



## **BRAINSTORMING: A REVIEW OF RESEARCHES**

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### **Abstract**

*Brainstorming activity is one of the most important methods for developing creative thinking in the students as well as resolving the problems in the field of education, social and economic growth, political issues etc. it is particularly helpful when one need to break out stales, established patterns of thinking so that they can develop quick new ways of looking at things. The purpose of this review paper is to analyze the previous studies and provide suggestions for further research. In this paper, a review of some studies has done from 1975 to 2015. Many studies have conducted regarding the effectiveness of brainstorming for ideas generation in different areas but there is not satisfactory status of researches on brainstorming used as a teaching method for improving novel ideas generation and developing creative thinking in the teaching-learning process. Therefore, it is need to focus on its implication in the classroom situation and give attention on further research for finding out better results of brainstorming. This paper will provide a better view about process and importance of brainstorming and further insight about knowledge gaps, i.e. study of brainstorming with other new concepts as- aesthetic creativity, mathematical creativity, intelligence, scientific attitude and other demographic variables.*

**Key words:** *Brainstorming, Creative thinking, Teaching methods.*

### **Review of Studies related to Brainstorming:**

This paper is based on an analysis of Ph.D. theses, research papers and articles published in the various types of national and international journals, books and magazines. The aim of this paper is to critically review the previous studies on brainstorming. The review of previous studies throw light on the concept of Brainstorming, its process and how to use better in the classroom situation. This review also provides useful insights for teachers to deal with the reluctance to participate in the brainstorming session and develop interest of the students.

‘Brainstorm’ means using the brain to storm a creative problem and to do so in commando fashion, with each stormer audaciously attacking the same objective. Brainstorming is a group activity to generate a large number of ideas in order to find out the solution of a problem. It is very useful technique in all fields like business, industry, social organizations, education, Politics etc.

Osborn (1953) has provided four basic rules for brainstorming session which are as follows:

1. Criticism is ruled out
2. 'Free wheeling' is welcomed
3. Quantity is wanted
4. Combination and improvement of ideas is welcomed

These four basic rules are necessary for conducting successful brainstorming session but Osborn was also declared that they (the rules of brainstorming) were not sufficient and outlined a number of considerations for managing groups and preparing for productive session. Some other researchers were also explained that for successful and more fruitful brainstorming session, some supportive resources, strategies are also required. The review of some studies related to brainstorming is as follows:

**Unin and Bearing (2016)** conducted a study on 'Brainstorming as a way to approach student-centered learning in ESL classroom. The purpose of the study was to explore the brainstorming activities used and how brainstorming was employed to promote SCL (student-centered learning). The sample consisted of 164 male and 157 female students. The data were collected through questionnaires, interview schedules and classroom observations during the brainstorming sessions. The findings were obtained as follows: (i) brainstorming activities using words lists, words mapping and pictures were generally utilized in the speaking tasks and (ii) brainstorming contributed to increase in students' motivation, confidence and participation as reflected by the positive behaviour of the students during classroom observations.

**AlMutairi (2015)** conducted a study to investigate the effectiveness of brainstorming strategy in developing creative problem solving skills among male students in Kuwait. The sample of the study consisted of (98) male students. The sample was distributed into two classes, first experimental group (47) and second as control group (51) of the students. The tools used in the study were brainstorming program and Torrance Tests of Creative Thinking. The findings of the study showed that brainstorming strategy was more effective in comparison to traditional method of teaching.

**Desai (2015)** explored the effect of group brainstorming on the auditors' search for potential misstatements and assessment of fraud risk in the presence of pressures and opportunities. The results indicated that individual auditors are more sensitive to the presence of high opportunities when the pressures and opportunities are interacted at the high and low levels.

**Manouchehry et al. (2014)** carried out a study on the effect of Brainstorming strategies on the improvement of learners' writing skill. The sample was consisted of 60

Iranian EFL (English as foreign language) intermediate learners of language institute in Khorasan of Iran. In the experiment 20-20 students were selected for the each group i.e. two experimental groups and one control group. The result was found that brainstorming strategies had a positive effect on EFL learners' writing skill.

**Zarif and Matten (2013)** studied the role of using Brainstorming on student learning outcomes during teaching at middle level. Sample was consisted of 25 students of a middle school. They reported that Brainstorming was helpful for improving learning outcomes at middle level.

**Al-Khatib (2012)** investigated the effect of using Brainstorming strategy for developing creative problem solving skills among female students in Princess Alia University College. The study was conducted on 98 female students, distributed into two classes (one class with 47 students as Brainstorming group and other as control group with 51 students). Torrance Creative Thinking Test was used for measuring creative thinking of students. The researcher found significant positive results and recommended that faculty members should use Brainstorming strategy in their teaching for better results.

**SIM and POP (2012)** explained the mind mapping and brainstorming as methods of teaching business concepts in English as a foreign language. The investigators suggested that these two techniques have a wide range of usage: from reading books and figuring out main ideas and concepts, to business meeting, planning compositions, sorting out family problems, expanding a topic to be studied.

**Maitah et al. (2011)** accomplished the study to reveal the effectiveness of the training program that was based on the effectiveness to teach the introduction to the special education course to the students in the department of educational sciences in the middle University faculties to develop the critical thinking. The sample consisted of 70 students divided into two groups, experimental group that included 35 students had learned using brainstorming and a control group consisting of 35 students learned in the usual way. The results as obtained by the researchers attributed that the brainstorming method required learners to call their previous experiences and conducted different mental skills and intellect, as knowledge acquisition skills, social skills and organizational skills, administrative and collaborative activities; all of which earn students who were learning a different analytical skills, particularly critical thinking, while there was no opportunities to those who learned by the usual way.

**Gopkumar (2010)** carried out a study on "Group creativity in Brainstorming under conflict situations in the context of performance appraisal". The study was conducted in the

State of Kerala amongst two groups, one manufacturing sector employees and other service sector employees, considered as Universe. In sample, subjects comprised of male and female graduates, under graduates, skilled and unskilled employees, who are familiar with their work and profession. There were altogether 720 employees, 360 each from Manufacturing and Service sectors. Questionnaires, Interviews and observation schedule were used for data collection.

Randomized block (RB) design was used in this study. Each block (group) comprises of 6 subjects (individuals) and each block was subjected to three different types of treatments (minimal instructions, Brainstorming and debate conditions) and each treatment appeared equal number of times in each block. He concluded that the total ideas generated by the groups under Debate condition were marginally superior, irrespective of the category of the organization, to conventional Brainstorming condition (functional approach, where possibility of criticism is ruled out). However, Debate conditions stimulated the groups significantly to generate more number of ideas, including new ideas (group creativity) than did under Minimal instructions condition. Further, he reported that Creativity can be encouraged within work groups through autonomy in the work, encouragement of creativity, mutual openness to ideas, constructive challenge to new ideas, and shared goals and commitments.

**Litchfield (2009)** conducted an experimental study by treating brainstorming rules as assigned goals and compared their effectiveness to that of quantity goals as interventions to improve the number of ideas generated by individuals controlling for goal commitment. The researcher found that brainstorming rules alone did not convey an advantage over even a vague quantity goal presented alone for enhancing the number of ideas generated in two common tasks. The researcher revealed that specific, difficult goals were only partially effective on their own, as expected when goal commitment was moderate and reported that brainstorming rules improve ideas quantity only when these combined with a specific, difficult quantity goal.

**Houston (2008)** presented a paper on “enhancing English learning through Brainstorming” in the international conference on creativity development held in Taiwan Normal University in 2008. He described that two popular creative exercises, Brainstorming and creative problem solving could boost creativity and develop fluency in English. The researcher proclaimed that Brainstorming is a well-known activity for producing solutions and explained three types of Brainstorming which were highly suitable for language learning, i.e. mini-brainstorm, problem solving brainstorm and mini-project.

**Kshirsagar (2006)** carried out a study on brainstorming program for evaluation of teachers by students. The objective of the study was to know the opinion of the teachers about students' evaluation of teacher (SET). The sample consisted of 94 teachers, teaching in the 14 affiliated colleges of education of Pune University during 2002-2003 selected by cluster sampling and 756 students of same university colleges selected by different type of sampling methods. The tools were consisted of Brainstorming program, questionnaires, interview schedules and evaluation of teaching scale. Results were as follows: (i) The Brainstorming program had enabled to provide additional inputs and ideas about SET and (ii) Students and teachers expressed their views that SET would develop an attitude towards quality teaching in the teachers.

**Shan(1993)** studied "Identification and development of creativity: A study of high school students of Jammu." The objective of the study was to study the effect of teaching through the curricular activities of Brainstorming, problem solving, project activity and Quiz in comparison to traditional method of high school students. The study was conducted on 266 male students of ninth class from backward hilly region of Jammu. The researcher used the verbal and non-verbal tests of creative thinking (self-developed) and Raven's standard progressive matrices (SPM) for obtaining the scores of creativity and intelligence respectively. The results were found as follows: (i) The group of students who were taught science using various curricular activities, namely: Brainstorming, problem solving, Quiz and project activity, gained significantly in their verbal fluency, flexibility and originality as compare to the group of students taught through traditional method and (ii) The use of Brainstorming activity in teaching of science was found to be significantly more effective in development of verbal creative thinking among students in comparison to the use of problem solving, Quiz and project activities as well as traditional method.

**Jawaharlal (1990)** explored educational programmes for fostering creativity among primary school children. The main objective of the study was to find out experimentally whether the structure creative teaching programme (SCTP) through Brainstorming technique increases the composite creativity scores in fluency, flexibility and originality of the primary school children. The study was conducted on 30 primary school children of class IV and V from the Sourashtra School, Madurai. He concluded that creativity was enhanced in primary school children and similar enhancement in creative abilities, such as fluency, flexibility and originality when taught through specially prepared creative programmes.

**Patel (1988)** studied on 'the development of Brainstorming technique programme and to study its effect on creativity of the secondary school children.' The main objective of the

study was to establish the procedure of Brainstorming technique and to study its impact on creativity levels of secondary school students. The nature of the study was experimental, conducted on students of class IX. The tools used were creativity test developed by J.Z. Patel and the Brainstorming technique programme prepared by the investigator. He concluded that the Brainstorming technique procedure proved powerful for developing verbal and figural creativity.

**Hanson (1984)** reviewed some studies related to brainstorming to determine its effectiveness on various group process variables and confirmed that brainstorming had a questionable impact on group functioning. **D'lima (1981)** used brainstorming for the development of creative thinking in children through B.Ed. trainees, as an institutional project at Bombay. The investigator was applied creativity training of sequential brainstorming in the teacher education programme for B.Ed. trainees and found that creative thinking could be developed in the students by using brainstorming activities through B.Ed. trainees.

**Julius (1980)** analyzed the effect of Brainstorming method among three small Nigerian groups namely nominals, dyads and triads. Brainstorming procedure was found more effective with nominal being superior to dyads and triads on ideational fluency, ideational flexibility and ideational originality. He further investigated that Brainstorming was more effective in dyads than triads on fluency, flexibility and originality dimensions.

**Deshmukh (1979)** has used Brainstorming technique of teaching for the development of creative potential. He described the procedure of Brainstorming in the lines of Osborn (1953) and suggested some additional points for a successful Brainstorming session as, (i). Too many experts should not be included in the Brainstorming sessions. One hour is the average time for the session though 5 to 10 minutes ideational is also a common practice, and (ii). The problem should be specific and fairly limited range. It renders a definite target to attack for the group.

**Pillay (1976)** conducted an experimental study to know the effect of patterns of teaching upon creative thinking among adolescents. The main objective of the study was to find out the effect of the creative teaching method (Brainstorming and Morphological analysis) upon the general creative thinking and creative thinking in geography of 8<sup>th</sup> grade students of Vallore. The Passi's test of creativity (verbal) and self-developed 'creative thinking in geography' test were used for measuring general creativity and creative thinking in geography respectively. The sample consisted of 71 eighth grade students (36 in control group and 35 in experimental group) who were selected from two schools. The results were



found as follows: (i) The treatment of creative teaching method in geography, when compared with the traditional method did not produce differential effect upon general creative thinking of eighth graders, (ii). The treatment of creative teaching method in geography did not produce differential effect upon divergent production abilities in geography of eighth graders, when compared with the traditional method, and (iii). The treatment of creative teaching method in geography did not produce differential effect upon ideational fluency, spontaneous flexibility, associational fluency, expressional fluency, and originality of eighth graders when compared with the traditional method.

**Shorpe (1975)** tried to enhance the verbal and figural creative abilities of educationally handicapped children using Brainstorming and programmed instructional techniques. Nine intermediate grades educationally handicapped classes were randomly assigned to four experimental treatments, i.e., Brainstorming, programmed instruction, combination of Brainstorming & programmed instruction and control. The alternate forms of Torrance tests of creative thinking (TTCT) were administered as pre and post-tests. The results were shown as follows: (i) The Brainstorming group scored significantly higher than the programmed instruction and control groups on verbal fluency and verbal flexibility and (ii) Brainstorming group scored significantly higher than control group on figural fluency and figural flexibility.

**Sajjad (n. d.)** conducted a study to determine the effectiveness of various teaching methods used for teaching at graduate level. Two hundred and twenty undergraduate students studying in 11 departments of faculty of arts, University of Karachi, were interviewed about their perceptions of best and effective teaching methods. The investigator reported that Brainstorming method was rated as the best method only by 11% students while most of the graduate students rated the lecture method as the best method at graduate level.

### **Conclusions and Suggestions:**

Review of the related literature shows that brainstorming is very important teaching technique for developing creative thinking. It is also helpful for school teachers to make their learning outcomes more effective and to improve critical thinking, writing skills, problem solving ability and other personality traits. It is also helpful for teachers to deviate from traditional method and make a fruitful recreation for the students.

It is revealed that the researches have used various types of brainstorming activities such as word lists, word mapping, pictures, some special types of programs, projects, problem solving activities etc. (Unin and Bearing, 2016; Shan, 1993; Patel, 1988 and others). Houston (2008) has explored three types of brainstorming- mini brainstorming, problem

solving brainstorming and mini project based brainstorming. The researchers have used different types of brainstorming, i.e. individual brainstorming, group brainstorming, electronic brainstorming etc. but group brainstorming has been used in the most of the studies. The investigators have been used group brainstorming (Al-Khatib, 2012; Houston, 2008; Shan, 1993; Patel, 1988; Shorpe, 1975 etc.) and electronic brainstorming (Zayed and Shaheen, 1995) to boost up creativity and its components, i.e. fluency, flexibility and originality.

On the basis of review of previous studies, it is revealed that most of the investigators have used brainstorming for developing creative thinking while it has been also applied for improving learning outcomes (Zarif and Matten, 2013). Manouchehry (2014) has applied brainstorming for improving learners' writing skill and as a method of teaching to teach business concepts in English as a foreign language by SIM and POP (2012).

Most of the investigators have applied brainstorming at secondary and higher secondary school level while D'lima (1981) has used brainstorming for the development of creative thinking in children through B.Ed. trainees. Pillay (1976) has used the creative teaching method (brainstorming and morphological analysis) for developing general creativity and creativity in geography for 8<sup>th</sup> class students and reported that creative thinking had not promoted by using brainstorming at primary level. Instead of above studies, Gopkumar (2010) conducted a study on employees of manufacturing and service sectors. It has been noted that most of the studies employed only one experimental and one control group quasi experimental design although Gopkumar (2010) used randomized block design for experimental study. So, untapped area is brainstorming at higher education and professional education levels by employing different types of experimental designs.

Therefore on the basis of review of studies, it can be concluded that brainstorming can be used as a teaching method as well as teaching strategy. The previous studies reveal the implications of brainstorming for school teachers, managers, administrators and students also. It is very beneficial to students in developing reasoning power, creative problem solving ability, fluency in English or any language, self-motivation, self-confidence and other personality traits. The review also suggested that the school managers and administrators should provide freedom to teachers and make availability of useful learning materials and resources so that brainstorming can be employed in the classroom successfully.

- For teachers, brainstorming teaching method may be a better alternative to traditional method of teaching for developing creative and critical thinking. It can also be used for



developing scientific thinking, problem solving ability, scientific attitude, and positive attitude towards self, self-motivation, self-discipline and self-trust.

- There should be a place of brainstorming as a method of teaching in the practice teaching of prospective teachers so that trainee teachers can be trained in its principles, rules and procedures for better implementation in the actual classroom situations.
- The school should provide conducive and appropriate environment to the students for improving creative potential and learning outcomes by using brainstorming and some other innovative teaching methods.
- Group brainstorming method of teaching is beneficial in classroom. Its not only good for creative thinking but also clarifying concepts at grass root level and its applications in different situations.

#### **Recommendations for further studies:**

The experiences gained during the review of previous researches related to brainstorming have enabled the investigators to make following suggestions for further studies:

- The most of the studies were conducted to know the effectiveness of brainstorming in respect to conventional method of teaching. The further study can also be undertaken for comparing the effectiveness of brainstorming with reference to other teaching methods as morphological analysis, concept mapping, problem solving, Synectics etc.
- The study may be carried out on University students and trainees teachers also.
- Till today, most of the studies were done on brainstorming in the science stream. So, further studies may be conducted in the different subject streams as literature, social science, arts, commerce etc.
- Almost all of the researches have done in normal students' classrooms. The study can be taken with special students and specific classroom settings.
- Some longitudinal developmental researches might also be undertaken for further improvement in the procedure of brainstorming method according to different demographic variables and subject streams.
- Further experimental studies can be done by using randomized Solomon four-group, factorial designs, Latin square designs etc.
- The future researches can be conducted to know the effectiveness of brainstorming on mathematical creativity, aesthetic creativity, mathematical attitude, scientific attitude and

other personality traits as- intelligence, critical thinking, problem solving ability, reasoning power etc.

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