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The effect of using brainstorming in Achievement and developing of scientific thinking in the course of science to seventh grade students in Saud Kharji School, Kuwait City, Kuwait

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Abstract
This research aims to identify the difference between the method of brainstorming and lecture, in Achievement and developing of scientific thinking in the course of science to seventh grade students in Saud Kharji School, So the researcher used the experimental method and the research sample consisted of seventh-graders, were selected simple random way, were divided into two groups of 20 students per group, one of them experimental were been taught according to the method of brainstorming and the other one was a control group taught according to the method of lecture.
The researcher took into account the provision of internal and external safety of the experiment, the researcher prepared educational program consisting of 32 educational units distributed to 16 educational units for each group, as the program was implemented in a way brainstorming for the experimental group and the lecture for control group .And by two units a week. After the completion of the implementation of the program was conducted two tests grades and scientific thinking and after data acquisition and processing means of statistical tests the (t) for independent samples equal number, it has been getting some results, The researcher recommended after that by using the method of brainstorming as the better method than the lecture in the achievement of science course and the development of scientific thinking.
Keywords': Brainstorming, Scientific Thinking, Achievement, Experimental Method, Lecture Method, Educational Program.

1. Introduction

Fontana (1981) Confirms that brainstorming is a way to bring ideas without regard to the evaluation, this does not mean leaving the evaluation, but only postponed to the end of the session. And it must be responsible for the brainstorming session should be aware that the brainstorming process is not guaranteed to get new ideas, as well as, the use of brainstorming is not just a way to encourage new ideas, but in order to encourage participants all of them to contribute to the collective action.
So many educators have focused on the training of the teaching staff on modern techniques and methods and their applications, which stimulates learners' thinking to participate in their abilities whole self, and to promote social link between them, also used these methods the thinking in solving problems in different teaching positions multiple areas, have led to new discoveries and solutions creative, including the method of brainstorming.

Educators considered it is a one of the ways to help individuals and train them to solve problems creatively "within the group and found that the highest collective thinking of the individual to think it may reveal that the group produced a way that produces brainstorming in the hours produced by the individual in multiple months.

2. The Study Importance

This research is "modest" contribution at the level school learning to use the method of brainstorming to the importance of this stage of education in shaping the future of society and supplement it by the creative capacities because the present students are teachers in the future. It gives indications and indications of researchers in the field of teaching methods in science at the level of knowledge and scientific thinking to their students, which is the common base of the base to increase achievement and the development of thinking among students, Research contribute to encourage science teachers to use methods and modern methods of teaching, and increase their awareness of the importance of using it.

3. The Study Problem

Despite the confirmation of recent trends in education on the role of the learner being an educational process axis, but it is still negative "in the educational process and the limited role on listening and receiving, so it must work to create opportunities for students to gain experience by thinking, teamwork and the interaction between them, and it must adopt modern ways to cope with the rapid development of the human mind to make the student element "active" in the process.

The researcher diagnosis the study problem through the nature of his work and his modest experience in teaching and direct briefed on how they taught the material (science) students are used to the way of listening and memorization of vocabulary school, has earned it the student deal "of knowledge and information. But not required in finding creative solutions to them level and that the use of traditional methods of teaching, such as lecture led to a lack of students link their environment education to focus on only the cognitive aspects.
It is therefore necessary to use modern methods in the development of thinking and this development cannot give rise within the modules under the curriculum and educational programs implemented in ways that traditional methods, as it makes the teacher pot "for the transfer of information and skills, and requests to remember and retrieve that information and retrieve the student without paying attention to the development of mental capacity, especially thinking.

4. The Study Objectives

This study aims to verification the difference between two methods brainstorming and lecture in cognitive achievement of science and the difference between two methods brainstorming and lecture in the development of scientific thinking to the students in the course of science to seventh grade students in Saud Kharji School, Kuwait City.

5. The Study Hypotheses

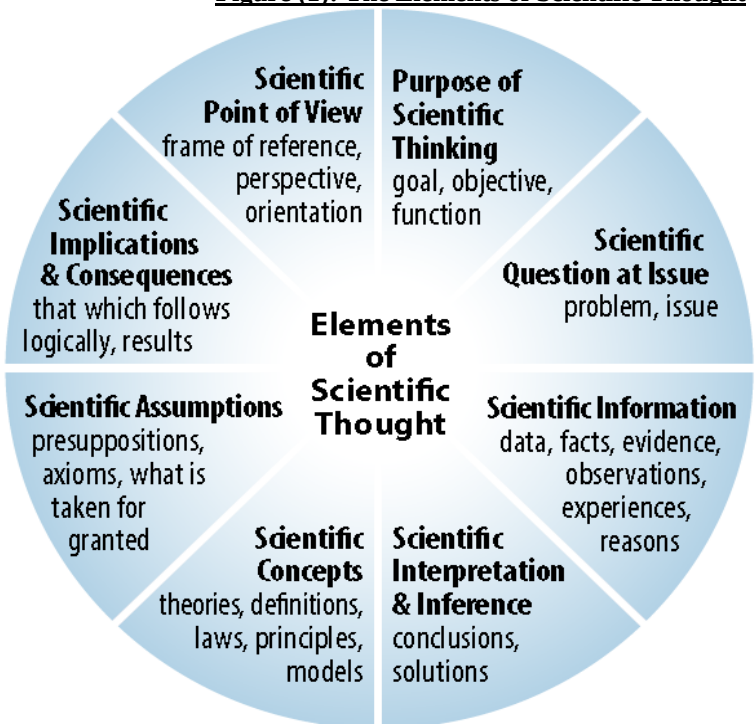
5.1. H1: There are significant differences between the averages of the experimental group which studying a way of brainstorming and the average of the control group which studying a way lectures in cognitive achievement of science among seventh grade students in Kuwait.
5.2. H1: There are significant differences between the averages difference experimental group which studying a way of brainstorming and the averages for the control group, which studying a way lecture in the development of scientific thinking.

6. Theoretical framework

6.1. Definition of brainstorming: Brainstorming is the name given to a situation when a group of people meet to generate new ideas around a specific area of interest. Using rules which remove inhibitions, people are able to think more freely and move into new areas of thought and so create numerous new ideas and solutions. The participants shout out ideas as they occur to them and then build on the ideas raised by others only when the brainstorming session is over are the ideas evaluated.

6.1.1. Traditional Brainstorming: The normal view of brainstorming is where a group of people sit in a room and shout out ideas as they occur to them. They are told to lose their inhibitions and that no ideas will be judged so that people are free to shout out any ideas at all without feeling uncomfortable. People should build on the ideas called out by other participants. The purpose of this is to gain as many ideas as possible for later analysis. Out of the many ideas suggested there will be some of great value. Because of the free-thinking environment, the session will help promote radical new ideas which break free from normal ways of thinking.
6.1.2. Advanced Brainstorming: The model propose is an extension of the traditional brainstorming scenario and makes the whole process easier and more effective. Advanced brainstorming builds on the current methods of brainstorming to produce more original ideas in a more efficient way. Specialized techniques, better processes and better awareness, combined with new technologies, make traditional brainstorming a less frustrating process. Most of the problems associated with traditional brainstorming disappear as a more effective process is used.
6.2. Definition of Scientific thinking: is that mode of thinking about any scientific subject, content, or problem in which the thinker improves the quality of his or her thinking by skillfully taking charge of the structures inherent in thinking and imposing intellectual standards upon them. and there are some result related to scientific thinking like:
6.2.1. A well cultivated scientific thinker: raises vital scientific questions and problems, formulating them clearly and precisely.
6.2.2. Gathers and assesses relevant scientific: data and information, using abstract ideas to interpret them effectively; comes to well-reasoned scientific conclusions and solutions, testing them against relevant criteria and standards.
6.2.3. Thinks open mindedly within convergent systems of scientific thought, recognizing and assessing scientific assumptions, implications, and practical consequences; and communicates effectively with others in proposing solutions to complex, scientific problems.
And the Figure Below shows The Elements of Scientific Thought:

Figure (1): The Elements of Scientific Thought



7. Literature review

7.1. The Study of (Bilal Adel Al-Khatib, 2012):**The Effect of Using Brainstorming Strategy in Developing Creative Problem Solving Skills among Female Students in Princess Alia University College**, American International Journal of Contemporary Research Vol. 2 No.10; October 2012

The purpose of this study is to investigate the effect of using brainstorm strategy in developing creative problem solving skills among female students in princess Alia University College. The sample of the study consisted of (98) female students. The sample was distributed into two classes, the first represents the experimental group totaling (47) students taught through brainstorming strategy within the course of developing thinking skills in the academic year 2010/2011, and the second represents the control group totaling (51) students. The instruments of this study were a program to use brainstorming strategy and Torrance creative thinking test. Both validity and reliability were checked by the researcher. The findings of the study showed that there are statistical significant differences at the level of ($\alpha = 0.05$) between the experimental group and the control group in the total score and the sub scores of the creative thinking in the favor of the experimental group indicating the effectiveness of using brainstorming strategy in developing creative thinking skills. The researcher recommended the use of this strategy in universities as well as conducting more studies regarding its effect by using other samples in different environments.

7.2. The study of (Ahmed Taleb, 2013): **The Effect of Using Brainstorming Strategy on Developing Creative Thinking Skills for Sixth Grade Students in Science Teaching**, Published: e-Learning "Best Practices in Management, Design and Development of e-Courses: Standards of Excellence and Creativity" , 2013 Fourth International Conference.

This study explores the effect of using brainstorming strategies in teaching science on improve creative thinking for sixth grade students in Isa town primary school. More specifically, this paper focuses on students' creative thinking skill, There are a lots of ways directed to development of creative thinking is the most important way of brainstorming being tested in the field of education on the many educational materials and proven effective in the development of the creative capabilities of students, such as Collado study (Collado 1992), Sanfilippo (Sanfilippo 1993) , this study comes to know the effect of using the method of brainstorming in the teaching of science on the development of creative thinking for students in the sixth grade primary in kingdom of Bahrain. The population of research is 60 students (two classes). Data were collecting after doing a two test (pre test and post test), quantity data were collected. From this research, some differences have been found in students' the brainstorming strategies have effective of

students' creative thinking skills and we found this results from significant differences for experimental group.

7.3. The study of (Corinne Zimmerman, 2007): **The development of scientiWc thinking skills in elementary and middle school**, Developmental Review 27 (2007) 172–223.

The goal of this article is to provide an integrative review of research that has been conducted on the development of children's scientiWc reasoning. Broadly deWned, scientiWc thinking includes the skills involved in inquiry, experimentation, evidence evaluation, and inference that are done in the service of conceptual change or scientiWc understanding. Therefore, the focus is on the thinking and reasoning skills that support the formation and modiWcation of concepts and theories about the natural and social world. Recent trends include a focus on deWnitional, methodological and conceptual issues regarding what is normative and authentic in the context of the science lab and the science classroom, an increased focus on metacognitive and meta-strategic skills, and explorations of diVerent types of instructional and practice opportunities that are required for the development, consolidation and subsequent transfer of such skills. © 2007 Elsevier Inc. All rights reserved.

7.4. The Study of (Richard K. Coll, Mark C. Lay , Neil Taylor, 2008):**Scientists and Scientific Thinking: Understanding Scientific Thinking Through an Investigation of Scientists Views About Superstitions and Religious Beliefs,** Eurasia Journal of Mathematics, Science & Technology Education, 2008, 4(3), 197-214

Scientific literacy is explored in this paper which describes two studies that seek to understand a particular feature of the nature of science; namely scientists' habits of mind. The research investigated scientists' views of scientific evidence and how scientists judge evidence claims. The first study is concerned with scientists' views of what constitutes superstitious beliefs. The second concerned potential conflicts between scientific theories and evidence, and religious beliefs. The research findings suggest that these scientists, unlike their stereotype, hold idiosyncratic views of what constitutes good scientific evidence and sound, credible testimony. The interviews provide a window into scientific thinking as practiced by modern scientists, and suggest that the scientists are rather more open to alternative thinking than might be supposed. The implications of these findings are discussed in the context of their implications for scientific literacy.

8. The study population and sample

8.1. The study population: The choice of the research community way (intentional) and students of the intermediate stage, seventh grade students, science course and the number (78) students.

8.2. The study sample: consisted of two divisions students took them out of the four divisions in the intermediate stage (A- C) has been selected the two simple random way, as tested C Division)) to represent the experimental group and taught in a way (brainstorming) and represented the Division of (A) the control group studying the way lecture. Table (1) shows that.

Table (1): The Study Sample

Division	Group	Independent Variable	Total No.	Excluded	Net No.
A	experimental	brainstorming	24	4	20
B	control	Lecture	22	2	20

9. The study Tools

9.1. Achievement Test

It has been relying on the achievement test that has been prepared in advance, which includes three levels (remembering, application, and discovery), and the test includes in his final image on (80) items which varied test and paragraphs of questions which illustrates the pattern of questions and distribute questions and paragraphs levels (Merril), also the choice of a variety of questions to be drafting this helps the student to think and answer according to the different levels of performance (remembering, application, and discovery).

9.2. Instruction of the test correction

Given the degree (one) to correct answer and (zero) for the wrong and left answer this for all paragraphs of questions objectivity with the exception of a question (fill the answer), where it was treated paragraphs of this style of Questions by giving (two) degrees to correct answer and (zero) for wrong and abandoned the answer, and this ranged total score of objective questions between (0-60) Degree.

As for the essay questions were given to the questions of the type (define, count, draw, complete the drawing) by (one) degree for the correct answer and (zero) for the wrong and abandoned answer, either questions of the type (reason, designed, analyzed, give examples) have been given (two) degrees correct answer and (zero) to wrong and abandoned answer, and this ranged from the total score for the essay questions (0-40) degrees, and thus the total score ranged between test (0-100) degrees.

9.3. Test of scientific thinking:

Researcher adopted the Test of scientific thinking for (Saleh, 1985), as amended by (Mohammad Sohail, 2004) to suit the Kuwaiti environment and because it is characterized by the following:

9.3.1. The test consists of five sections, namely, (identifying the problem, and the hypothesis testing, test the validity of hypotheses, interpretation section, public section) and these sections have the ability to measure scientific thinking as the literature indicated in this area.

9.3.2. Prepared this test phases school and university, and to all disciplines the test is characterized by that it has selected paragraphs of the terms of reference of all (Literature, Art and Science, Sport and political). The number of paragraphs of the test (104) items.

9.4. Educational program:

The programs included (32) educational units divided into experimental and control groups and by (16) and educational unit of each method and as follows:

16 educational units ⇒ experimental groups ⇒ Brainstorming
16 educational units ⇒ control groups ⇒ lecture

And it took the actual experience (8) weeks during which distributed units by two units per week for each group, and was the time for each unit (90) minutes. The researcher after selecting the teaching material presented a program on the way according to brainstorm on a group of arbitrators with experience and competence in the field of teaching methods and to express their views and comments in the program. The researcher implementation of the program starting on 20/2/2015 till 25/4/2015

10. The application of final experience

It has been application the education program units on the two sets of parity after the research procedure among them the number of variables that have been mentioned above. It was given two sets of educational research material itself was applied (brainstorming) Division of the experimental group (C) and the way to compulsory the control group of Division (A).

10.1. The comparison between the experimental and control groups in achievement test:

This section related to the 1st Hypothesis: There are significant differences between the averages of the experimental group which studying a way of brainstorming and the average of the control group which studying a way lectures in cognitive achievement of science among seventh grade students in Kuwait.

And the table (2) below shows the comparison between the experimental and control groups in achievement test:

Table (2)

Test Sections		experimental group		Control groups		t*
		Diff Pre test Post test	±	Diff Pre test Post test	±	
Test Per Level	*Remembering*	*30.53*	*1.62*	*26.33*	*1.72*	*7.77*
	Application	*29.24*	*1.16*	*26.38*	*2.27*	*4.93*
	Discovery	*17.85*	*1.34*	*15.11*	*1.39*	*6.22*
Test Per Questions style	*Objectivity*	*46.09*	*2.58*	*41.22*	*1.81*	*6.76*
	Essay	*31.53*	*2.14*	*26.6*	*2.24*	*6.94*
Total		*77.62*	*2.48*	*67.82*	*2.38*	*12.43*

*** Value (t) Tabulated front and the degree of freedom (38) and under level of significance (0.05) = 2.03**

It is seen from the table above (No.2), that the values of (t) calculated is greater than tabular and this indicates the existence of significant differences in the sections achievement test and the total score teams to the test in science between the experimental and control groups and by the review of the Means it's clear difference in

favor of the experimental group that studied according to the method of brainstorming. With this result, it has to **accept** the 1st Hypothesis.
And the researcher attributed this result to the effectiveness of brainstorming to increase awareness and understanding of the material subjects by the students because this method has provided a broad base of information about the subject matter helped students to absorb the problems faced during the practice and the development of cognitive strengths of learners, increasing fluency ideas and diversity and originality, and in this way make the student in an active and effective position.

As researcher attributes reason for this result is that down the questions that are raised in the brainstorming that inspire vitality and activity during the lesson, especially in a collective atmosphere of intimacy and cooperation that push students to think and discussions among the students themselves, and between the teacher and students on the other.

As well as the offer a way of brainstorming includes a set of clear steps that would psychological foundations sensitive in learning and encourage group discussion and take into account individual differences among students as well as they way encourage consolidation and the absence of frustration among students, are all factors that help to ensure the success of the learner to access information and Knowledge gain.

10.2. The comparison between the experimental and control groups in scientific thinking test:
This section related to the 2nd Hypothesis**:** There are significant differences between the averages difference experimental group which studying a way of brainstorming and the averages for the control group, which studying a way lecture in the development of scientific thinking.
And the table (3) below shows the comparison between the experimental and control groups in scientific thinking:

Table (3)

Test Sections	experimental group		Control groups		t*
	Diff Pre test Post test	±	Diff Pre test Post test	±	
Identifying the problem	*7.2*	*0.27*	*4.17*	*0.892*	**14.42*
Selecting hypotheses	*5.14*	*0.76*	*2.85*	*0.864*	**8.80*
Test the validity of hypotheses	*6.42*	*0.641*	*3.61*	*0.781*	**12.21*
Interpretation	*3.55*	*0.508*	*1.86*	*0.74*	**8.45*
Generalization	*6.28*	*0.576*	*4.79*	*0.69*	**7.45*
Total Degree	*27.94*	*1.481*	*17.36*	*1.555*	**21.504*

*** Value (t) Tabulated front and the degree of freedom (38) and under level of significance (0.05) = 2.03**

It is seen from the table above, that the values of (t) calculated is greater than tabular and this indicates the presence of significant differences in a test scientific thinking and the total score for the two experimental and control sections teams and review (circles arithmetic difference between pre and post tests) clear superiority of the experimental group that studied according to the method of brainstorming the mental control group studied according to the method of lecture. With this result, it has to **accept** the 2nd Hypothesis.
This is due to the effectiveness of the method of brainstorming in teaching as they unleash thinking, and give students the freedom to express an opinion and welcomes exotic ideas and avoid student vitriol these factors correspond to the nature of the students who are inclined at this stage to the independence and freedom of opinion. "The brainstorming is one of the ways that encourage thinking and launches potential when educated in an atmosphere of liberty and safety.

11. The Results of study

11.1. Effective way to use brainstorming and lecture in the achievement of science and the development of scientific thinking.

11.2. Beats the experimental group that studied according to the method of brainstorming on the members of the control group, who studied according to the method of lecture in the achievement of knowledge of the substance of teaching methods tested individuals.

11.3. The impact of the method of brainstorming better than the way of lecture in the development of scientific thinking

12. References

1) *Meadow, A., & Parnes, S. J. (1959). Evaluation of training in creative problem solvin,. Journal of Applied Psychology, 43, 189–194.*
2) *Meadow, A., Parnes, S. J., & Reese, H. (1959). Influences of brainstorming instructions and problem sequence on a creative problem solving test. Journal of Applied Psychology, 43, 413–416.*
3) *Nickerson, R. S. (1999). Enhancing creativity. In R. J. Sternberg (Ed.), Handbook of creativity (pp. 392–430). New York: Cambridge University Press.*
4) *Nunamaker, J. F., Applegate, L. M., & Konsynski, B. R. (1987), Facilitating group creativity: Experience with a group decision support system. Journal of Management Information Systems, 3, 5–19.*
5) *Parloff, M. B., & Handlon, J. H. (1964). The influence of criticalness on creative problem solving in dyads. Psychiatry, 52, 117–122.*
6) *Parnes, S. J. (1961). Effects of extended effort in creative problem solving. Journal of Educational Psychology, 52, 117–122.*
7) *Putnam, L. L., & Stohl, C. (1996). Bona fide groups. In R. Y. Hirokawa & M. S. Poole (Eds.), Communication and group decision making (2nd ed., pp. 147–178). Thousand Oaks, CA: SAGE Publications.*
8) *Rickards, T. (1999). Brainstorming. In M. A. Runco & S. R. Pritzker (Eds.), Encyclopedia of creativity (pp. 219–227). New York: Academic Press.*
9) *Ruback, R. B., Dabbs, J. M., & Hopper, C. H. (1984). The process of brainstorming: An analysis with individual and group vocal parameters. Journal of Personality and Social Psychology, 47, 558–567.*
10) *Sager, S., & Baron, C. (1994). Statview for the Macintosh (2nd ed.). Berkeley, CA: Abacus Concepts.*
11) *Seta, J. J., Seta, C. E., & Donaldson, S. (1991). The impact of comparison processes on coactors' frustration and willingness to expend effort. Personality and Social Psychology Bulletin, 17, 560–568.*
12) *Shepperd, J. A. (1993). Productivity loss in performance groups: A motivation analysis. Psychological Bulletin, 113, 67–81.*
13) *Smith, B. L. (1993). Interpersonal behaviors that damage the productivity of creative problem-solving groups. Journal of Creative Behavior, 27, 171–187.*
14) *Blankenship, D .J (1975) Study of effects of Creativity Training upon the self concept , achievement , and Creative Performance of first grad pupils, Dissertation Abstracts , International 36 (11): 7147-A*
15) *Maria (1985) study of the development of creativity and creative thinking in science teaching, the catholic university of America, Pg. 158*
16) *Klentin study (1998), entitled "The Impact of a summer program on the capabilities of creative thinking development, Virginia- polytechnic- institute & state- University (0247), Pg. 183*
17) *Sauer, T. (2000). The effect of mathematical model development on the instruction of acceleration to introductory physics, students, ProQuest Dissertations and Theses; Thesis (Ph.D.)--University of Minnesota*
18) *Wares, A. (2001) Middle school student's construction of mathematical models, unpuplished doctoral Dissertations, Illionis State University. Normal*
19) *Bogner, F.X, (1999): Empirical Evaluation of an Educational Conservation Program Introduced in Swiss Secondary School International Journal of Science Education*
20) *Gibson, H.L (1998): A Study of The Long Time Impact An Inquiry- Bassed Science Program Science on Student Attitudes Toward Science and Interest in Science Careers, (Seventh Grade, Eight Grades). Dissertation Abstract International –A, 59 (2), P449*
21) *Alvin M. Pettus, (1980) Identifying Factors Related To Science Process Skill Performance Levels, School Science and Mathematics Volume 80, Issue 4, pages 273–276, April 1980*
22) *Gerry D. Haukoos and John E. Penick (1983), The influence of classroom climate on science process and content achievement of community college students, Journal of Research in Science Teaching , Volume 20, Issue 7, pages 629–637*