

The Effect of Using Brainstorming Strategy in Developing Creative Problem Solving Skills among Female Students in Princess Alia University College

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Abstract

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.

Key words: brain storming, problem solving skills

1. Introduction

The globe is turning to be a small village, due to the developments in the scientific, economic and social aspects of life as well as the communication revolution results from the knowledge development and globalization. As a response to those developments and challenges it was necessary to prepare a generation that capable of confronting those challenges through changing the traditional methods of learning and teaching as well as focusing on providing students with the suitable training on different thinking styles.

Individuals can't be prepared for present and future through pouring information into them through the traditional teaching methods that depend on the teacher in the first place. However, this must be done through guiding students towards achieving knowledge understanding in relation with everyday problems since we live in the era of openness between communities requiring us to employ information and investing it in solving problems in the environment leading to the development of the ability of thinking as well as developing innovation and creativity (Al-daoud, 2004).

Brainstorming strategy is one of the most important strategies in provoking creativity and solving problems in the educational, commercial, industrial and political fields. Brainstorming strategy was introduced by Alex Osborn, an American advertisement company manager in 1938 as a results of his inconvenience of traditional business meetings. Brainstorming means the use of brain to the active problem solving and the brainstorming session aims to develop creative solutions to problems (Jarwan, 2005).

On the other hand, creative thinking is known as a compound mental activity aiming to direct a strong desire to look for solutions or reaching original solutions that were not known before (Jarwan, 2008).

Hoing (2001) defined it as the multiple thinking that includes the breaking up of old ideas, making new connections, enlarging the limits of knowledge and the onset of wonderful ideas.

With regard to creative problem solving it is based on the cognitive theory that adopts the concept of the cognitive structure. It is the mental process of creating a solution to a problem. It is a special form of problem solving in which the solution is independently created rather than learned with assistance. Creative problem solving always involves creativity (Qattami, 2010). It can be defined as a frame of styles designed to help and enhance the problem understanding then generating new and different solution and assessing those solutions using the creative skills (Gardner, 1999; Richard, Angle & Ann, 1999). Due to the importance of both concepts (brainstorming and creative thinking) the current study aims to explore the relationship between them especially in developing creative problem solving skills.

2. *The Study Problem and Questions*

As a response to the international trend of developing the creative thinking skills especially creative solving of problems because of its importance in helping individuals to cope with international changes and the technology revolution and the communication and interaction in the globalization era. Moreover, it helps in developing creative problem solving skills as well as a balanced individual's personality capable of social interaction and using self learning. Further, the role of the teacher had evolved and developed to be a facilitator and trainer, this require him to obtain new teaching methods such as brainstorming and other strategies that can develop creative thinking skills among students. Therefore, the current study seeks to answer the following questions:

1. Is there a statistically significant effect at the level of significance ($\alpha = 0.05$) for using brainstorming program in teaching creative thinking skills development course in enhancing creative problem solving skills among princess Alia college students compared to the control group?.
2. Is there a statistically significant effect at the level of significance ($\alpha = 0.05$) in developing creative thinking sub skills of the experimental group compared with the control group?.

3. *The Study Objective*

The study aims to:

1. Investigate if there are differences in the means of female students scores on problem solving skills attributed to the brainstorming program.
2. Exploring the extent of acquiring creative problem solving skills among princess Alia college students.

4. *The Study Importance*

The importance of this study emerges from the importance of its variables represented in brainstorming strategy and creative problem solving skills. Moreover, the importance of the current study is that it seeks to reveal the effectiveness of the training program that is based on brainstorming to develop creative problem solving skills among students. The study is seeking to design a practical program that can be used by teachers to employ brainstorming strategy to enable students from generating creative solutions for problems.

5. *The Study Limits*

The study was conducted within the following limits:

- A sample of female students in princess Alia college in the summer semester of 2010/2011.
- The study discussed brainstorming and creative problem solving variables. Thus, findings are limited to those variables within the used procedures.
- Teaching three units of creative thinking skills development course for Bs degree students.
- The psychometric characteristics represented in the validity and reliability of the creative problem solving skills scale.

6. *Procedural Definitions*

- **Brainstorming Strategy:** brainstorming is an innovative conference with special nature in order to produce a list of ideas that can be used as clues lead students to the development of the problem while giving each student the chance to express her ideas and share those ideas with others and encourage new ideas (Al-blwi, 2006).
- **Creative Problem solving skills:** A mental process where the gifted uses his experiences and available information to respond to the requirements of unfamiliar situation through executing whatever that may solve ambiguity and closing time gaps. It is measured through calculating students' scores on Torrance test (Alala, 2009).

7. Literature Review and Previous Studies

The Literature review will discuss the concepts of brainstorming and creative problem solving skills as well as related studies in both national and international levels

Brainstorming

Al-maghrawy, (2012) defines brainstorming as a group creativity forum for general ideas. According to Zayton (2001), brainstorming was developed by Alex Osborn to produce ideas without inhibition. Brainstorming technique involves oral and pre-writing exercises for helping the learner and for expressing ideas by the teacher. It is a technique that is used under the discussion method.

Brainstorming has a great importance in the teaching process. Referred to its importance for students in (Sayed. 292:2009) as follows:

1. Helps students to solve problems, an innovative solution.
2. Helps students to benefit from the ideas of others through the development and build on them.
3. Helps the cohesion of the students and build relationships among them and assess the views of others.

"And its importance for the teacher referred to in (Humaidan 105:2005).

Helps the teacher to conclude ideas that are broader than students' thinking solutions Makes the teacher more democratic and respectful of views regardless of the different points of view.

The major purpose of brainstorming as a teaching strategy is to foster and enhance communication skill, help to promote thinking and decision-making skill as well as foster different viewpoints and opinions. It may equally be used in all key areas of learning. However, the major limitation is that it is generally not suitable for younger levels because of the level of reasoning required in order for it to work. The teacher must equally be able to guide and give aid as necessary considering the class environment as such considerations often determine the outcomes. In brainstorming techniques, the instructor carefully plans the lesson to reach the desired learning outcomes. The group interacts in response to questions, and the instructor refrains from entering the discussion as an active participant. Students are encouraged to learn about the subject by actively sharing information, experiences, and opinions. The flow of communication is a transaction among all the students rather than recitation and response between individual students and the instructor.

Stages of Problem solving in brainstorming session:

A-blwi (2006) mentioned for stages that must be followed in problem solving within the brainstorming session, those are:

- A. Phrasing the Problem: The teacher who is responsible on the sessions offers a problem and discusses its various dimensions for students to ensure understanding.
- B. Framing the problem: in this stage the teachers determines the problem accurately by reframing the problem in certain questions. This may offer acceptable solutions without the need for further brainstorming.
- C. Practicing brainstorming for one or more than one statement in problem. This step is very important as many ideas are generated. Al-qarni (2011) mentioned that this step needs:

1. conducting warming up session
2. Receiving ideas even if they were nonsense.
3. Offering the four principles of brainstorming on the board in order to be seen by students.
4. writing and presenting all ideas (Proposed solutions).
5. Frustration and boring must be avoided.

D. Offering the ideas: Brainstorming session lead to generate a big number of ideas and therefore, those ideas must be evaluated and select the most suitable and important ones according to novelty, originality, usefulness, duration and cost as well as logic (Bani Hamad, 2006).

Creative Problem Solving

Scholars and researchers discussed the issue of creative problem solving of problems in general and especially in the field of gifted students. The creative problem solving can be defined within its three components as the solution, this means finding a way to solve the problem.

The problem refers to obstacles that present a challenge to the individual to reach a the goal. This challenge needs a solution or making a decision. Thus, creative solving is a frame or system including productive thinking tools that can be used to understand problems or generating different ideas that are not traditional then evaluating them to reach new solutions (Mitchell & Kowalik, 1999). Qattami (2010) mentioned many definitions for creative problem solving. As (Barens, Noller & Blondi) stated that it is taking a creative decision through thinking and reflecting and predicting ideas and solutions through deep awareness. Meanwhile, Asaks and Trafinger argued that it is the natural and dynamic system and a way to handle a certain challenge. It is noted that through the steps of creative problem solving model brainstorming strategy has its own importance since the aim is to generate many idea that may be the solution of a problem (Abu Jado and Nawfl, 2007).

The creative problem solving approach is the effort by the individual or the group's creative thinking to solve a problem, and can be used in many areas, and provide a framework regulating the use of tools and specific strategies to help generate and develop products that are characterized by novelty and utility, it is a framework of processes with a regulatory function , a system used by the product of the thinking tools in order to understand the problems and opportunities and the generation of many diverse ideas is familiar as well as evaluating, developing and implementing the proposed solutions (Al-asar, 2000).

Abu Jao and Nwafli (2007) mentioned that the model of creative problem solving contains the following six stages:

1. Finding the Dilemma : this stage includes considering trends, experiences and interests with careful attention to number of general subjects that can be adopt for the creative solution.
2. Finding information: this stage leads to an increased awareness of the problem through available facts, knowledge, information and feelings regarding the problem from previous stage.
3. Findings the problem: In this stage many questions are taken into consideration and many phrases of the problem are considered for collecting information.
4. Finding ideas: This stage contains the search for many responses or proposed ideas or the question or problem that is chosen previously.
5. Finding the solution: This step includes findings the solution by determining the standards of evaluating promising ideas then choosing suitable ones. Accordingly, ideas are analyzed and organized.
6. Acceptance: In this case the focus is on considering certain elements that may affect the successful use of the proposed promising solutions.

Qattami (2010) mentioned the advantages of this model as follows:

- Approved: as it was used for fifty years by many organizations around the world and supported by scientific research.
- Easy to use: It is easy when be applied and suitable for all ages and culture has no effect on it.
- Practical: can be used to solve daily problems and other challenges.
- Positive: helps the gifted student to express his talent and direct his thinking positively.

8. Previous Studies

1. The study of Harbi (2002) that aimed to measure the impact of the use of brainstorming and the development of critical thinking and academic achievement in a sample of (63) students from the secondary first grade to biology in the Kingdom of Saudi Arabia, where the students were division into two groups, one experimental and the other is control, the results have shown the presence of statistically significant differences between the average achievement of the objectives knowledge of Bloom's Taxonomy for the experimental group which studied by using of the brainstorming. study of Darayseh (2003) aimed to determine the impact of a proposed program is based on the two strategies of the semantic map and brainstorming in the development of attitudes and writing ability in English for students of the scientific secondary first grade, and to assess the role that played by these strategies in improving their attitudes toward writing in the area of Ramtha, where the study population was consisted of all students of the scientific secondary first grade in the educational government schools of the Directorate of Ramtha Educational District in the academic year of (2002- 2003) and the sample consisted of (212) learners (males, females), spread over three divisions for males and three females were selected randomly, the experimental group has formed of two divisions of males and two divisions of females, while the control group consisted of the Division for males and one for females, The study showed the results, the most important, there are significant differences in favor of the experimental group that taught according to the proposed program.

2. Hung (2003) tried to develop revised creative problem solving instructional units and assessment tools in elementary school chemistry courses. The treatment was studied using a quasi-experimental design including the pre and post testing of 25 fifth graders. The RCPS instructional unit was “Acid-base Properties of Aqueous Solutions”. The assessment tools were “Test of Scientific Problem Solving” and “Test of Scientific Creativity”. The major finding was that RCPS instruction of “Acid-base Properties of Aqueous Solutions” can increase students’ scientific creativity and science problem solving ability because there was significant difference between the pre-test and post-test scores in scientific creativity and scientific problem solving. Based on the findings of this study, the researcher proposes that RCPS instruction of “Acid-base Properties of Aqueous Solutions” be used in elementary school natural science instruction and also provides suggestions for science instruction and future science education research.
3. Al-Blwi (2006) conducted a study to investigate the effectiveness of brainstorming in developing creative thinking and measuring the thinking happened among science stream students. The sample consisted of (100) male and female students chosen from o school in Tabouk public schools one for males and the other for females. Two classes were chosen, each class contained of (25) students. The findings of the study showed that there were significant statistical differences between the study groups attributed to the teaching method of creative thinking. There were no significant statistical differences between the means of males and females performance and the interaction between the method and gender.
4. Bani Hamad (2006) investigated the effect of brainstorming in eighth grade students achievement in science according to Bloom taxonomy. To achieve the aim of this study to classes totaling (64) students were chosen randomly to present the groups of the study. Each group consisted of (32) students, the first studied through brainstorming while the second studied through the traditional method. The findings of the study showed that there were no significant statistical differences between the means of students scores in both groups on the pre test attributed to the teaching strategy. Moreover, there were no significant statistical differences between the means of students scores in both groups on each category of the Taxonomy attributed to the teaching strategy,
5. Al-Olimat (2008) studied the effect of brainstorming and discovery strategies in developing creative thinking among eighth graders in science in Jordan. The sample was chosen purposefully totaling (85) students distributed into an experimental group and a control group. The findings of the study showed that there is an evident effect for brainstorming and discovery in developing creative thinking. Moreover, there were differences between both strategies in the favor of brainstorming.
6. Al-abadi (2008) conducted a study to explore the effect of an educational program in developing creative thinking skills among gifted disabled students. The sample of the study consisted of (28) male and female students suffer from learning disabilities in public and private schools in Amman city. Students were distributed equally into an experimental group and a control group, 11 students on each group. The findings of the study showed that there were statistical significant differences between the means of both groups on creative thinking test in the favor of the experimental group attributed to the educational program. Moreover, there were no statistical significant differences in the interaction between the program and the intelligence rate in developing creative thinking skills among those students.
7. Al-qarni (2011) studied the effectiveness of brainstorming strategy in developing creative thinking among third intermediate students in Qurayyat city. Purposeful random sample was drawn, the sample consisted of (115) male and female students. Two classes were chosen to represent the experimental group and the experimental group. The researcher administrated Torrance test (Form A) as a pre test. The findings of the study showed that there are statistical differences between the means of both groups on the test in the favor of the experimental group studied through brainstorming. Moreover, there were no statistical significant differences between the means of male and female students scores on the creative thinking test and sub skills attributed to gender. There were statistical difference between the means of students scores on the post test and its sub skills attributed to interaction between gender and the teaching method.
9. Al-maghawry (2012) aimed to identify the effectiveness of using the brainstorming technique to learn some basic skills and collection of knowledge for beginners in the sport of volleyball, the researcher used the experimental method using the experimental groups design, one experimental and one control group using the pre and post- tests for both groups.

This study was conducted on a sample of 50 students from first year students, Faculty of Physical Education, Benha University for the academic year 2011/2012. Tests of physical and skill and achievement of cognitive attainment and intelligence were used. The researcher has designed an educational program using the method of brainstorming of duration 7 weeks, three units a week and time of each unit 90 minutes, implementing the program has been during the period from 30/10/2011 to 22/12/2011. The results of this study showed that the method of brainstorming had a positive effect on learning the skills of passing, serve and smash stroke for the experimental group. Brainstorming demonstrated a positive effect on learning the skills of passing, serve and smash stroke of the control group. The rate of percentage in the level of performance skills and cognitive attainment of the experimental group which used the method of brainstorming was better than the rate of percentage in performance skills and cognitive attainment of basic skills in the sport of volleyball.

10. Methodology

-The Study Population

The population of the current study is consisted of all female students from Princess Alia University College registered in Child education major in the summer semester of 2010/2011 totaling (2612) female students.

-The Study Sample

The study sample is consisted of (98) female students from princess Alia University College, distributed into two classes, an experimental group totaling (47) students taught through the training program and an experimental group totaling (51) students didn't receive any training. Both groups were chosen deliberately as the researcher teaches the course.

- The Study Instruments

1. Brainstorming Program

The one month training program is based on brainstorming strategies containing 10 sessions within 45 minutes duration for each. Those sessions were carried out in the summer semester while teaching students creative thinking skills course. Three units were taught, those are:

- Unit1: Thinking and its development.
- Unit2: Critical thinking.
- Unit3: Creative thinking.

Program Validity

The program has been displayed on ten judges from the faculty members at Universities, who expressed their views about the program in terms of relevance for the purposes of the study. Eight judges out of ten agreed with a rate of (80%) on the validity of this program.

2. Torrance Test of Creative Thinking

This test is used to measure the level of creative thinking and its sub skills, it is valid for all age categories as its consists of six tests:

- Asking questions: this requires the individual first to ask any number of questions about a picture.
- Guessing Reasons: the respondent is required to guess all consequences related to the situation in the picture.
- Guessing Results: the respondent is required to guess all consequences related to the situation in the picture.
- Enhancing Product: this test requires respondent to think of the smartest and novel ways to make a doll more interesting for children.
- Unusual usage: Requires respondent to think of the biggest number of uses for empty cartoon boxes.
- Hypothetical situations: the respondent is required to write all his predictions for the consequences of a hypothetical situation through a picture representing this situation.

Torrance test was designed to measure three skills, those are:

1. Fluency: represented in the possible number of responses for the situation within a time unit.
2. Flexibility: represented in the different categories of responses in a fixed time unit.
3. Originality: represented in the number of fixed and unique responses in a certain time unit.

Torrance test validity

The researcher offered the test to (10) judges from faculty members who expressed their opinions and agreed on the effectiveness of the scale in measuring the total score of creative thinking and the sub scores on originality, flexibility and fluency.

Torrance test validity

The researcher used the (Test - Retest Method) by applying the test on a random sample consisted of (41) students from the community of the study (outside-its sample), within 3 weeks Time limit between the two administrations. The total reliability score was (0.74) while the sub scores were 0.81, 0.76 and 0.78 respectively.

11. Findings of the Study

First, results related to the first question: Is there a statistically significant effect at the level of significance ($\alpha = 0.05$) for using brainstorming program in teaching creative thinking skills development course in enhancing creative problem solving skills among princess Alia college students compared to the control group?.

To answer the study first question, means and standard deviations were calculated for Samples' scores on the pre and post Torrance test as a whole according to group variable (experimental) that was taught according to the program and the control group which didn't receive any training. Table (1) shows the results

Table (1) Means and standard Deviations for Samples' scores on the pre and post Torrance test as a whole according to group variable

	Control Group			Experimental Group		
	Number	M	SD	Number	M	SD
Pre-test	51	37.59	3.24	47	38.15	3.94
Post-test	51	41.45	3.20	47	54.66	3.70

Table (1) shows that there is a difference between the two means of students scores on Pre and Post Torrance test in both groups. To investigate the statistical significance between the two administrations according to group variable (experimental that was taught according to the program and the control group which didn't receive any training). Two way ANCOVA was used at the level of ($\alpha = 0.05$). Table (2) shows the results.

Table (2): Results of [Analysis of covariance](#) (ANCOVA) for students scores on the pre and post Torrance test as a whole according to group variable

Variance	Square	df	Square M	F	sig	Effect Size
Pre	300.846	1	300.846	34.011	.000	.264
Group	4065.550	1	4065.550	459.611	.000*	.829
Error	840.335	95	8.846			
Total	5206.730	97				

Sig: at ($\alpha = 0.05$).

Table (2) shows that there are statistical significant differences at the level of ($\alpha = 0.05$) between the two means of students scores on post test as a whole in both groups(experimental that was taught according to the program and the control group which didn't receive any training). F value totaled (459.611) showing a statistical significant value at ($\alpha = 0.000$). To determine the value of differences in the means between the two groups, modified means were calculated after eliminating the effect of performance on pre test. Table (3) shows the results.

Table (3): Modified means of students scores in both groups on Torrance post test after eliminating the effect of performance on pre test

Group	Modified means	Standard Error
Experimental	41.58	0.42
Control	54.52	0.44

Table (3) shows that the differences were in the favor of the experimental group who was taught through the program as the modified means totaled (54.52), it is higher than the modified means of the control group who didn't receive any training as the modified means totaled (41.58). Eta Square was used to find the effect size, it totaled (82.9%) this means that the group variable explains (82.9%) of the variance in means between both groups on the test as a whole.

Second, results related to the second question: Is there a statistically significant effect at the level of significance ($\alpha = 0.05$) in developing creative thinking sub skills of the experimental group compared with the control group?.

To answer this question means and standard deviations were calculated for the samples' scores on each skills of creative test according to group variable (experimental that was taught according to the program and the control group which didn't receive any training). Table (4) shows the results.

Table (4): Means and Standard Deviations for the Samples' scores on Torrance tests as a whole according to group variable

Skill		Control Group			Experimental Group		
		No	M	SD	No	M	SD
Fluency	Pre-test	51	24.61	2.38	47	24.49	2.42
	Post test	51	25.49	2.55	47	32.96	1.77
Flexibility	Pre-test	51	9.41	1.08	47	10.04	1.30
	Post test	51	11.22	1.51	47	15.02	2.15
Originality	Pre-test	51	3.57	1.47	47	3.62	1.66
	Post test	51	4.75	1.53	47	6.68	1.73

Table (4) shows that there is an apparent difference the two means of students scores on each skill for pre and post creative test in both groups. To investigate the significance of those differences according to group variable: (experimental that was taught according to the program and the control group which didn't receive any training) after eliminating the differences on the pre test Two Way ANCOVA test was used at the level of ($\alpha = 0.05$). Table (5) presents the results.

Table (5): Results of [Analysis of covariance](#) (ANCOVA) for students scores Torrance post test according to group variable

Variance	Skills	Squares	df	Means	F	Sig	Effect Size
Pre (Fluency)	Fluency	271.066	1	271.066	134.126	.000	.591
	Flexibility	.130	1	.130	.041	.841	.000
	Originality	.335	1	.335	.137	.713	.001
Pre (Flexibility)	Fluency	.124	1	.124	.061	.805	.001
	Flexibility	8.190	1	8.190	2.562	.113	.027
	Originality	12.825	1	12.825	5.233	.024	.053
Pre(originality)	Fluency	2.974	1	2.974	1.472	.228	.016
	Flexibility	14.499	1	14.499	4.536	.036	.047
	Originality	21.333	1	21.333	8.704	.004	.086
Hotelling's Trace=7.595	Fluency	1298.563	1	1298.563	642.540	*.000	.874
	Flexibility	297.533	1	297.533	93.078	*.000	.500
	Originality	102.432	1	102.432	41.791	*.000	.310
Error	Fluency	187.952	93	2.021			
	Flexibility	297.283	93	3.197			
	Originality	227.948	93	2.451			
Total	Fluency	1760.678	97	1760.678			
	Flexibility	617.635	97	617.635			
	Originality	364.874	97	364.874			

Sig: at ($\alpha = 0.05$)

Table (5) shows that there is a statistical significant differences at the level of ($\alpha =0.05$) between the two means of the students scores on the post test of creative thinking in both groups, experimental that was taught according to the program and the control group which didn't receive any training) as all (F) values were significant at the level of ($\alpha =0.05$). To investigate the significance of those differences according to group variable: (experimental that was taught according to the program and the control group which didn't receive any training) after eliminating the differences on the post test . Table (6) presents the results.

Table (6): Modified means of students scores in both groups on Torrance post test for each skills after eliminating the effect of performance on pre test

Skill	Group	Modified mean	Standard Error
Fluency	Control	25.44	.20
	Experimental	33.02	.21
Flexibility	Control	11.30	.26
	Experimental	14.93	.27
Originality	Control	4.65	.22
	Experimental	6.78	.23

Table (6) shows the modified means for the students scores in the experimental group and the control group on each skill of post creative thinking test (originality, flexibility and fluency) after eliminating the differences on the pre test. Differences were in the favor of the experimental group who was taught through the training program as the means were (6.78, 14.93, 33.02) respectively and it is higher than the means of the control group that totaled (4.65,11.30,25.44). To find the effectiveness of the method Eta square was calculated, it totaled (31.0%, 50.0%, 87.4%). This means that the group variable interpret (87.4 ,%50.0 ,%31.0%) respectively on the variance between the means of students performance on each skill of Torrance creative thinking test.

As seen above, there is a statistical significant difference between the means of the performance of the group that received training and the control that didn't receive any training even in the total score of the test or its sub skills. This may be attributed to the nature of brainstorming strategy as a collective discussion strategy that encourage students to generate the highest number of ideas that are varied and creative in a spontaneous and free open climate that is not critical and doesn't limit the freedom of launching ideas. Moreover, its nature based on phases allows students to move from one step to another freely after completing the previous step.

The effect of this strategy in developing creative thinking as a whole and in its sub skills may be attributed to the advantages of this strategy that are accepted among students. Some of those advantages are the preparing element and making students ready to participate in the sessions as well as joy environment that provide students with a free climate that doesn't contain any critics and interference.

The findings of this study are Consistent with the Darayseh, 2003; Al-Olimat, 2008; Al-bwli, 2006, Al-maghray,2012; Bani hamad, 2006, Al-; qarni,2011).

12. Conclusion

Based on the findings of the study the researcher recommended

1. Encouraging Faculty members to use brainstorming strategy in teaching.
2. Conducting more studies discussing this strategy and its relation to other variables such as critical thinking.
3. Conducting more studies on other samples from different study and age levels and from different environments.

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