

Effectiveness of brain-based strategy for lateral thinking by fifth applied preparatory grade in physics

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Abstract:

The research aims to identify Effectiveness of brain-based strategy for lateral thinking by fifth applied preparatory grade in physics , For realization of this research the experiment carried out on which is Al-hussein Ibn Ruh scientific school for boys as class (A) is chosen randomly (by lot) to be the experimental group that is to be taught with brain based learning strategy while class (B) represents control group that is to be taught by the traditional method. The number of student in both classes is (70) students after disposing two of failure students in class (A) and another one in class (B). This makes the final number of students is (67). research tool: researchers formulate lateral thinking test of (20) items (puzzles) and the respondent must solve these puzzles to measure lateral thinking, and the way of marking this test by (1, 0,). Validity and stability of the test are check where stability Coefficient (0.82) that is applied after finishing the experiment. Statistical program SPSS and Excel are used for measuring t-test for the two independent samples, Key square, Pearson linear correlation coefficient, items difficulty coefficient, discrimination coefficient, effectivity of wrong alternatives, Cronbach's alpha and η^2 . Based on the results, researchers conclude that effectivity of brain based strategy in the lateral thinking for the experimental group students in comparison with the control group that is taught with traditional method.

1. The research problem

Teaching physics faces many problems, one of these problems is students' weakness in comprehending physics concepts since most used methods of teaching in this time are traditional that is of presentative nature and are based on memorizing where student has negative role that means neglecting student's role in acquiring knowledge by his own. This leads into producing generations that are unable to use thinking and in need to simple component of good thinking. Based on his experience in teaching physics in intermediate and preparatory schools which sounds enough, researcher notices decline in academic achievement in spite of the efforts that the teachers do. He also notices that there is a clear failure in using new methods or strategies of teaching sciences in general and physics

in specific that develops skills and modes of thinking of students. These methods and strategies takes into consideration individual differences among students and urge them to think and use new skills and this what questioaire results prove where majority of sample members (90%) admit that they use lecture and discussion strategy that is based on feeding and memorizing away from teaching by thinking and its modes or anything that is related to cognitive field. Without paying attention to the emotional and skillful side in teaching, for the second question results are ignorance with them and for decline in academic achievement (third question) the results assure that students who use summaries copybooks that are previously prepared by teachers, makes them depend on memorizing away from practicing thinking skills which leads to clear decline in academic achievement level. 85% of their answers assures the decline in preparatory stage students academic achievement and there is not any usage of modern modes of thinking. For the fourth question, 95% of students answer assure that they do not have any information about it.

2. As the results of many studies in the field of teaching physics assure that decline in academic achievement as a result for using traditional means as with Al-Jouburi (2016) [1] and Al-abadi's (2016) [2]. Thus, Based on previous narrative, it is better to find the tools that guaranty treating mentioned negative issues. Researcher attempt to find suitable teaching strategy that can achieve effective learning which makes the students more participant in the educational process and increases their academic achievement. This also makes them more participants in the scientific activities as well as increases their desire to solve physical problems in addition to teaching them modes and skills of thinking and one of these skills is brain-based learning strategies that is used in this research. This strategy is considered one of the strategies that arouses thinking and based on the previous narrative the problem of the researcher can be briefed in the following question

What's the effectiveness of teaching with brain-based learning strategy in lateral thinking for the students of fifth preparatory grade in physics?

2. Importance of research

Importance of research can be summarized with following points:

- 1- This study keeps pace with modern international scientific developments, as it calls for focusing on learning in an environment that is in harmony with nature and structure of the brain.
- 2- Teachers, supervisors and syllabus developer of science must be notified to the importance of developing skills of lateral thinking in physics.
- 3- This study can provide assessment tools in lateral thinking skills field.

3. Objective of Research

The current research aims to identify the effectiveness of effectiveness of brain-based strategy in lateral thinking for the students of fifth applied preparatory grade.

4. Research limits: The current research can be determined as below:

1. Human limits: students of fifth applied grade in the secondary and preparatory schools that are affiliated to general directorate of education Karkh II in Baghdad government.
2. Topical limits: seventh, eighth and ninth chapters of physics course for the fifth applied scientific preparatory grade, sixth edition, 2016.
3. Time limits: second course of academic year (2016/2017)

5. Definition of terminologies

Brain-based learning strategy is defined by (Qurani,2015) as : a group of educational activities and steps that are executed by students and teachers and that are based on assumptions and theoretical concepts of brain-based learning. It is done through successive steps: preparation, acquisition, preference de, forming memory and functional perfection.[3]

Researcher defines it as : A group of related and organized steps that are performed by researcher and students and they are based on assumption and theoretical concepts of brain-based learning according to successive steps (preparation, acquisition, preference de, forming memory and functional perfection).

Lateral thinking which is defined by (Mahmood.2006) as: a type of thinking that depends on exploring more solutions and alternatives and through it , the problem or the situation can be checked from different aspects and finally solving the problem. [4]

Researcher also defines it procedurally as: a style or type of thinking that is acquired by student through his attempt to find available solution or alternatives to deal with situations or problems that he encounter. It is measured by the total degree the students record within lateral thinking test which is prepared for this sake.

6. Theoretical background

The nature of teaching science differs from that of other school subjects since sciences depend much on making students to participate in the scientific activities, as they practice a group of scientific activities such as observation, conclusion, prediction , explanation ans son on. Thus science teacher must use multiple and varied methods of teaching especially the modern ones. [5]

Modern education focuses on teaching that means providing the student with life experiences to be used in his real life. It is also the behavior that is beneficial for the student and society in the present time and future. Thus the teacher and school must work to simplify teaching and the process of getting knowledge in order to reach highest level of academic achievement. Schools are required to establish an suitable environment for learning students as well as rebuilding their programs , methods of teaching and way of planning in a way that is compatible with the students' capacities and the activities that they do in a way that achieves harmony with their interests, desires and basic requirements while continuing achieve acceptable level of academic progress and achievement.

Education in any society is aimed to enlightening that society individuals scientifically and to increase their scientific culture in order to be present in their behavior when facing scientific issues in their life. For this specialist in education field assure that science syllabuses and their teaching are not traditional transmitting knowledge to the student and memorizing them by him but it is a process of activating the previous knowledge, rebuilding, understanding, memorizing and retrieving it according to student mental, sentimental and skillful

growth and his personal integration from all aspects in order to achieve scientific culture in teaching sciences. [7] Therefore, education is considered subject to change due to its nature and its role in society. Based on what's mentioned previously, the variables in the age of information will cause strong shakes in education system in terms of its philosophy, policy, methodology, styles as the objective of education is no longer providing the student with knowledge as a goal in itself but keep thinking how to get knowledge through different and multiple sources and functioning it by students in solving problems that they encounter in their everyday and academic life in addition to mastery in dealing with knowledge tools. [8]

Education must also be concerned with teaching students how think and to train them to use modern pattern of it in order to go forth successfully in their lives and to contribute in building a culture since in many countries one of the basic requirements of educational syllabus is giving great consideration to thinking and to list it as one of the objectives that they aimed to. Many educational programs develop their activities that are aimed to train student for thinking. Norris sees that thinking is not an educational choice only but an necessity that cannot be left. He ascribes this a group of considerations like: development of thinking leads to more understanding of what student learns as teaching is basically a process of thinking and functioning thinking in teaching changes the process of knowledge acquisition from passive activity into mental one, such change produces better perfection to the cognitive content and linking its elements with each other. Capacity to think is consider as a basic requirement for the student as the student who has this capacity will be independent in terms of his thinking, able to supervise his thinking, free of dependency and able to take right decisions through his academic life.

School is considered as a social and educational organization that is established by the society to serve his purposes and to achieve his objectives as well as it has an important role in hardworking to provide all circumstances and needed possibilities for preparing and raising generation of student as well as providing suitable learning environment in a way that facilitates learning , helps the teacher in doing his duty and increases student's pride with his school. School and other educational organization use

academic syllabus since it is the only thing that can interpret educational process as a procedural activity as it formulates objectives, plans, trends of society. In this case, syllabus is based on requirements of its orientation and hopes, objectives, aspirations, values, culture of that society. Syllabus is something that equals culture in any community of certain country that has thinkers who develops it and purify it out of impurities and mistakes in addition to its people. [10] Thus, modern syllabuses of sciences –including physics- must be centered on necessity of student's comprehension to the scientific information as well as providing him/her with intellectual skills in order to be able to apply his previous knowledge in finding solutions and alternatives to deal with any situation or problem in life and to conduct explanatory activities that enables students to form solid cognitive structure and this structure provides him/her with procedural skills enables him/her in solving problems in his life. As the students is the first objective of the educational process, education tries with its different facilities and means to educate, upbringing and prepare students to participate in the community productively and fruitfully, as students differ in their capacities, some of them are able to achieve high level of academic achievement when they are exposed to the theoretical explanation, some of them whose their learning can be increased by using multiple teaching aids such as watching transparencies, shelves, photos and educational films others need variety of teaching aids to form a clear picture about the scientific content. All this is to provide educational situation that fulfils the different need and requirements of students in a way that achieves better production for their mental, physical, sentimental, skillful, moral and esthetical development as well as developing their thinking in order to save experiences in the present time that have relation to the objectives that the teacher tries achieve. [11]

Teacher is considered one of the basic elements of education process and interactive situations which occurs between him/her and his/her students since he/she is the responsible and controller of the educational environment in the class as well as whatever happens in the class. He/she is responsible for forming students' trends and desires and to drive them for more communication, persistence and achievement. The importance and status of teacher comes from the multiple roles and tasks that he/she

does within the class as his/her role is not only providing and transmitting information and knowledge but it includes achieving the educational objectives which include skills and values acquirement as well as knowledge that helps in developing their personalities through using multiple and varied means and methods of teaching that suits the topics that is taught by the teacher. [12] teacher must conveys the content (information or knowledge) in order to achieve the behavioral and educational objective in the most interesting way that could raise student's desire and drive him/her to learn with paying attention to the student's qualities and his psychological, social, mental and physical characteristics. Teacher has to invent his teaching method and to be flexible in using teaching method that he is convinced it will achieve the intended educational objective, his personality also has the great effect in teaching. Thus the reason for students' attention is the ability, skill and the method of teaching of teacher rather than the content of the academic topic itself. [13] Method of teaching is considered one of the basics that the educational process is based on, as it represents an important element of syllabus. It is closely connected with cognitive material and the educational objectives and it plays a role in achieving these objectives since they specifies the roles of the teacher and student in the educational process as well as it specifies the methods, styles and activities that are to be used. [14] Educationalist agree that education for thinking or leaning thinking skills is one of the important educational objectives and the teacher has to do as much he can in order to provide the student with opportunity of thinking, majority of them consider thinking as an educational objectives that has the priority as when the formulate their educational objectives, anyone can find that they express their wishes and expectations in developing their students capacities in order to be able to deal effectively with complicate problems of life in the present time and in the future. for this reason, educationalist reconsider the effectivity of methods of research and their used strategies in schools, thus a process of seeking for special teaching strategies that makes the learner as an effective element in the small village that we live in nowadays. [15]

Researchers of the present find that the interest of other researchers is recently focused on studying brain in terms of learning and understanding that are

based on meaning, recognizing mechanisms of brain work with its two hemispheres for supporting student activities and developing their mental abilities as some specialists call for building programs and academic syllabus that are based on learning that is based on brain in order to develop students abilities in many fields since human brain is not a single system but it is a group of systems that work together interactively and comprehensively in order to understand situations completely and not partially. [16]

Thus the results researchers about brain comes out with the theory of learning based on brain that leads for creating academic environment which make the student busy with educational experience and to make him/her get rid of fear and to let him/he to interact actively.[17] in this context, many researches of brain and education indicate that each hemisphere of brain are responsible for dealing with different kind of information or knowledge and brain's function depends basically on left and right hemisphere, in other words, both hemispheres of brain deals with different kinds of recognition and thinking as well as tow different kinds of knowledge. Some researchers show that left hemisphere deals with managing analytical and logical behavior of human while right hemisphere deals with information more comprehensively and it is capable of representing whole thing mentally in same time left hemisphere splits information into smaller element. Thus generally, left hemisphere is responsible for dealing with abstract and linguistic issues while right one is responsible for feelings, experience and things related to sensitive knowledge. [18] researches about mind do not refer that traditional methods and strategies of teaching are necessarily wrong, but they show that these methods are neither in harmony with brain's functions nor the best way for leaning based on brain as well as the y provide us with clear understanding methods that could help students for learning perfectly and in order to use the modern methods that is lead to activating thinking processes within the mind completely as well as it stimulate students to have a role in acquiring knowledge that is not based on memorizing only, but it based on an interactive dynamic knowledge which brain-based leaning to have learning of meaning and to organize learning according to the principle of mind. [19]

Brain-based learning is an approach that uses modern researches of neurology as it shows how learning is performed naturally within mind. Based on what we know about the actual structure of human brain and its function in different phases of development. What is worth to be mention here is that the brain has multiple and varied abilities and skills which differ from one student to another and this goes back to physiological maturation of student brain in addition to the fact that brain is affected with the biological and environmental effects that makes certain student distinctive in terms of his features when he/she is compared to others. [20] in the shade of what is mentioned previously, a new educational direction comes to light and it is known as brain compatible Learning or brain based learning. It is the learning that considers basic structure of human brain, its function. One of strategies that is derived out of this approach is brain based strategy as it is considered the first strategy that is derived out of brain based theory, it includes five steps: preparation (tribal readiness and preparation), viewing and acquiring information (direct and indirect learning), elaboration (explanation and clarifying), formulating memory and functional integration.

In spite of the fact that learning is based basically on brain in one way or another but learning according to brain based strategy harmonized with natural method that brain learns with. This strategy is considered as a complete concept that specifies education features. It is not inflexible mode or style for treating problem but it is a group of concepts that represents the basis of skills or knowledge by which it is possible to ake better decisions about learning. In this context Willis (2007) sees that brain based strategy can be used to improve students' memory, reinforcing learning in addition to achieving success. Shore (2012) assures that this strategy has a role in helping students to achieve a deeper levels of learning and thinking during courses and developing their experience. [3]

Jensen (2007) indicates that it is possible to make better decisions about learning process, if principles of brain function are being taken in consideration. Brain based learning includes knowing the rules of brain function thus learning is modified in a way that makes learning in a harmony with these rules in order to achieve learning of meaning for students. Klob and Klob indicates that meaningful learning does not occur at once but it occurs gradually since

brain works with different units during learning. Madrazo and Motz (2005) denotes that brain based learning is functioning knowledge through using results of neurology researchers about mechanism of brain function in order to achieve better understanding about students' learning and their intellectual development. [21]

Sousa (2006) believes that brain based learning uses integrative functioning of emotions, feedback, rich environment, music, motion, formulating meaning and disappearance of threat in order to make student more productive and participant. Results of many researches that are based on theory of brain based learning and are focused on function of brain hemisphere by using thinking modes (mental controlling mode) of students, such studies indicate that both hemispheres' functions centered on two modes of analytical thinking: linguistic and mathematical logic, these modes of thinking are functions of left hemisphere while functions of right hemisphere includes visual, intuitive, creative and overall thinking.

Developing thinking skills and thinking modes within students is one of the most important objectives of teaching sciences and scientific education because of important role of science syllabus in activating student memory and excitation of his/her mental abilities which leads to developing his/her different thinking skills. Teaching thinking skills and its mode rises the degree of excitement and attraction to the school experiences and makes student role positive and active to be reflected with different forms: improving academic achievement and their success in school exams and achieving educational objectives. [22]

Researchers think that the importance of brain based strategy lies in the connection its steps with mental processes that the student needs when confronts educational and everyday life situations such as making decision and solving problems. Such connection helps student to perform any task. Because of the importance of brain based strategy, many studies are made and they refer to its effectivity with certain variable such as defense and intelligence in some academic topics. In several counties around the world and with different samples of school and universities students, pinkerton (2002) concludes that student who study by brain based strategy are better than students who study by traditional method in terms of their attainment in

science. Willis (2008) alludes that brain based strategy stimulates student to use creative thinking and learning that goes beyond preparation for exam. There is new trend for using one of creation modes which is the serious creation or it is entitled as lateral thinking which is the solution for solving problems with non-traditional styles or illogical ones clearly. It is also called as vertical thinking to be distinctive as De Bono assures that the purpose of lateral thinking is to change thoughts and to produce new ideas. Lateral thinking means lateral transmission from one idea to another. [23]

Mureid and Abed Ali's study indicates that lateral thinking with renewed way may get along with nowadays concepts. It is a kind of creation and it acquires its charm from its interesting search for simple new ideas. Its also for all since it is not dependent on pure intelligence while Kubeicy and Ameen's study (2014) indicates that lateral thinking has many benefits in enriching imagination and thinking with many prospects thus it develops brain in terms of expanded thinking that is called as intelligence skills. [25]

Researchers sees that lateral thinking importance lies in expanding imagination and thinking with many solutions as brain develops with deep thinking and developing intelligence skills in a better way, and it is considered intellectual process that provides information and knowledge for student through experience and practice. Because of lateral thinking importance, many studies indicate that lateral thinking is a mode of creative thinking as in Saleh and Sa'aud's study (2014) . lateral thinking can be learnt, practiced, used by anyone and tools and styles of lateral thinking shows according to experience that they can be learnt as examined patterns as we need a new idea , it is possible for anyone to use organized patterns to produce new ideas. [26]

7. Research methodology and procedures

A.experimental structure: researchers use experimental structure that is called experimental structure of partial control for two equivalent groups (control and experimental groups) with pre-test and post test for measuring lateral thinking as shown in sechme 1.

scheme (1) experimental structure of the research

Group	Equivalen ce	Independen t Variable	Dependent Variable
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experim ental	1. Time age 2. Intelligence 3. Previous information	Brain based learning	Lateral thinking
control	4. Lateral thinking	Traditional method	

B .Research community limitation: research community includes all students of fifth applied preparatory grade inn preparatory and secondary governmental schools in general directorate of education Karkh II in the city center of Baghdad during the academic year (2016-2017).

C .choosing research sample: researchers choose the school where they apply their experiment which is Al-hussein Ibn Ruh scientific school for boys as class (A) is chosen randomly (by lot) to be the experimental group that is to be taught with brain based learning strategy while class (B) represents control group that is to be taught by the traditional method. The number of student in both classes is (70) students after disposing two of failure students in class (A) and another one in class (B). This makes the final number of students is (67).

D. Equivalence of research groups: Equivalence of research groups is achieved on 16/2/2016 according to the following variables: Time age intelligence, previous information in physics, lateral thinking). T-test value is calculated where the results are non-indicative statistically.

E. research tool: researchers formulate lateral thinking test of (20) items (puzzles) and the respondent must solve these puzzles to measure lateral thinking, and the way of marking this test by (1, 0) , in other words, when student answers the puzzle correctly will be graded (1) but if he/she mistakes or never answer the puzzle , he/she will be graded (zero). In this way and based on the correct answers of each puzzle, but the total mark of the test is measured by summing the marks of all puzzles thus the highest mark of the respondent is (20) and lowest is (zero). The average mark is (10). Validity and stability of the test are check where stability Coefficient (0.82) that is applied after finishing the experiment. Statistical program SPSS and Excel are used for measuring t-test for the two independent samples, Key square, Pearson linear correlation coefficient, items difficulty coefficient, discrimination coefficient, effectivity of wrong alternatives, Cronbach's alpha and η^2 .

F. **Teaching plans preparation:** researchers prepare a group of teaching plans for student of both research groups (experimental and control) in the shade of the content of seventh, eighth, ninth chapters of physics course book that is taught in fifth grade in the academic year (2016-2017) as well as they formulate the behavioral objectives as one teaching plan for each class. The total number of plans are (40) for the experimental group that is taught with brain based learning strategy and (40) plans for the control group that is taught with traditional method.

H. **procedures of applying experiment:** researchers start applying experiment on Thursday (16/2/2017) as the second researcher teaches both research groups. Experimental group are taught according to the teaching plans that is prepared by the researchers where five classes are taught for each group in the week.

g. **applying lateral thinking test:** researchers apply lateral thinking test on Thursday (16/2/2017) for both group in the same time and Students' marks of both groups are calculated.

8. Presenting and explaining results:

a. **presenting results of null hypothesis that states:** in order to check the validity of the second null hypothesis of research which states " there is no difference of statistic indication at (0,05) level between the average of students' marks in the experimental group which is taught with brain based learning strategy and the average of students' marks in control group that is taught with traditional method".

Table (1) results of T-test for research groups in lateral thinking test

Groups	Number	Statistic average	Standard deviation	T-test value		indication
				calculated	tabular	
experimental	34	11.71	3.43	2.73	1.99	indicative
control	33	9.27	3.83			

Table 91) shows that calculated T-Test value is (2,73) which is bigger than tabular value that is

(1,99) at indication level of (0,05) and freedom degree of (65). This indicates that there is difference of statistic indication between the between the average of students' marks in the experimental group and the average of students' marks in control group and this disapproves null hypothesis and approves its alternative.

B: **specifying the effect size (d) (effectivity) for the independent variable on the dependent variable (lateral thinking):** researchers use effect size equation (d) for the independent variable (brain based strategy) on the dependent variable (lateral thinking),

At calculating the value effect size (d) (based on the value of eta square for the independent variable (brain based learning strategy) on the second dependent variable (lateral thinking), researcher find that (d) value =(0,321) and this means that effect size of brain based strategy on lateral thinking is weak. Based on the results, researchers conclude that effectivity of brain based strategy in the lateral thinking for the experimental group students in comparison with the control group that is taught with traditional method.

9. Recommendations: in the shade of the results of the present research, researchers conclude the following:

1. Starting training courses for teaching staffs about brain based strategy.
2. Implying syllabus of developing courses for teachers in the educational organizations with number of modern methods and patterns of teaching and one of them is brain based strategy.
3. Adopting the Brain-Based Learning Strategy as a cognitive stimulant in the curriculum of science teaching methods and training students of faculties of education and teachers' institutes to adopt them in teaching.

10. Proposals: To complete this research, researchers suggested the following

1. Conducting further studies on the use of the brain-based learning strategy in other study stages.
2. Conducting studies to compare the effectiveness of the brain-based learning strategy with other methods and strategies in the development of achievement and lateral thinking.
3. Conducting studies on the obstacles to the development of lateral thinking among students.
4. Conducting a similar study of the current study in other variables, visual thinking, scientific thinking, reasoning, decision making.

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