

The Effect of Using Brainstorming Strategy in Developing Creative Problem Solving Skills among male Students in Kuwait: A Field Study on Saud Al-Kharji School in Kuwait City

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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 male students in Saud Al-Kharji School in Kuwait. The sample of the study consisted of (98) male 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 2012/2013, 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 the Kuwait schools.

Key words: Brain storming, Problem solving skills, Creative thinking, Thinking skills, Experimental group, Control group.

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 result 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.

1.1. What is Brainstorming?

Madison Avenue advertising executive Alex Osborn developed the original approach and published it in his 1953 book, "Applied Imagination." Since then, researchers have made many improvements to his original technique. The approach described here takes this research into account, so it's subtly different from Osborn's approach.

Brainstorming combines a relaxed, informal approach to problem solving with lateral thinking. It encourages people to come up with thoughts and ideas that can, at first, seem a bit crazy. Some of these ideas can be crafted into original, creative solutions to a problem, while others can spark even more ideas. This helps to get people unstuck by "jolting" them out of their normal ways of thinking.

Therefore, during brainstorming sessions, people should avoid criticizing or rewarding ideas. You're trying to open up possibilities and break down incorrect assumptions about the problem's limits. Judgment and analysis at this stage stunts idea generation and limit creativity. Evaluate ideas at the end of the session – this is the time to explore solutions further, using conventional approaches.

1.2. Why Use Brainstorming?

Conventional group problem solving can often be undermined by unhelpful group behavior. And while it's important to start with a structured, analytical process when solving problems, this can lead a group to develop limited and unimaginative ideas.

By contrast, brainstorming provides a free and open environment that encourages everyone to participate. Quirky ideas are welcomed and built upon, and all participants are encouraged to contribute fully, helping them develop a rich array of creative solutions.

When used during problem solving, brainstorming brings team members' diverse experience into play. It increases the richness of ideas explored, which means that you can often find better solutions to the problems that you face.

It can also help you get buy-in from team members for the solution chosen – after all, they're likely to be more committed to an approach if they were involved in developing it. What's more, because brainstorming is fun, it helps team members bond, as they solve problems in a positive, rewarding environment. While brainstorming can be effective, it's important to approach it with an open mind and a spirit of non-judgment. If you don't do this, people "clam up," the number and quality of ideas plummets, and morale can suffer.

1.3. Individual Brainstorming

While group brainstorming is often more effective at generating ideas than normal group problem solving, several studies have shown that individual brainstorming produces more – and often better – ideas than group brainstorming.

This can occur because groups aren't always strict in following the rules of brainstorming, and bad behaviors creep in. Mostly, though, this happens because people pay so much attention to other people that they don't generate ideas of their own – or they forget these ideas while they wait for their turn to speak. This is called "blocking."

When you brainstorm on your own, you don't have to worry about other people's egos or opinions, and you can be freer and more creative. For example, you might find that an idea you'd hesitate to bring up in a group develops into something special when you explore it on your own. However, you may not develop ideas as fully when you're on your own, because you don't have the wider experience of other group members to draw on.

1.4. How to Use the Tool (Brainstorming)

To run a group brainstorming session effectively, follow these steps:

Step 1: Prepare the Group

First, set up a comfortable meeting environment for the session. Make sure that the room is well-lit and that you have the tools, resources, and refreshments that you need.

How much information or preparation does your team need in order to brainstorm solutions to your problem? Remember that prep is important, but too much can limit – or even destroy – the freewheeling nature of a brainstorming session.

Consider who will attend the meeting. A room full of like-minded people won't generate as many creative ideas as a diverse group, so try to include people from a wide range of disciplines, and include people who have a variety of different thinking styles.

When everyone is gathered, appoint one person to record the ideas that come from the session. This person shouldn't necessarily be the team manager – it's hard to record and contribute at the same time. Post notes where everyone can see them, such as on flip charts or whiteboards; or use a computer with a data projector. If people aren't used to working together, consider using an appropriate warm-up exercise, or an icebreaker.

Step 2: Present the Problem

Clearly define the problem that you want to solve, and lay out any criteria that you must meet. Make it clear that the meeting's objective is to generate as many ideas as possible.

Give people plenty of quiet time at the start of the session to write down as many of their own ideas as they can. Then, ask them to share their ideas, while giving everyone a fair opportunity to contribute.

Step 3: Guide the Discussion

Once everyone has shared their ideas, start a group discussion to develop other people's ideas, and use them to create new ideas. Building on others' ideas is one of the most valuable aspects of group brainstorming. Encourage everyone to contribute and to develop ideas, including the quietest people, and discourage anyone from criticizing ideas.

As the group facilitator, you should share ideas if you have them, but spend your time and energy supporting your team and guiding the discussion. Stick to one conversation at a time, and refocus the group if people become sidetracked. Although you're guiding the discussion, remember to let everyone have fun while brainstorming. Welcome creativity, and encourage your team to come up with as many ideas as possible, regardless of whether they're practical or impractical. Use thought experiments such as Provocation or Random Input to generate some unexpected ideas.

Don't follow one train of thought for too long. Make sure that you generate a good number of different ideas, and explore individual ideas in detail. If a team member needs to "tune out" to explore an idea alone, allow them the freedom to do this. Also, if the brainstorming session is lengthy, take plenty of breaks so that people can continue to concentrate.

2. The Study Problem

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:

2.1. 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 male students in Saud Al-Kharji school compared to the control group?

2.2. 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 Objectives: The study aims to:

- 3.1.** Investigate if there are differences in the means of male students scores on problem solving skills attributed to the brainstorming program.
- 3.2.** Exploring the extent of acquiring creative problem solving skills among Saud Al-Kharji school 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. Literature Review

5.1. Brainstorming

Al-maghraby, (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.

5.2. Problem solving in brainstorming session:

A-blowy (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 Hamid, 2006).

5.3. 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 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 Trafnger 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).

6. The Study Methodology

6.1. The Study Population:

The population of the current study is consisted of all male students from Saud Al-Kharji School registered in the 7th Grade in the summer of 2012/2013 totaling (170) male students.

6.2. The Study Sample:

The study sample is consisted of (98) male students from Saud Al-Kharji School, 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.

6.3. The Study Tools

A. 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 first 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.

A.1. 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. Nine judges out of ten agreed with a rate of (90%) on the validity of this program.

B. 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.

B.1. Torrance test was designed to measure three skills, those are:

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

B.2. 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.

7. Findings of the Study

7.1. First: 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 male students in Saud Al-Kharji school 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 | | |
|---------------|---------------|-------|------|--------------------|-------|------|
| | Numbe r | M | ST.D | Numbe r | M | ST.D |
| 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

| Varian ce | Square | d.f | Square M | F | sig | Effect Size |
|-----------|----------|-----|----------|---------|--------|-------------|
| Pre | 300.846 | 1 | 300.846 | 34.011 | 0.000 | 0.264 |
| Group | 4065.550 | 1 | 4065.550 | 459.611 | 0.000* | 0.829 |
| 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.

7.2. Second: 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 | .f | Means | F | Si | Effect |
|-------------------|-------------|----------|----|----------|---------|-------|--------|
| | | | | | | g | Size |
| Pre (Fluency) | Fluency | 271.066 | | 271.066 | 134.126 | .000 | .591 |
| | Flexibility | .130 | | .130 | .041 | .841 | .000 |
| | Originality | .335 | | .335 | .137 | .713 | .001 |
| Pre (Flexibility) | Fluency | .124 | | .124 | .061 | .805 | .001 |
| | Flexibility | 8.190 | | 8.190 | 2.562 | .113 | .027 |
| | Originality | 12.825 | | 12.825 | 5.233 | .024 | .053 |
| Pre(originality) | Fluency | 2.974 | | 2.974 | 1.472 | .228 | .016 |
| | Flexibility | 14.499 | | 14.499 | 4.536 | .036 | .047 |
| | Originality | 21.333 | | 21.333 | 8.704 | .004 | .086 |
| Hotel ling's | Fluency | 1298.563 | | 1298.563 | 642.540 | *.000 | .874 |
| Trace=7.595 | Flexibility | 297.533 | | 297.533 | 93.078 | *.000 | .500 |
| | Originality | 102.432 | | 102.432 | 41.791 | *.000 | .310 |

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 skill after eliminating the effect of performance on pre test

| Skills | 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%, and 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-maghrawy, 2012; Bani Hamid, 2006, Al-qarni, 2011).

8. Conclusion

Based on the findings of the study the researcher recommended, Encouraging Tutors and Teachers to use brainstorming strategy in teaching in the schools and conducting more studies discussing this strategy and its

relation to other variables such as critical thinking, and conducting more studies on other samples from different study and age levels and from different environments like Universities or Training Institute.

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