the meaning of relevant physical concepts.	3,44	0,95	4	Middle
11	Avoid giving monetary judgments to students' answers.	3,40	0,94	5	Middle
6	It gives distinguished students equal opportunities to help the weak in class.	3,33	0,93	6	Middle
15	It provides a safe learning environment in which students feel reassured.	3,32	0,93	7	Middle
13	He exercises neutrality toward discussions among students.	3,30	0,93	8	Middle
4	Students are prepared to accept and respect all ideas presented. albeit strange.	3,29	0,93	9	Middle
8	It raises in students controversial issues that require discussion, dialogue, and exchange of views.	3,28	0,93	10	Middle
11	Provides creative students with feedback.	3,28	0,92	11	Middle
12	Students are asked divergent questions with multiple answers.	3,26	0,91	12	Middle
5	Students are placed in situations that have no definite end, which increases their motivation towards physics.	3,17	0,89	13	Middle
2	Motivates students to ask questions and make sure the ideas presented are correct.	3,09	0,87	14	Middle
7	It calls on students to distinguish between assumptions and facts that can be relied upon when dealing with scientific issues.	2,98	0,96	15	Middle
Total mean		3,30	0,92	-	Middle

It is clear from the above table that the means that measure the level of the contribution of physics teachers to the development of fluency skill ranges between (2.98-3.49), as item (3) states that "it uses various teaching methods and methods that make students a focus of activities Classroom "is ranked first, with a significant level of contribution, with an mean

(3.49) and a standard deviation (0.98); Perhaps the reason for this is due to the teachers' knowledge of the importance of class activities and assigning them to students, which provides learners with the cognitive, skill and educational aspects of these activities and the role of these activities in promoting and realizing the growth of their personalities and preparing them for a better life and guiding them towards positive behavior, while item (7) states that Distinguish between assumptions and facts that can be relied upon when dealing with scientific issues "in the last place with an mean score of (2.98) and a standard deviation (0.86) with an mean contribution level; This can be attributed to the failure of teachers to clarify the two concepts of students (the imposition, the truth), especially when dealing with scientific events, and given the importance of the assumptions in the formation of natural sciences that without which no science could be discovered and proven, teachers must give it the greatest attention.

**Flexibility skill:** To show the level of the contribution of physics teachers to developing flexibility skill among students of the preparatory stage, means and standard deviations for the expressed items have been calculated, and Table (14) illustrates this:

Table (14) Means and Standard deviations for the responses of the individuals in the research sample (N = 564)

Tool Order	Items	Mean	Std. Deviation	Order	Level
2	It provides an opportunity to apply the subject matter of learning in new situations.	3,43	0,99	1	Middle
13	Values students' ideas and shows their value.	3,41	0,98	2	Middle
9	It gives students the opportunity to express their thoughts freely.	3,30	0,90	3	Middle
16	It provides students with activities that take into account their capabilities and capabilities.	3,26	0,89	4	Middle
5	Provides psychological security and reassurance to students in the classroom.	3,21	0,89	5	Middle
6	Receive students' ideas, no matter how simple.	3,17	0,89	6	Middle
3	It seeks to change students' misconceptions.	3,16	0,88	7	Middle
8	It gives students the opportunity to choose the activity they want.	3,15	0,88	8	Middle
14	It directs students to real problems.	3,08	0,88	9	Middle

10	Open to new and unique ideas presented by students.	3,07	0,87	10	Middle
11	Accept familiar and unfamiliar thoughts.	2,99	0,86	11	Middle
12	Accept unreasonable questions from students.	2,97	0,84	12	Middle
18	Instruct students to take advantage of free time.	2,97	0,83	13	Middle
1	Uses various formulas in the calendar, such as: How do we treat? What led to?	2,97	0,83	14	Middle
15	Diversify ideas in a flexible manner.	2,92	0,83	15	Middle
17	Encourages asking questions and ideas whatever they are.	2,89	0,82	16	Middle
7	Interpretation of ideas and concepts to students in an unfamiliar way.	2,87	0,76	17	Middle
4	Students are given the opportunity to reformulate concepts and relationships and express them in their own style.	2,79	0,75	18	Middle
Total mean		3,08	0,86	-	Middle

It is clear from table (14) that the means that measure the level of the contribution of physics teachers to the development of flexibility skill ranged between (2.79-3.43) with an mean level of contribution, and it appears from the above table that item (2) which states "provides an opportunity The application of the subject matter of learning in new situations "came first with an mean (3.43) and a standard deviation (0.99), and this is due to the teachers' focus on using and dedicating what students learned in schools in daily life, i.e. linking them to life situations In the surrounding environment and employing it in a way that makes the learner able to face the problems that they are exposed to, while item (4) which states "gives students the opportunity to reformulate concepts, relationships and skills and express them in their own way" came in the last rank with an mean of (2.79) and deviation Standard (0.75) with an mean level of contribution, and this can be attributed to the lack of time (classroom), in addition to the ability to reformulate the learner needs to understand the subject matter and thus teach them the skill of expression and creation and organization of ideas in addition to not having enough time to use such a method in all lessons.

- **Originality skill:** To show the level of the contribution of physics teachers in developing the originality skill among preparatory students, means and standard deviations for the expressed items have been calculated, and Table (15) shows that:

Table (15) Means and Standard deviations for the responses of the respondents (n = 564)

Tool Order	Items	Mean	Std. Deviation	Order	Level
12	Students engage in situations that foster creative thinking.	3,23	0,98	1	Middle
10	Students are encouraged to come up with unfamiliar ideas.	3,17	0,95	2	Middle
8	Students are asked to exchange ideas on physical issues.	3,15	0,95	3	Middle
3	Students are encouraged to come up with new ideas.	3,03	0,92	4	Middle
6	It focuses on students' higher mental abilities (analysis. synthesis, evaluation).	2,99	0,91	5	Middle
9	Students are encouraged to practice organizing, planning and not being indiscriminate by putting up during discussions.	2,98	0,91	6	Middle
4	Creates new teaching aids that help students develop their creative thinking.	2,93	0,90	7	Middle
5	Students make comparisons of concepts and facts to identify similarities and differences.	2,82	0,89	8	Middle
7	It directs students towards imagination.	2,80	0,88	9	Middle
11	It educates students about the importance of creativity in learning physics.	2,77	0,87	10	Middle
1	It presents students with concepts and ideas in a way that is easy to make comparisons.	2,75	0,84	11	Middle
2	He uses the questions and gives the students sufficient time to answer them.	2,63	0,67	12	Middle
Total mean		2,93	0,88	-	Middle

It is clear from Table (15) that the means that measure the level of the contribution of physics teachers to the development of the skill of originality range from (2.63 - 3.23). as all items came with an mean level of contribution, and it is clear from the table that item (12) which states "Participate students in situations that develop creative thinking" came first with an mean of (3.23) and a standard deviation (0.98). Perhaps this is due to the members of the research sample emphasizing the achievement of education goals that emphasize the development of cross-sectional thinking, as well. On the teacher's encouragement to the learner in providing part of the lesson, i.e. making the learner a focus of the educational process, and thus making the class more dynamic and interactive in educational situations and creating a creative environment for education, while Item (2) states that "he uses the questions asked and gives sufficient time for students in The answer to it is "in the last rank with an mean of (2.63) and a standard deviation (0.67) with an mean contribution level. This can be attributed to the lack of time allocated to the lesson and the nature of those questions that require more and delving deeper into things in order to obtain predetermined responses through questions. "Sequence related to the subject of the lesson, as well as looting Other information related to the educational reality in our schools.

- **The skill of sensitivity to problems:** To demonstrate the level of the contribution of physics teachers to the development of the skill of sensitivity to problems among students of the preparatory stage, means and standard deviations for the expressed items have been calculated, and Table (16) illustrates this:

Table (16): Means and Standard deviations for the responses of the individuals in the research sample (N = 564)

Tool Order	Items	Mean	Std. Deviation	Order	Level
6	It works to take into account individual differences between students.	2,99	0,86	2	Middle
2	Students are allowed to bring up and solve everyday problems.	2,97	0,83	1	Middle
1	It works to connect students 'ideas with reality.	2,94	0,94	3	Middle
17	It seeks to instill self-confidence in students.	2,93	0,83	4	Middle
7	Students are directed towards analyzing scientific issues in general and physics in particular.	2,92	0,82	5	Middle
3	Help students formulate problems in more than one way.	2,91	0,91	6	Middle
5	It helps students how to test hypotheses and solve problems.	2,89	0,82	7	Middle
16	It provides students with self-learning opportunities.	2,89	0,82	8	Middle
9	Instruct students to use skills in unfamiliar situations.	2,87	0,76	9	Middle
10	It aims to raise awareness among students through research.	2,84	0,83	10	Middle
13	It uses the problem-solving method in teaching students.	2,84	0,91	11	Middle
11	Students get rewarded when they come to creative solutions to the issue at hand.	2,82	0,81	12	Middle
8	It gives students time to think about answering questions.	2,80	0,88	13	Middle
14	He follows everything new in the field of science in general and physics in particular.	2,79	0,93	14	Middle
4	Students develop scientific curiosity and curiosity.	2,77	1,00	15	Middle

12	It seeks to strengthen and address the strengths and weaknesses of students.	2,63	0,67	16	Middle
15	It confronts and addresses learning barriers for students.	2,48	0,97	17	Low
Total mean		2,84	0,85	-	Middle

It is clear from table (16) that the means that measure the level of the contribution of physics teachers in developing the skill of sensitivity to problems ranges between (2.48-2.99), as item (6) stated that "works to take into account the individual differences between students First place with an mean (2.99) and a standard deviation (0.86). Perhaps this is due to the teachers' emphasis on the skill of dealing with students with full parental status as a principle of the educational process; As well as the use of teaching methods that take into account the difference and variation between students at various levels in order to achieve the desired educational goals in the best way, while item (15) which states "to confront and address the obstacles of creativity among students" came in the last rank with an mean of (2.48) and deviation Standard (0.97) with a low level of contribution, as there are many problems that relate to the program of preparing physics teachers, as well as the problems experienced by Iraqi schools (the large number of students) and their lack of many requirements for the creative environment in the classroom, in addition to obstacles related to the nature of the learner Such as fear, hesitation, lack of self-confidence, continuous preoccupation, etc., which ultimately leads to not reaching the goals to be achieved. To summarize the results, the researchers arranged skills in descending order and extracting means and standard deviations that measure the level of the contribution of physics teachers to developing the creative thinking skill of middle school students. And Table (17) illustrates this:

Table (17): Arrangement of skills, means, standard deviations and the level of contribution as a whole

Tool Order	Items	Mean	Std. Deviation	Order	Level
1	Fluency	3,30	0,92	1	Middle
3	Flexibility	3,08	0,86	2	Middle
2	originality	2,93	0,88	3	Middle
4	Sensitivity to problems	2,84	0,85	4	Middle
Total mean		3,03	0,87	-	Middle

It is clear from table (17) that the means of the four creative thinking skills related to the estimates of the members of the research sample ranged between (2.84 - 3.30), and as shown in the above table in descending order, and based on the above, the results showed that most creative thinking skills Physics teachers practice with students is the skill of fluency, which came in the first place, followed by the skill of flexibility, which came in second place, and then the skill of originality came third, and the skill of sensitivity to problems came in the last rank, and all of them were with an mean contribution level and an overall mean (3.03) and deviation Standard (0.87), and the researchers attribute the reason for the fluency skill over

other skills to the teachers' use of modern teaching methods that make the learner the focus of the educational process and thus make students thinkers and creators, as well as arouse students' interest and create relationships between scientific concepts by providing climates Safe educational instruction in the classroom that allows freedom to think and express their opinions even if they are strange, in addition to training students to accept ideas and discuss them with all students even if they are simple, and As well as training students to distinguish between principles, facts, concepts and other mental skills mentioned in Table (17), and the researchers did not find a previous study that dealt with developing scientific and creative thinking skills together in order to compare the results of previous research with the results of the current research, so this is the first study in the field Physics teaching methods are specialized.

**Conclusions:** In light of the results of the current study, the researchers reached a number of conclusions:

1-The existing physics teacher preparation program has limited potential in preparing a teacher who is capable of possessing scientific and creative thinking skills.

2- The possibility of benefiting from the list of skills of scientific thinking and creative thinking in training physics teachers for junior high in Iraqi schools.

3- It is possible to use the list of scientific thinking and creative thinking skills and include them in the program of preparing physics teachers during the study period for the university stage.

**Recommendations:** In light of the results of the current study, a set of recommendations can be presented as follows:

- Revising the physics teachers' preparation program and rebuilding it in the light of scientific thinking and creative thinking skills, by: - Developing a physics teacher preparation program and organizing it according to scientific thinking and creative thinking skills in a way that contributes to achieving the current educational goals of physics and reaching proficiency level.

Training teachers to use various teaching strategies and methods focused on developing their scientific and creative thinking skills.

Diversifying educational-learning activities for the Physics Teachers Preparation Program and including thinking skills to enable teachers to participate effectively in the learning process.

#### **Future Work:**

In light of the results of the current study, the two researchers point to some of the proposed research and studies, including:

- Conducting similar research in different scientific disciplines in a way that is compatible with different thinking skills.

- Conducting experimental research that contributes to develop the skills of scientific and creative thinking for teachers in the intermediate stage, using a developed strategy.

## References

- 1- Abd Es-Salam, M. A.: *Teaching Science and the Requirements of the Times*, al-Fikr al-Arabi, Cairo, 2006.
- 2- Abu Jado, S. M. and Nawfal, M. B.: *Teaching theoretical thinking and practice*, 1st edition, Dar Al-Masirah, Jordan, 2007.
- 3- Abu M., *Descriptive of Solomon: The level of administrative leadership practice in Palestinian universities in Gaza governorates to delegate authority and ways to activate it*, College of Education, Islamic University of Gaza, 2009 (*unpublished Master Thesis*).
- 4- Abu Z., Y.: *Effect of using educational games in teaching mathematics in developing creative thinking among sixth-graders from basic education in Gaza Governorate*, Al-Azhar University, College of Education, 2006 (*unpublished master thesis*).
- 5- Alexander K, D: *Effect of instruction in creative problem solving grade students in an introduction to world agricultural science and technology course*, *unpublished doctoral dissertation* the graduate faculty of Texas tech university, 2007.
- 6- Al-Jamal, M. J.: *Developing Creative Thinking Skills Through The Curriculum*, 1st edition, University Book House, UAE, 2005.
- 7- Al-Jubouri, M. J.: *Scientific Research Methodology An Introduction to Building Research Skills*, 1<sup>st</sup> Edition, Al-Safa, Amman, 2013.
- 8- Al-Qasim, W. Q. et. al. : *A teacher's guide for developing thinking skills*, Ministry of Education - Educational Development, 2<sup>nd</sup> edition, King Fahd National Library, Riyadh, 2006.
- 9- Al-Qatami, N.: *Teaching thinking for the basic stage*, 1<sup>st</sup> edition, Al-Fikr, Amman, 2003.
- 10- Al-Taiti, M. M.: *The Knowledge Structure for Skills Acquisition – Learning and Teaching it*, 1st edition, Al Amal, Amman, 2004.
- 11- Atefa, H. A. A. & Naida, A. H. S.: *Teaching Science in the Light of Quality Culture - Goals and Strategies*, 1<sup>st</sup> edition, University Publishing House, Cairo, 2011.
- 12- Attia, M. A.: *Thinking, Types, Skills, and Educational Strategies*, Safa, Amman, 2015.
- 13- Barbakh, A. O.: *The extent of Islamic education teachers practicing creative thinking methods among the ninth grade students in UNRWA schools in Gaza governorates*, *Journal of the Islamic University for Educational and Psychological Studies*, Volume (20), No. (1), pp. 91 - 129, 2012.
- 14- Beyer, B. (2001) "*What Research Suggests About Teaching Thing Skills*" in costa, Arthur (Editor). *Developing minds: A Resource book for teaching*, Alexandria: A. S. C .D.
- 15- De Bono: *Creative Thinking*, Retrieved, January 25, 2003.edition, Al-Masirah, Amman, 2010.
- 16- Gahbari, T. A. & Abu Shaira Kh., M.: *Qualitative Research in Education and Psychology*, 1<sup>st</sup> edition, Arab Society Library, Amman, 2011.
- 17- Hallaq, H.: *Methods and Curricula in Education and the Qualities of a Successful Teacher*, 3<sup>rd</sup> Edition, Al-Nahda Al-Arabia, Beirut, 2011.
- 18- Jarwan, F. A. R.: *Teaching Thinking Concepts and Applications*, 6th edition, Al Fikr, Amman, 2013.
- 19- Shakshak, A.: *Development Of The Child's Cognitive Skills Of The Mind*, 1st edition, Al-Shua` Publishing and Sciences, Syria, 2008.
- 20- The Unusual, Symbolism: *Evaluation , Psychological and Educational Measurement*, The Anglo-Egyptian Press, Cairo, 1981.
- 21- Zaitoun, H. H.: *The Nature and Structure of Science - Applications in Scientific Education*, 1<sup>st</sup> Edition, Ammar, Ketabak Press, Amman, 1986.