

Precautionary thinking and its relationship to the academic achievement of middle school students in physics

LAMEES ISMAEL HAMEED

Directorate of Education of Babylon

lamisesmael@gmail.com

ABSTRACT

Recently, interest in mental processes, including thinking, has increased as a result of the massive scientific development of information, which called for care to know the way each individual thinks and how to deal with these developments. Surrounding thinking is one of the types of thinking that was associated with the scientist Edward De Bono. This term, which means research to solve problems in non-Traditional or clearly irrational, it means moving sideways from one idea to another in multiple ways as opposed to vertical thinking that relies on rigid sequences and sequential steps.

And that the academic achievement of physics has a significant impact on directing students towards information and the extent to which they benefit from it. Thus, the problem of the current research is determined by answering the following question: Is there a relationship between perceptive thinking and academic achievement among middle school students?

The current research was limited to fifth grade preparatory students for the morning study in its two sections (applied-biological) from (males-females) for the academic year (2021-2022).

In order to verify the objectives of the current research, the researcher built a test for circumferential thinking according to the proposals, theories and opinions of De Bono in circumferential thinking, and the test consisted of (33) questions, and the researcher extracted the psychometric characteristics of the test; So, she relied on apparent validity, constructive validity, and reliability coefficient by means of re-testing, so the reliability coefficient reached (0.70), and the reliability coefficient in the analysis of variance reached (0.70). From its validity, distinction, and effectiveness of its false alternatives, the researcher made sure of the reliability of the test in two ways. The researcher reached the following results:

Preparatory stage students have a good level of peripheral thinking.

- There are statistically significant differences among middle school students in peripheral thinking according to the variables of gender (male-female) in favor of females, and the section (applied-biological) in favor of the applied section .
- Preparatory stage students have a good level of academic achievement.
- There are statistically significant differences among middle school students in academic achievement according to the variables of gender (male-female) in favor of females, and the (applied-biological) section in favor of the biological section .
- There is a statistically significant relationship between peripheral thinking and academic achievement in the research sample.
- There are no differences in the relationship between perceptive thinking and academic achievement according to the variables of gender and section .

Based on the results of the current research, the researcher recommended a number of recommendations and proposals.

Keywords:

peripheral thinking, academic achievement, preparatory stage

Chapter one:

First, the research problem.

The development of students' mental abilities and the promotion of positive behaviors is a social and educational necessity imposed by the demands of society in the progress and in the process of building the human being according to enormous scientific and technical foundations, so it has become the duty of education to be able to play its role in the search for means and the development of methods and activate theoretical and applied programs to develop those abilities, foremost of which is thinking (Abu Jadu and Muhammad, 2007: 53).

Thinking is the most complex type of human behavior, through which man is distinguished from other creatures by his ability to determine the goal of his

behavior and devise solutions and alternatives that lead to achieving that goal or solving a specific problem (Jarwan, 2013: 51).

Despite the existence of multiple patterns of thinking, there is a type of thinking called (peripheral thinking) that imposes its importance because it sought to change old ideas, concepts and perceptions to generate new concepts and perceptions that are applicable (Hassan, 2014: 29); peripheral thinking is a type of thinking that relies on devising as many solutions and alternatives as possible, looking at more than one side of the problem or situation, jumping at the steps of solving the problem and making use of all available information (Novell, 2009: 37).

The availability of academic achievement for learning is one of the necessary things to strive for the academic success of students, and that the higher the academic achievement, the greater the efforts exerted in the learning process, in addition to that the level of academic achievement required rises substantially when the work required of the student is easy, until the level of academic achievement reaches the highest level when the work required of him is difficult (Salkhi, 2013: 132).

The research problem is that the way the student thinks whenever she looks at the problem in all its aspects and is not limited to one aspect is better in order to solve the problem or the situation or question that is exposed to it and this may or may not depend on the academic achievement of the student in the acquisition of knowledge, and therefore the problem of the current research can be determined by answering the following question:

(Is there a relationship between prudential thinking and academic achievement among middle school students?)

Second: - Significance of research

The preparatory stage is one of the basic and important stages in the stages of educational development, as it shows the features, trends and values; it is also the stage of preparation and promotion of life responsibilities and self-reliance, as well as the stage in which the personality crystallizes and takes its relatively stable features.

It is an important stage of development in human life due to the important biological, social and psychological changes that occur in it (Al-Badri, 2009: 36).

Thinking is considered the highest level of mental activity, and it represents one of the cognitive processes that constitute an upscale aspect of human personality that distinguishes it from other living organisms, as man can by thinking to face all the problems he faces and find solutions that suit it, and if thinking in its usual form is a natural instinct created by God Almighty in man, but good thinking is not formed automatically, but must be learned and acquire skill in it, and it is noted that many people do not improve thinking not because they lack mental ability, but because they have not learned the techniques of good thinking methods (Salama, 2012: 31).

Our Islamic religion has paid great attention to thinking and urged the use of reason, but the subject of thinking is one of the main things on which the Islamic call was based, and the greatest evidence of this is what is stated in the Holy Quran, the first and main source of Islamic law, which calls for thinking as the Almighty says: "Did they not reflect on their souls when Allah created the heavens and the earth, and what is between them is the truth and the term of the Islamic Sharia" (Surah Al-Rum/verse 8); and the Almighty says: "He who remembers Allah is standing up and sitting on His side, and remembers Himself."

Studies (De Bono) have indicated that the teaching of thinking does not mean including the subject of interest in the development of thinking among students within the educational objectives and the text of the need for all this and the claim that the curriculum takes into account some thinking skills, but the subject of teaching thinking should be adopted on the basis of studied and established rules and identify ways of implementation and practical application (Sawafatah, 2008: 133).

Precautionary thinking is one of the modes of thinking and it is related to the world De Bono, who invented the term preconception thinking, which means research to solve problems by unconventional or clearly illogical methods. He called it by this name to distinguish it from another type of thinking, which he called vertical thinking, which is mainly attributed to logic or what a person is familiar with and used to. De Bono considered preconception thinking as a special

type of information processing and it must take its way along with other methods of collecting information (Baqali and Hassanin, 2017: 127).

Surround thinking is a new vision of creativity without restriction to put ideas, whether in terms of creative skills or strategies used to achieve skills, it is a unified and integrated creative style that helps students to produce new ways of thinking or decision-making tools. Learning will be reflected in the way we perform daily tasks, as it will be characterized by speed, accuracy and high quality (Battisch, 1993: 41)

Surrounding thinking is the search for alternatives, methods, suggestions and many opinions before making a decision. One of the most famous means of thinking in this way is the method of dialogue, imagination, visualization, re-description, and thinking from multiple angles; and it sometimes goes according to the steps of solving a particular problem and is not intended to adhere to the literal sequence. It may sometimes happen that the problem is solved once you change your view of things, so it is useful to divert thinking when solving problems from the expected intuitive ideas to unexpected new ideas (Cook, 1990: 5).

Thus, prudential thinking must receive a degree of studies and research, although thinking studies occupy a wide field in educational and psychological studies, but they are rare in the field of thinking.

(Dori, 1995: 21)

Raising the level of academic achievement is one of the important educational goals in the life of the student, which the educational system works to improve among students. It is the criterion for the progress of the student in his study and his transition from one stage to another. Its importance does not stop to this extent only , but it uses what he learned and absorbed of information and experiences in the face of challenges and problems in daily life (Richard, 2001:2).

Achievement is one of the objectives of teaching science and scientific education, due to its educational importance in the life of the student. In the educational field, achievement is the (only) criterion according to which students progress in study and transfer them from one educational class to another, as well as their distribution in different educational disciplines or their admission to colleges or universities of higher education. Achievement is also the basis for most

educational decisions (methodological and administrative) in education (Akram, 2019: 46).

Therefore, the importance of the current research lies in the following points:

1. Thinking is one of the mental processes that provides students with a set of strategies that enable them to interact with the environment in which they live better, and each individual has a specific strategy or method of solving the problem or situation that he is exposed to, and that surround thinking is one of the types of thinking that helps solve problems in unconventional ways and find new unexpected ideas.
2. Academic achievement differs from one person to another because it is the student's effort to acquire knowledge and understanding in order to increase educational and pedagogical experiences.
3. The importance of the preparatory stage, which contributes to the preparation of students strong and influential numbers to become later good citizens and useful to their community .

Third: Research Objectives

The current research aims to identify:

1. The level of prudent thinking among middle school students.
2. Differences in the thinking of the students of the preparatory stage according to the variables of gender (males - females) and the section (applied– biological).
3. The level of academic achievement of middle school students.
4. Differences in the academic achievement of middle school students according to the gender variables (male – female) and the section (applied - biological).
5. The relationship between prudent thinking and academic achievement among middle school students.
6. Differences in the relationship between peripheral thinking and academic achievement among students of the preparatory journey according to the gender variables (males – females) and the section (applied - biological).

Fourth: Research dilimitations:

The current research is determined by the students of the fifth scientific grade in the governorate center (Babylon) and for the morning study of both gender es (males - females) and for the two section es (applied - biological) for the academic year (2021 – 2022).

Fifth: Terminology

The following is a definition of the terms that make up the search variables:

1. Thinking was defined by:

- (Shermis 2011) as: "Internal representation of external events, facts, and objects and occurs in any situation in which external conditions do not have the features and connotations associated with the correct response" Shermis 2011, 133)
- **Procedural definition:** Distinguishing the relationship between the thing we are trying to do and the consequences of this attempt

2. Predispositional thinking was defined by:

- (Al-Khafaji, 2021) that: "It is a way to solve problems by using imagination to find new ways of looking at the problem." (Al-Khafaji, 2021: 59)
- **Procedural Definition:** The degree to which the respondent gets by answering a purpose-built background reasoning test in the current research.

3. Achievement defined by:

- (The CDM, 2013) as: "A digital quantity obtained by the student when answering the test prepared by the teacher for previously studied topics. The test is conducted after the completion of teaching those topics. We infer through that numerical value on the student's result and the extent of the learning he obtained" (The CDM, 2013: 5).
- **Procedural definition:** The scores obtained by students in the objective achievement test prepared by the researcher for the book of physics for the fifth scientific grade (applied – biological).

Chapter Two: Theoretical Background and Previous Studies

Topic 1: Theoretical Background

First, think.

Thinking is one of the features that distinguish man from other living organisms. It is a concept that has multidimensional dimensions and different opinions about it, reflecting the complexity of the human mind and the complexity of its processes. Thinking is carried out through a series of mental processes that the brain performs when exposed to a stimulus that is received through one or more of the five known senses. Thinking includes the search for meaning and requires reflection and careful consideration of the situation or experience that the student is going through. Scientists differ about the concept of thinking despite their interest since ancient times in this subject, as they developed many theories, foundations, manifestations and different patterns, and they conducted many experiments on many living organisms. Thinking is a cognitive mental phenomenon that is not devoid of practicing all living organisms, but differently. Therefore, this phenomenon is based on internal mental activities (Hamid, 2016: 41).

Through thinking, man deals with the things that surround him in his environment, and at the same time he addresses the situations that are faced without making a virtual act. Thinking is a behavior that uses ideas and symbolic representations of things and events that are not present, that is, that can be remembered, imagined or imagined. Man uses the process of thinking when faced with a question or feels that there is a problem he encounters. The relationship between thinking and the problem is overlapping as they are two sides of the same coin. Thinking does not occur unless there is a problem that the student feels and affects him and needs to provide a solution to complete the deficiency or remove the conflict and contradiction, which ultimately leads to closing what is missing in the situation and solving or settling the problem (Ismaili, 2011: 69).

Second: Precautionary Thinking

It is a term associated with the name of the global thinker (De bono), who was the first to use it in 1967 to indicate the thinking by which one looks at the problem from different angles, so this thinking tends to take in various other perspectives, and may even proceed away from what is familiar in thinking (Gordon, 2005: 31).

Dr. De Bono is considered by many to be the global leader in creativity. He is the inventor of the phrase "peripheral thinking", which means trying to solve problems by non-traditional methods. He is a new vision of creativity without restriction to put ideas (Center, 2013: 31).

In developing this type of creativity, De Bono relied on understanding the mechanism by which the brain works based on what has been reached in neuroscience through its author (the mechanism of the mind). The brain organizes the information received by it through the senses in a self-regulating way. The brain works to form patterns and search for them later. The pattern is meant by the structured formation of the neurons that make up the brain or the organization of the information on the memory surface. The pattern is a repeated neural sequence, in its responses to the information received, as it allows it to organize itself on its surface, which is similar to the water falling from the sky on a soft ground that takes the pathways available to it, or forms itself the pathways that take place in it. The form of these pathways depends on the nature of the information received and the way it was received (Seligman, 2003: 51).

Third: Academic Achievement:

A Educational studies and research have occurred a tremendous development in the scientific standards of the procedures in which education is carried out as well as school procedures in order to achieve the goals and purposes that came from Education, which is the achievement of comprehensive development of the learner in all aspects, and academic achievement as an educational phenomenon has received special attention and is the subject of many studies and researches, most of the research and studies were directed towards the mental variables associated with academic achievement, and the results of research and studies showed that the level of the student who has reached him in the achievement of the study does not stop at the limit of his mental level, but rather the impact of this level with several variables, including motivation, emotion and social and economic (Nasrallah, 2010: 59).

Therefore, the desire to achieve is a general desire that each learner tries to achieve from a To reach levels of success and creativity, as well as the desire to achieve as a result of an urgent need that encourages the student to engage in activities that require more determination and challenge to reach the desired goal.

Achievement is also important in the mental processes carried out by the student, the result of which reaches the student to the order of a and his transition from a stage of study to another, and that academic achievement has a strong link to learning, but a good wider than achievement, learning includes the procedures and changes all of which occur in a student's illness within the educational situation, as well as includes the acquisition of students of information and scientific experiences as well as habits and values and a desired and undesirable goals, while academic achievement is linked to the desired goals (Sedqi, 2016: 137).

Section 2: Previous Studies

1. Al-Moussawi Study (2009)

The need for cognitive closure and self-regulation and their relationship to peripheral thinking

The study aimed to identify the relationship between the need for cognitive closure, self-organization and peripheral thinking among university students according to the variables (gender- and specialization), and to achieve the objectives of the research, the researcher translated the measure of the need for cognitive closure from the preparation of Krokanski, and the scale is (38) items distributed over (5) areas, and also translated the measure of self-organization prepared by Krokanski and the scale is (23) items, and built a test for peripheral thinking consisting of (21) questions, and after finding the psychometric properties of the three tools on a sample of (411) students of Mustansiriyah University students. (Al-Moussawi, 2009: T.K.)

2. Janabi Study (2019)

The Effectiveness of the Problem Tree Strategy in the Achievement of Fifth Grade Students

The research aims to identify the effectiveness of the problem tree strategy in the achievement of fifth-grade students, and to achieve the goal of the research and its hypothesis, the researcher adopted an experimental design located in the field of experimental designs with partial control of the post-testing of the academic achievement of the two research groups, and the researcher prepared a research tool, as it was represented by an achievement test in the physics subject of

the multiple choice type, consisting of (40) items of the type (multiple choice, essay questions). The validity, reliability and level of difficulty of the test items, the strength of discrimination, and the effectiveness of its incorrect alternatives, and after analyzing the results statistically, the researcher reached the superiority of the students of the experimental group who studied the physics subject with the problem tree strategy over the students of the control group who studied the same subject in the usual way in the achievement test (Al-Janabi, 2019: TTH).

Chapter: III

Research Methodology and Procedures

This chapter includes a presentation of the research methodology and procedures in terms of identifying the research community and selecting a sample from that community, preparing tools characterized by honesty, reliability and objectivity, and using appropriate statistical means to analyze and process the data of this research, as follows:

I. Research methodology

This research represents one of the relational research, which is one of the descriptive research, so it is based on the descriptive research approach that adopts the principle of analysis and scientific interpretation to describe, classify, analyze and subject its conclusions according to the problem presented to the scientific study in order to advance knowledge.

Second: The research community

The current research community consists of students of the fifth scientific grade, the morning study for the academic year (2021-2022), which is (2690) students, distributed by section and gender to (1348) students of the applied section by (718) students and (630) students. The biological section includes (1342) students, (617) students and (725) students, who are attending (37) secondary and preparatory schools by (14) secondary schools and (23) preparatory schools distributed by gender on (16) secondary and preparatory schools for males, and (21) secondary and preparatory schools for females, within the Directorate of Education of Babylon Governorate. The ages of these students range (17-19) and they come from close social, economic and cultural environments; as shown in Table (1)

Table (1) The research community of fifth grade preparatory students by section and gender

| Schools | Number of schools | Number of students per section | | Total |
|-------------------------------|-------------------|--------------------------------|---------|-------|
| | | Applied | Biology | |
| Boys' secondary schools | 4 | 10 | 51 | 61 |
| Secondary schools for girls | 10 | 116 | 257 | 373 |
| Middle Schools for Boys | 12 | 708 | 566 | 1274 |
| Preparatory schools for girls | 11 | 514 | 468 | 982 |
| Total | 37 | 1348 | 1342 | 2690 |

Third: Research Sample

The current research sample included (400) male and female students selected in a random, phased manner with equal distribution, as schools were selected and their number and divisions were selected from these schools (two divisions of the applied section and two divisions of the biological section) and students were randomly selected from these divisions according to the gender and section variables. (200) male students were selected by (100) male students of the applied section and (100) students of the biological section, (200) female students were selected by (100) female students of the applied section and (100) female students of the biological section. As for males, (100) students were selected from middle school The revolution for boys by (50) students of the applied section and (50) students of the biological section, and (50) students of the applied section of the Canadian Preparatory for Boys, (50) students of the biological section of the preparation of the statement for boys, and females have been selected (100) students of the preparatory of the suns by (50) students of the applied section and (50) students of the biological section, and (100) students of the High School of Virtues by (50) students of the applied section and (50) students of the biological section, and thus the current research sample of (400)

students of the applied and biological sections, and thus the proportion of the research sample to The research community (14,869%) is approximately (15%), and Table (2) shows this .

Table (2) The sample of schools and the number of students according to the gender variable and the section

| Schools | Applied Section | | Biological section | | Total |
|------------------------------|-----------------|---------|--------------------|---------|-------|
| | Males | Females | Males | Females | |
| Al thawra Preparatory school | 50 | | | | 50 |
| Al Kindi Preparatory School | | | 50 | | 50 |
| Al Bayan Preparatory School | 50 | | 50 | | 100 |
| Al Fadael Preparatory | | 50 | | 50 | 100 |
| Al shumooos High School | | 50 | | 50 | 100 |
| Grand Total | 100 | 100 | 100 | 100 | 400 |

Fourth: Research Tools

Since the current research aims to know the relationship between peripheral thinking and academic achievement among middle school students, it was necessary to have two appropriate tools to measure (peripheral thinking - academic achievement):

First: the test of peripheral thinking

The researcher prepared a test for peripheral thinking due to the lack of a local test that suits the current research sample, in which the following steps were followed:

1. **Determine the concept to be measured:** In order for the researcher to rely on the concept in the preparation of the test, the researcher has adopted the view of De Bono)) and adopted his definition of prudential thinking, which states that (a way to solve problems using imagination to find new ways of looking at the problem).
2. **Preparation of the test items** in their initial form: In order to identify the pattern of peripheral thinking among middle school students, the researcher reviewed a number of De Bono's proposals and theories about peripheral thinking, which were interspersed with a set of questions and puzzles posed by De Bono, as well as a set of tests for peripheral thinking. The researcher then identified similar and different tests, the researcher identified (40) questions for peripheral thinking.
3. **Correction of the test:** The test is corrected by giving weights (0,1) by giving a score of one for the correct answer and zero for the wrong answer according to the solutions and answers given to each question in the test. The total score is calculated by collecting the correct answers, and therefore the highest score the respondent can obtain is (40) and the lowest score the respondent can obtain is (0) and the hypothetical mean of the test is (20).
4. **Preparation of the test correction key:** A key has been prepared to correct the test in which the correct answers and solutions to each of the questions included in the test have been included.
5. **The first exploratory application:** The peripheral thinking test was applied to a sample of (40) students from the fifth grade preparatory students, by (20) students from Tabarsi Preparatory for Boys and(20) students from Toledo Preparatory for Girls. After conducting the exploratory study and reviewing the answers, it became clear that the test items and instructions were clear to the students, and it was found that the time taken to answer the test ranged between (40-45) minutes.
6. **Statistical analysis of the items** of the peripheral thinking test: The researcher applied the test in its initial form, amounting to (40) items to a sample of students in the fifth grade in its two sections (applied - biological) for the preparatory stage, which is the sample to be studied in the current research, and

they were chosen in a random way from the research community and their number reached (400) students; The statistical analysis includes:

A) Item difficulty coefficient: In order to calculate the difficulty coefficient of the peripheral thinking questions, the 400 forms were arranged in descending order, and 27% of the forms with the highest scores and the same percentage of the forms with the lowest scores were determined. The number of students in each group was (108) students. The test items were arranged according to their difficulty from difficult to easy. Table (3) shows the values of the peripheral thinking difficulty coefficients .

Table(3) Evaluate the difficulty coefficient of the peripheral reasoning test

| QUESTIONS | Order | Difficulty index | QUESTIONS | Order | Difficulty index |
|-----------|-------|------------------|-----------|-------|------------------|
| 2 | 1 | 0,45 | 11 | 21 | 61 |
| 25 | 2 | 0,45 | 20 | 23 | 0.62 |
| 32 | 3 | 0,45 | 27 | 24 | 0.62 |
| 1 | 4 | 47 | 16 | 26 | 63 |
| 24 | 5 | 0.48 | 22 | 27 | 63 |
| 18 | 7 | 51 | 13 | 28 | 0.64 |
| 17 | 8 | 0.55 | 19 | 29 | 0.64 |
| 23 | 9 | 0.56 | 29 | 30 | 0.64 |
| 33 | 10 | 0.56 | 5 | 31 | 0.65 |
| 7 | 11 | 0:57 | 6 | 32 | 0.65 |
| 3 | 12 | 0.58 | 21 | 33 | 0.65 |
| 12 | 13 | 0.58 | 8 | 35 | 0.66 |
| 14 | 14 | 0.58 | 9 | 36 | 0.66 |
| 26 | 16 | 0:59 | 28 | 37 | 0.68 |
| 15 | 18 | 0.60 | 4 | 38 | 69 |
| 30 | 19 | 0.60 | 10 | 39 | 69 |
| 31 | 20 | 0.60 | | | |

A)Distinguishing items : The discriminating force of each question was extracted andthetable (4) shows that.

Table (4) The Discriminatory Power of Background Thinking Test Questions

| QUESTION | Discriminator | QUESTION | Discriminator | QUESTION | Discriminator |
|----------|---------------|----------|---------------|----------|---------------|
|----------|---------------|----------|---------------|----------|---------------|

| S | y force | S | y force | S | y force |
|----|---------|----|---------|----|---------|
| 1 | 0.43 | 12 | 0.41 | 23 | 0.46 |
| 2 | 0.46 | 13 | 0.46 | 24 | 0.40 |
| 3 | 0.43 | 14 | 0.46 | 25 | 0.41 |
| 4 | 0.46 | 15 | 0.40 | 26 | 0.43 |
| 5 | 0.49 | 16 | 0.45 | 27 | 0.44 |
| 6 | 0.40 | 17 | 0.43 | 28 | 0.40 |
| 7 | 0.44 | 18 | 0.44 | 29 | 0.46 |
| 8 | 0.43 | 19 | 0.41 | 30 | 0.47 |
| 9 | 0.44 | 20 | 0.44 | 31 | 0.49 |
| 10 | 0.40 | 21 | 0.40 | 32 | 0.65 |
| 11 | 0.46 | 22 | 0.49 | 33 | 0.54 |

7. The validity of the test: The researcher relied on two types of honesty:

A) Face validity : This type of honesty was achieved in the current test and was referred to in the steps of building the test.

B) Construction validity: Indicators of construction validity :

- Method of the two extreme groups: It has been referred to in the statistical analysis process of the peripheral thinking test .
- The relationship of the item score to the total score of the test: The researcher used the binary correlation coefficient for the purpose of finding the correlation between the score on the one question and the total score of the test, and it was found that all items have statistically significant correlation coefficients at the level of significance (0.05) and the degree of freedom (398), and Table (5) shows this.

Table (5) Correlation coefficient values for peripheral reasoning test

| QUESTIONS | Correlation coefficient | QUESTIONS | Correlation coefficient | QUESTIONS | Correlation coefficient |
|-----------|-------------------------|-----------|-------------------------|-----------|-------------------------|
| 1 | 0.451 | 12 | 0.377 | 23 | 0.321 |
| 2 | 0.313 | 13 | 0.327 | 24 | 268 |
| 3 | 0.212 | 14 | 0.221 | 25 | 0.231 |
| 4 | 0.136 | 15 | 260 | 26 | 0.133 |
| 5 | 0.274 | 16 | 289 | 27 | 0.221 |
| 6 | 226 | 17 | 431 | 28 | 0.453 |
| 7 | 0.303 | 18 | 296 | 29 | 0.313 |

| | | | | | |
|----|-------|----|-------|----|-------|
| 8 | 0.445 | 19 | 278. | 30 | 0.321 |
| 9 | 0.329 | 20 | 356 | 31 | 326. |
| 10 | 0.385 | 21 | 487 | 32 | 0.273 |
| 11 | 0.360 | 22 | 0.385 | 33 | 0.453 |

- 8. Test reliability** : The researcher relied on the method of analysis of variance: this equation is designed to extract the internal consistency of the tests; and by applying the equation, the reliability coefficient reached (0.70), which is a good reliability coefficient.
- 9. The final version of the peripheral thinking test:** After the researcher finished analyzing the items of the peripheral thinking test and finding the psychometric properties of validity and reliability , the final version of the test was obtained, which consists of (33) items in the form of questions that the respondent answers with either correct or wrong answers according to the solutions set for the test and shown in the correction key. The answer sheet was also placed on the test separately and includes the sequence of items (1- 33). Therefore, the highest score obtained by the respondent is (33) degrees, and the lowest score is (0), and the hypothetical average of the test is (16,5) degrees.

Second: Achievement Test

The following is an explanation of the steps that the preparation of the achievement test has gone through:

- 1. Determination of the scientific material:** The test aims to measure the achievement of the students of the two research groups (experimental, and control) in the last four chapters (circular and rotational movement, vibratory and wave motion, sound, electric current, and magnetism) of the book of physics material for the fifth scientific grade for the year (2021), eighth edition.
- 2. Formulating behavioral goals and determining their levels:** Behavioral goals in the cognitive field were formulated based on the content of the educational material covered by the trial period, which amounted to (165) behavioral goals according to the classification of (Bloom) cognitive at its six levels, which are (remembering, understanding, application, analysis, synthesis, evaluation) and were presented to a number of arbitrators, to indicate their views on the accuracy of its formulation and its suitability for its cognitive

levels, and an agreement percentage of at least 80% and above of the opinions of the arbitrators was adopted , and thus the agreed goals became distributed over the three chapters, as shown in Table (6), which was included in the teaching plans and in light of that, the achievement test was prepared.

Table (6) Behavioral objectives in the cognitive field according to content

| Semester | memory | Understanding | Apply | Analysis | assemblage, assembly, installation, anatomy, structure, texture, combination, synthesis, composition, composing | calendar | Total |
|----------------------------------|--------|---------------|-------|----------|--|----------|-------|
| Circular and rotational motion | 17 | 12 | 11 | 5 | 2 | 2 | 49 |
| Vibratory, wave and sound motion | 14 | 10 | 9 | 4 | 4 | 2 | 43 |
| Electric current | 15 | 7 | 6 | 2 | 3 | 3 | 36 |
| Magnetism | 16 | 6 | 5 | 4 | 4 | 2 | 37 |
| Total | 62 | 35 | 31 | 15 | 13 | 9 | 165 |

3. Preparation of the specification table (test map): Any design of the specification table requires finding a kind of balance between the two basic dimensions in the table, which are the content and objectives. Accordingly, the researcher prepared a test map that included the topics of the required chapters of the physics book scheduled for the fifth scientific grade based on Bloom's classification in the cognitive field of levels. In preparing the test map, the following steps were followed:

A) Calculate the percentage of the importance of the content of the chapter by the following law:

$$100 \times \frac{\text{Number of pages per chapter}}{\text{Total pages count}} \text{ significance level per chapter}$$

A) Calculate the percentage of the importance of the behavioral goal by the following law:

$$100 \times \frac{\text{Behavioral objectives per each level}}{\text{Total behavioral objectives}} \text{ significance level per chapter}$$

B) Counting the number of items (questions) for each cell according to the following law:

Number of items per cell = relative weight of each class x relative weight of target x total number of test items

The researcher identified the test items with (40) table (7).

Table (7) Test Map

| Topics | No. of Pages | Relative importance | Behavioural objective | | | | | calendar | To Qu |
|---------------------------------|--------------|---------------------|--|-------------------|-----------------|----------------|--|----------|-------|
| | | | reachievement , reminiscence, recall 38% | Understanding 21% | Application 19% | Analysis of 9% | assemblage, assembly, installation, anatomy, structure, texture, combination, synthesis, composition, composing 8% | | |
| ircular and rotational motion | 31 | 29% | 4 | 2 | 2 | 1 | 1 | 1 | 11 |
| ibratory, wave and sound motion | 28 | 26% | 4 | 2 | 2 | 1 | 1 | 1 | 11 |
| lectric current | 25 | 23% | 3 | 2 | 2 | 1 | 1 | 0 | 9 |
| agnetism | 23 | 22% | 3 | 2 | 2 | 1 | 1 | 0 | 9 |
| | 107 | 100% | 14 | 8 | 8 | 4 | 4 | 2 | 40 |

4. **Drafting test items :** The researcher drafted the items of the achievement test of the multiple choice type, as the number of items of the achievement test reached (40) test items of the multiple choice type.
5. **Formulation of test instructions:** The researcher prepared a number of instructions, including: (the purpose of the test mode, the nature of the test components, indicating that each question was read accurately and attentively, determining the amount of the score on each item, an illustrative example of how to choose).
6. **Test validity:** To confirm the validity of the achievement test, the researcher adopted two types of validity:
 - A) **Face validity :** Accordingly, the researcher distributed the achievement test with the behavioral objectives and the specification table to a group of specialists in education and methods of teaching physics. In light of their opinions and suggestions, the items or alternatives that need to be modified were modified after extracting the value of the calculated K-square and comparing it to the table value of (3.84) at a level of significance (0.05) and a degree of freedom (1). The results showed the validity of all test items .
 - B) **Content validity:** It is the degree to which the test measures the content of the study material to be measured. The validity of the content requires two things: the validity of the items in terms of the fact that the items represent the study content and the validity of the preview from the inclusion of the test items to the content of the study material (Abdul Rahman, 2017: 87), and then the test items are representative of the study content and comprehensive of it by relying on the specifications table (7) in indicating that.
7. **The first exploratory experiment:** For the purpose of knowing the duration of the test answer, the clarity of its items and instructions, and revealing the mysterious ones, the researcher applied it to a exploratory sample consisting of (30) male and female students from the fifth grade. After applying the test, the approximate average time taken to answer was calculated and it was found that the response time takes (43) minutes, as well as the clarity of drafting the test items for the students of the exploratory sample.

8. **The second reconnaissance sample:** To achieve this, the researcher applied the achievement test to a sample of (100) male and female students, and arranged their grades to extract the following:
- A) **Item difficulty coefficient:** When the researcher calculates the difficulty coefficient of each of the test items , he finds that it is limited to (0.39 – 0.69), and thus it is considered acceptable difficulty coefficients.
 - B) **Discernment coefficient:** When calculating the discernment power of each test item, the researcher found that it is limited to (0.33-0.67), which means that all test items are good.
 - C) **Effectiveness of false alternatives:** When calculating the effectiveness of the correct alternatives to the test items , the researcher found that they are limited to (-0.04 - 0.41) , which means that the incorrect alternatives have attracted more students from the lower group than the upper group.
9. **Test reliability** The researcher verified the reliability of the test in two ways:
- . Hemifractionation method: Reliability using the Pearson correlation coefficient (0.79) was corrected by the Spearman-Brown equation (0.88), and the test is stable.
 - A) **Kauder-Richardson method** 20: The coefficient of reliability when calculated with this equation is (0.80), and the test is stable.
10. The final application of the two research tools: After verifying the validity of the background thinking test and the achievement test and verifying their psychometric characteristics, as well as ensuring the clarity of their items and instructions to the responding students, the researcher applied the two tools together to the basic research sample of (400) students from the preparatory stage, and the researcher was keen to apply the two tools herself.

Fifth : Statistical Methods

The researcher relied on the statistical portfolio (SPSS) to analyze the data.

Chapter Four

Presentation and interpretation of results

This chapter deals with the presentation and interpretation of the results in the light of the objectives of the current research and discusses them with the

results of previous studies, and includes the researcher's conclusions based on the research results, as well as the recommendations she recommends, and the proposals she proposed in the light of the results as follows:

First: Presenting and discussing the results

The first goal: For the purpose of achieving the first goal, which aims to identify the level of prudential thinking among middle school students, the arithmetic mean of students' scores was extracted on the prudential thinking test, reaching (20,3050) with a standard deviation of (5,8001). When calculating the significance of the difference between the average scores of the sample on the prudential thinking test and the theoretical average of the test, which reached (16,5) score, using the T-test of one sample, it was found that the difference between the two means was statistically significant in favor of the arithmetic mean achieved for the scores of the individuals of the research sample, that is, there are statistically significant differences between the achieved average and the theoretical average and that the difference between them is real and is not caused by the factors of chance, and Table (8) shows that.

Table (8) T-test of one sample to identify the level of peripheral thinking

| No of Sample | Arithmetic mean | deviation, perversion, variation Standard | Theoretical average | T value | | Degree of freedom | Significance |
|--------------|-----------------|---|---------------------|-----------|---------|-------------------|--------------|
| | | | | Calculate | tabular | | |
| 400 | 20,3050 | 5,8001 | 16.5 | 13,120 | 1,96 | 399 | significance |

This means that the current research sample of fifth grade preparatory students has a good level of precautionary thinking, and this is evidence that middle school students have information, experiences and qualifications that helped them in the process of precautionary thinking, that is, the environment in which they live and interact with them provided them with a store of knowledge that helped them solve the situations or problems they are exposed to, so the environment has a great impact on the growth of the student's personality in all its mental, emotional and physical aspects.

The second goal: In order to achieve the second goal, which includes identifying the differences in peripheral thinking according to the two variables of gender (male – female) and the section (applied - biological), the researcher used the binary contrast analysis in interaction (ANOVA), and Table (9) shows this .

Table(9) Interactively analyzing binary variance for differences in peripheral thinking by gender and section variables

| Source of variance | Squares Total | Degree of freedom | Mean squares | Pecuniary value | Significance |
|---------------------|---------------|-------------------|--------------|-----------------|-----------------|
| Gender | 139,240 | 1 | 139,240 | 6,946 | significance |
| Section | 5329,000 | 1 | 5329,000 | 265,855 | significance |
| (gender + section) | 16,810 | 1 | 16,810 | .839 | Not significant |
| Residual error | 7937,740 | 396 | 20,045 | — | |
| Total | 13422,790 | 399 | — | — | |

It was found through the analysis of variation that there are differences in the averages of the degrees of peripheral thinking in the sample according to the gender variable (males– females), as the calculated mean value was (6,946) degrees, which is higher than the table value of (3,84) at the level of significance (0.05) and two degrees of freedom (1-396), and it appeared that the difference according to the gender variable in the peripheral thinking was significant in favor of females, as the arithmetic mean of the female group was (20,8950) degrees with a standard deviation of (5,7985) degrees, while the arithmetic mean of the male group was (19,7150) degrees with a standard deviation of (5,7558), and Table (10) shows this .

Table 10 Arithmetic averages and standard deviations of peripheral thinking by gender variable

| Gender | Number of students | Arithmetic Mean | Standard Deviation |
|---------|--------------------|-----------------|--------------------|
| Males | 200 | 19,7150 | 5,7558 |
| Females | 200 | 20,8950 | 5,7985 |

This is due to the methods of socialization and the impact of the family on the upbringing of the girl and care for her more than the male because of traditions and social norms that put restrictions on the actions of females more than males and this led to make females think more and look at the situation or the problem from all sides in order to solve that problem.

There are differences in the averages of the degrees of precautionary thinking in the sample members according to the variable of the section (applied - biological). The calculated value of the applied section was (265,855) degrees, which is higher than the table value of (3,84) at the level of significance (0.05) and two degrees of freedom (1 – 396). It was shown that the difference according to the section variable in the precautionary thinking was in favor of the applied section, as the arithmetic average of the applied section group was (23,9550) degrees, with a standard deviation of (4,5900) degrees, while the arithmetic average of the biological section group was (16,6550) degrees, and with a standard deviation of (4,4276) degrees, and table (11) shows this .

Table (11) Arithmetic Averages and Standard Deviations of Precautionary Thinking by Section Variant

| Section | Number of students | Arithmetic Mean | Standard Deviation |
|-----------|--------------------|-----------------|--------------------|
| Applied | 200 | 23,9550 | 4,5900 |
| biologist | 200 | 16,6550 | 4,4276 |

This is due to the nature of the materials that need to understand, perceive, analyze and devise these processes have to do with the process of perceptive thinking, unlike the materials for the biological section, which depends on concentration and indoctrination. This contradicts the perceptive thinking that is based on understanding and understanding the reasons behind the occurrence of things, as well as the teacher's way of delivering the material to the student has a great impact in stimulating thinking and encouraging the student to express his opinion and put forward his ideas.

There is no interaction between the two variables of gender and the section of peripheral thinking, as the calculated mortality value reached (0,839) degrees,

which is less than the tabular value (3,84) degrees at the level of significance (0.05) and two degrees of freedom (1-396).

The third goal: In order to achieve the third goal, which aims to determine the level of academic achievement among middle school students, the arithmetic mean of students' grades was extracted on the academic achievement test, reaching (41,4250) with a standard deviation of (3,9061), and when calculating the significance of the difference between the average scores of the sample on the academic achievement test and the theoretical average of the test, which reached (28) using the T-test for one sample, it was found that the difference between the two means was statistically significant in favor of the arithmetic mean achieved for the scores of the members of the research sample, as in Table (12)

Table 12 Indicators regarding the change in the number of migrants with tertiary education in countries of the Organization for Economic Cooperation and Development: 1990-2000

T-test of one sample to identify the level of academic achievement test

| Sam ple size | Arithmetic mean | deviation, perversio n, variation Standard | Theoreti cal average | T value | | Degr e of freed om | Signifi cance |
|--------------------|--------------------|--|----------------------------|------------|---------|--------------------------------|------------------|
| | | | | Calculated | tabular | | |
| 400 | 41,4250 | 3,9061 | 28 | 17,537 | 1,96 | 399 | signifi cance |

This means that the current research sample of fifth grade preparatory students has a good level of academic achievement, which indicates that the family performs an important and influential act in making the student interested in study or science, as several factors, including the achievement of the father and mother and the culture of the parents have an impact. The higher the achievement of the father and mother and their culture, the higher this is reflected on their children, as well as family education in creating and providing a psychological and physical environment.

Fourth Objective: In order to achieve the fourth objective, which includes identifying the differences in academic achievement according to the two variables

of gender (male– female) and the section (applied - biological), the researcher used the binary contrast analysis with an interaction (ANOVA), and Table (13) shows this.

Table (13) Interactively analyzing binary variance for differences in academic achievement by gender and section variables

| Source of variance | Squares Total | Degree of freedom | Mean squares | Pecuniary value | Significance |
|--------------------|---------------|-------------------|--------------|-----------------|-----------------|
| Gender | 86,490 | 1 | 86,490 | 6,614 | Significant |
| Section | 817,960 | 1 | 817,960 | 52,550 | Significant |
| Gender + Section | 4,840 | 1 | 4,840 | 370 | Not significant |
| Residual error | 5178,460 | 396 | 13,077 | – | |
| Total | 6087,750 | 399 | – | – | |

It was found through the analysis of the variance that there are differences in the mean scores of academic achievement in the sample according to the gender variable (males– females). The calculated mean value was (6,614) degrees, which is higher than the table value of (3,84) degrees at the level of significance (0.05) and two degrees of freedom (1-396). It was shown that the difference according to the gender variable in academic achievement was significant in favor of females, as the arithmetic mean for the female group was (41,8900) degrees with a standard deviation of (3,7347) degrees, while the arithmetic mean for the male group was (40,9600) degrees with a standard deviation of (3,0261) degrees, and table (14) shows this .

Table (14) Arithmetic averages and standard deviations of academic achievement by gender variable

| Gender | Number of students | Arithmetic Mean | Standard Deviation |
|---------|--------------------|-----------------|--------------------|
| Males | 200 | 40,9600 | 3,0261 |
| Females | 200 | 41,8900 | 3,7347 |

This indicates that the educational attainment of females is better than that of males. This is due to the methods of socialization that restrict the female and do not allow her to go out as much as the male. Therefore, her free time is more than

the free time of the male who spends most of his time outside the house. Therefore, females take more time to study than males. Some may view the girl as less than the boy. Such a situation leads the girl to want to prove to others that this view is wrong and that she is not less than the boy by persevering to obtain a prestigious position.

There are differences in the mean scores of academic achievement in the sample members according to the variable of the section (applied - biological). The calculated mean value of the applied section group was (62,550) degrees, which is higher than the table value of (3,84) at the level of significance (0.05) and two degrees of freedom (1 – 396). Differences appeared according to the section variable in academic achievement and in favor of the applied section , as the arithmetic mean of the applied section group was (42,8550) degrees and standard deviation (3,4297) degrees, while the arithmetic mean of the applied section group was (39,9950) degrees and standard deviation (3,8365) degrees , and table (15) shows this .

Table (15) Arithmetic averages and standard deviations of academic achievement by section variable

| Section | Number of labs | Arithmetic Mean | Standard Deviation |
|-----------|----------------|-----------------|--------------------|
| Applied | 200 | 39,9950 | 3,3365 |
| biologist | 200 | 42,8550 | 3,4297 |

This is due to the nature of the study materials that motivate the student to memorize, that is, the nature of the materials or curricula of the applied section encourages students to study because they rely on memorization more than the biological section because the study materials of the biological section are difficult or because the teachers do not explain the material well, as well as there are several other factors that help raise the level of academic achievement of the student, including the nature of family and economic factors, the level of ambition of parents, as well as the internal motivation of the learner.

Fifth Objective: The relationship between peripheral thinking and academic achievement among middle school students); To find out the relationship between peripheral thinking and academic achievement, the researcher used a correlation coefficient (pearson) to find out the nature of the relationship between the research

variables and found that it is equal to (0,213) degrees, while the tabular value reached (0,098), This indicates that there is a correlation between the two variables, and this is due to the information, experience and knowledge storage that the student possesses increases familiarity with the situation or the problem and thus can solve the situation or question. This means that the academic achievement of the material is strong or that he wishes to understand the material or the curriculum, as well as the scientific and technological development we live in today has an effective impact on the availability of great opportunities to obtain information about peripheral thinking through the computer and information transmission networks.

Sixth Objective: In order to achieve the sixth goal, which includes identifying the differences in the relationship between peripheral thinking and academic achievement according to the gender and section variables, the researcher used the azimuth test to find out the differences in the relationship, as the azimuth value calculated for the gender was (0.8) and the azimuth value calculated for the section is (0.6), which is less than the table azimuth value (1.66) at the significance level of (0.05), and this indicates that there are no differences in the relationship between the two variables according to the gender and section. Table 16 shows this.

Table (16) Differences in the relationship between peripheral thinking and academic achievement by gender and section variables

| | | Correlation coefficient | Fisher value | Calculated azimuth | Table azimuth | Significance |
|----------------|-----------------|-------------------------|--------------|--------------------|---------------|------------------|
| Gender | Males | 308 | 321 | 0.8 | 1,96 | (Nonsignificant) |
| | Females | 0,142 | 141 | | | |
| Section | Applied | 0,022 | 020 | 0,6 | | (Nonsignificant) |
| | Biologic | 080 | 080 | | | |

Third: Conclusions

From the findings of the current research, the researcher concluded the following:

1. Middle school students have a good level of peripheral thinking.
2. There are statistically significant differences among middle school students in thinking about the gender variables (males – females) in favor of females, and the section (applied – biological) in favor of the applied section .
3. Middle school students have a good level of academic achievement.
4. There are statistically significant differences among middle school students in academic achievement according to gender variables (males - females) in favor of females, and the section (applied – biological) in favor of the applied section .
5. There is a statistically significant relationship between peripheral thinking and academic achievement in the research sample.
6. There are no differences in the relationship between peripheral thinking and academic achievement according to the gender variables (male – female) and the section (applied – biological).

IV. Recommendations

In light of the results and their discussion, the researcher came up with a number of recommendations:

1. Preparation of some programs, activities and courses to develop the thinking of the students of the preparatory stage.
2. The family has a great impact and basis in the development of thinking in the child because the stage of childhood is the basis for other stages. Whenever the family exposes the child to a certain situation and asks him to find a solution, it leads to the development of thinking as well as work to develop his question. This helps him to grow his thinking and thus he can solve the problem he is exposed to.

Fifth: Proposals

To complement the current research, the researcher proposes the following:

1. Conducting a study aimed at developing prudent thinking among middle school students.

2. Conducting a study on academic achievement and its relationship to other thinking styles.

References

1. Abu Jadu, Saleh Muhammad Ali and Muhammad Bakr Nofal (2007): Teaching Theoretical Thinking and Practice, 1st Edition, Dar Al-Masirah, Amman.
2. Ismaili, Yamna Abdelkader (2011). Thinking patterns and levels of academic achievement. Amman: Al-Yazuri Scientific House for publication and distribution
3. Akram, Mesbah (2019): Achievement Level and its Relationship to Personal Characteristics and Academic Achievement of Children, 1st Edition, Dar Al-Masirah, Cairo.
4. Al-Kadam, Abdullah Saeed Hassan (2013): The Effectiveness of a Program in Investigative Thinking in the Subject of (Jurisprudence and Behavior) among Fourth Grade Primary Students in Riyadh Region, (Unpublished Master Thesis), Faculty of Graduate Studies, University of Jordan.
5. Al-Badri, Ahmed bin Humaid (2009): Developing Science Curricula in the Light of Scientific Culture, (Curriculum Symposium – Future Visions), Sultan Qaboos University, Faculty of Education Rustaq, (16 – 18) March.
6. Bakli, Dhi Abdul Hussein Makki and Hassanin Sadiq Saleh Abqah (2017): Creative Thinking (Innovation) and Academic Achievement, 1st Edition, Radwan Publishing and Distribution House, Amman, Jordan.
7. Jarwan, Fathi Abdul Rahman (2013): Teaching Thinking Concepts and Applications, 6th Edition, Dar Al-Fikr, Amman, Jordan.
8. Al-Janabi, Laith Hadi Marzouk (2019): The Effectiveness of the Problem Tree Strategy in the Achievement of Fifth Grade Students, University of Babylon. College of Basic Education, Iraq. unpublished master's thesis
9. Hassan, Hana Rajab (2014): Thinking about his education programs and measurement methods, Scientific Books House for Printing and Publishing, 1st Edition, Amman.
10. Hamid, Salma Mohammed (2016): The impact of the strategy of overlapping waves in the development of divergent thinking among fifth grade literary

- students in history, (unpublished master's thesis), Faculty of Education for Humanities, University of Diyala, Iraq.
11. Al-Khafaji, Ali Musa (2021): Surround Thinking, 1st Edition, Dar Al-Masirah for Publishing and Distribution, Amman, Jordan.
 12. Salama, Adel Abu Al-Ezz Ahmed (2012): Methods of Teaching Science and Its Role in Developing Thinking, Dar Al-Fikr for Printing, Publishing and Distribution, Amman, Jordan.
 13. Al-Salkhi, Mahmoud Jamal (2013): Academic Achievement and Modelling of the Factors Affecting It, Dar Al-Masirah, Jordan.
 14. Sidqi, Mohammed Saeed (2018): The Use of Achievement Tests in Education, Journal of Education Mission, Educational Research Department, Directorate General for Educational Development, pp. 52-66 .
 15. Sawafta, Walid Abdul Karim (2008): Developing Creative Thinking Skills, 1st Edition, Dar Al Thaqafa for Publishing and Distribution, Amman, Jordan.
 16. Al-Moussawi, Hussam al-Din Abdul-Muttalib (2012): The Need for Cognitive Closure and Self-Organization and Their Relationship to Circumferential Thinking, Journal of the Faculty of Education, pp. 211-331.
 17. Nasrallah, Omar Abdul Rahim (2010): The Low Level of School Achievement and Achievement Causes and Treatment, 1st Edition, Dar Wael Amman.
 18. Nofal, Mohammed Bakr (2009): Serious Creativity Concepts and Applications, Depuno Center for Publishing and Distribution, Amman, Jordan.
 19. Battisch, S., and others, "Instruction processes and student out comes In cooperative Learning Groups", the Elementary school Journal. Vol (51), No(4) Apr, 1993, p.91
 20. Center for teaching and learning, 2013. Twelve active learning strategies, University of Minnesota, Minnesota, USA.
 21. Cook, Li: the impact of cooperative learning strategies on professional and gradate education student at California state, Dissertation Abstracts International , Vol(51), No(1), 1990 .
 22. Dori, Y. ,Yersolavski, O. , Lazarowitz, R. : Paper Present at NARST Annuale meeting , San Francisco , ca, 1995
 23. Gordon, I. E. (2005). Theories of visual perception. New York: Psychology Press.

24. Richard , M. : Feldew and Reecca Brent Effective Strategies for Cooperative Learning, North Carolina , state university, J. cooperation and collaboration in collage teaching , 10 (2), 2001, pp. 69-75 .
25. Seligman et al (2003). Positive Psychology : FAQs . Psychological Inquiry. 14, 159-163
26. Shermis, Mark & Di vesta francis J (2011) : Classroom assessment in action, Rowman & Littlefield publishers, U K.