

# The Impact of Using Brainstorming in the Development of Creative Thinking and Achievement in the English Language of the 10th Grade Students at King Abdullah II Schools of Excellence in Amman

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## Abstract

This study aimed to identify the effect of using brainstorming in the development of creative thinking and achievement in the English language among 10th grade students at King Abdullah II School of Excellence. The study sample consisted of (168) students. The problem of the study was to answer the main question: What is the impact of using brainstorming strategy in the development of creative thinking and achievement in English language of 10th grade students at King Abdullah II School of Excellence in Amman?, to answer this question and the sub questions, the researcher built the study tools, which were: 1) A test for creative thinking in English, prepared by the researcher. 2) Achievement test of English language prepared by the researcher and consisted of (30) multiple choice questions.

The validity and reliability of the tools were verified. The researcher used the semi-experimental method according to the nature of the study. The researcher applied the pre and post study tools to the two groups (experimental and control), Where the students of the control group were taught using the normal way, while the experimental group was taught using the brainstorming strategy. The study was conducted in the second semester of the academic year 2017/2018.

The results of the study showed that there were statistically significant differences at ( $\alpha \leq 0.05$ ) between the mean scores of the experimental group (taught using the brainstorming strategy) and the control group (taught in the usual way) in the pre/posttest of creative thinking. Results also showed there were statistically significant differences at ( $\alpha \leq 0.05$ ) between the mean scores of the experimental group (taught using the brainstorming strategy) and the control group (taught in the usual way) in each skill of creative thinking (fluency, flexibility, and originality) in the pre/posttest of creative thinking. And also there were statistically significant differences at ( $\alpha \leq 0.05$ ) between the mean scores of the experimental group and the control group in the achievement test of English language.

In light of the results of the study, the researcher proposed some recommendations such as: English language books in the educational stages should include some creative thinking skills, such as fluency, flexibility and originality, and the use of modern methods and strategies in teaching English in different educational stages, such as the use of brainstorming.

**Keywords:** creative thinking, brainstorming, King Abdullah II Schools of Excellence

## 1. Introduction

The Concept of Brainstorming Strategy:

It may be called brain drain or generate ideas, as the mind recognizes the problem and then examines it and checks its particles so that it can reach the appropriate creative solution. And the first person who established this method (Alex Osborn) and then developed and amended it in 1957, and this method is to produce ideas first and then trial and modify and develop it. The method of brainstorming is used to solve problems individually or collectively, and training is meant to increase efficiency and raise the creative abilities of the individual (Al-Huwaidi, 2005).

As for the origin of the word brainstorming (stimulating, arousing or dripping the mind), it is based on the perception of "problem solving" as a position of two parties challenging each other, this method is to produce ideas first and then trial and modify and develop it. The mind has to get around the problem and look at it from more than

one side, and try to encircle it and storm it with all possible tricks. These tricks are the ideas that are actively generated is like a storm, it is a teaching strategy in which students follow a structured method of creative thinking to stimulate their minds to generate ideas about a specific problem in order to generate as many ideas as possible to solve them, while postponing the evaluation of ideas and criticizing them and consideration of its realism to a later stage.

Brainstorming means the use of the mind to actively address the problem. Brainstorming is a method of learning and training that is based on the freedom of thought and is used to generate the greatest number of ideas to address a subject of open topics of interested or professionals to the subject during a short session.

Brainstorming involves the generation and production of ideas and creative ideas from individuals and groups to solve a particular problem, and these ideas and opinions are good and useful. A state of mind in a state of excitement and readiness to think in all directions to generate the greatest amount of ideas about the problem or subject matter, so that the individual will have the freedom to allow the emergence of all opinions and ideas. Therefore, we say that the strategy of brainstorming is one of the modern strategies that encourage thinking and unleash the potential of students in an atmosphere of freedom and security allows the emergence of all opinions and ideas where the trainee at the top of interaction with the situation. This method is suitable for open issues and issues that do not have one correct answer.

Teaching Objectives Using Brainstorming Strategy (Al-Bakr, 2002):

Brainstorming aims at activating the role of the learner in educational situations and motivating learners to generate creative ideas on a particular topic by searching for correct answers or possible solutions to the issues presented to them.

It also helps students get used to respecting and appreciating others' opinions and taking advantage of their ideas by developing it and building on it. It can be said that the method of brainstorming is an educational method that can be used with learners, where the learner is free to think freely in a question or problem in search of the largest number of possible solutions, the flow of ideas from learners richly and quickly and without restraint, because the survival of the idea in mind inhibits other ideas from appearing, the search is then among the sum of ideas that are generated from the best idea without the need to criticize or miss the rest of the ideas.

Principles of using Brainstorming Strategy (Al-Huwaidi, 2005),

Postponement of judgment and postponement of the evaluation:

Avoid criticizing, judging or evaluating any idea presented by any student in the brainstorming session. The teacher is responsible for this as the moderator of the session, who does not allow criticism of any student from the group, and because criticism may limit the participation of a large number of students in new ideas in the introduction of new, exotic or creative ideas.

Freedom of thought and acceptance of all ideas:

To give full freedom during the brainstorming session and to allow discussion and the transfer of ideas from one person to another and accept all ideas, whatever their quality, because this freedom ultimately leads to the generation of creative ideas, and the large amount of ideas helps to extract some creative ideas from them.

Quantity before quality:

Emphasis on giving as many ideas as possible this is because the greater the number of ideas proposed by students, the greater the likelihood of emerging of creative ideas or leading to creative solutions to the problem.

Crystallize the ideas of others and developing it:

The teacher should encourage students to develop and improve some of their colleagues' ideas by adding to, modifying, or building on it, in order to create deep thoughts or new ideas.

Creating relationships between ideas:

Because this strengthens the ideas put forward as well as increasing understanding and deepening among students, which leads to the creation of better new ideas, and linking the different ideas leads to the provision of cooperation and mutual respect among students, which encourages innovation in ideas.

From this it can be said that brainstorming is an educational position that is used to generate the greatest number of ideas for participants to solve an open problem within a certain period of time in an atmosphere of freedom and security in the brainstorming away from confiscation, evaluation or criticism. And through the process of brainstorming according to the rules and the previous stages brainstorming has proven successful in many situations that need innovative solutions because it is characterized by the launch of individual ideas without

evaluation, because criticism of ideas or extravagance in their assessment, especially at the beginning of their appearance may lead to fear of the person or to his interest in quality over quantity which leads to slow down his thinking and decline the proportion of creative ideas he has. This illustrates the importance of brainstorming in the development of creative thinking and problem solving (Al-Huwaidi, 2005).

### *1.1 Problem of the Study*

The process of developing creative thinking is one of the important objectives of the educational institutions. This is indicated by the outline of the English language curricula for the basic stage in Jordan (Ministry of Education, 1993) due to the urgent need of our society, a generation that believes in learning foreign languages, has the ability to think creatively and solve our problems. However, there are many obstacles that prevent the achievement of this goal, including what has been indicated by research and studies of (Diab, 2005) and (Abu Zeina & Ababneh, 2007) relating to the teacher's way of presenting the material, management of educational situations, and his verbal interaction, how to answer students' questions, the clarity of their goals, the lack of educational activities that contribute to the development of creativity, the method of presenting the content of the curriculum is often impervious to students, which are factors in educational outcomes, including the creative thinking abilities of students.

As the researcher noted through her work in the field of public and university teaching that the need to create the right atmosphere for the openness of the mind, and to highlight the mental talents of our students and training them to think in different styles in the academic stages, and that the classroom practices in all its components within the classrooms still stand in the way of the development of creativity and thinking, especially the teaching methods, which usually focus on conservation and memorization, as many of the teachers are interested in how much knowledge, and the abundance of information at the expense of interest in the development of other aspects in the learner at the top of these aspects interest in the development of creativity, and methods of teaching are still limited to a large extent in the teaching of knowledge and information, and the learner listens and writes, this is not enough to develop thinking and creativity, but it makes teaching typical and similar patterns of most of the lessons, and refers to many studies, in a study prepared by the National Center for Human Resources Development on the performance of Jordan's students in English language in international studies show that there are weaknesses in the levels of conclusion, giving explanations, flexibility skills, and originality of ideas (National Center for Human Resources Development, 2007) also, the results of the national test to control the quality of education for the basic stage carried out by the Ministry of Education indicated to the low achievement of students in the levels of thinking and creativity in some detective, including English (Ministry of Education, 2007). The scarcity of studies on the method of brainstorming and discovery in the development of creative thinking among students, and the problem facing the educational- process, efforts have been directed towards improving the educational environment in all its elements to reach the desired goals, taking advantage of educational theories and experiences applied in a different position.

### *1.2 Questions of the Study*

What is the impact of using brainstorming in the development of creative thinking and achievement in the English language of the 10th grade students at King Abdullah II Schools of Excellence in Amman?

This question is divided into the following sub-questions:

- Are there statistically significant differences at ( $\alpha \leq 0.05$ ) between the mean scores of the experimental group (taught by brainstorming) and the control group (taught in the normal way) in the pretest of creative thinking?
- Are there statistically significant differences at ( $\alpha \leq 0.05$ ) between the mean scores of the experimental group (taught by brainstorming) and the control group (taught in the normal way) in the posttest of creative thinking?
- Are there statistically significant differences at ( $\alpha \leq 0.05$ ) between the mean scores of the experimental group (taught by brainstorming) and the control group (taught in the normal way) in each skill of creative thinking (fluency, flexibility, and originality) in the pretest of creative thinking?
- Are there statistically significant differences at ( $\alpha \leq 0.05$ ) between the mean scores of the experimental group (taught by brainstorming) and the control group (taught in the normal way) in each skill of creative thinking (fluency, flexibility, and originality) in the posttest of creative thinking?
- Are there statistically significant differences at ( $\alpha \leq 0.05$ ) between the mean scores of the experimental group (taught by brainstorming) and the control group (taught in the normal way) in achievement in English Language?

### 1.3 Hypotheses of the Study

The researcher proposed the following hypotheses:

- 1) There are statistically significant differences at ( $\alpha \leq 0.05$ ) between the mean scores of the experimental group (taught by brainstorming) and the control group (taught in the normal way) in the pretest of creative thinking.
- 2) There are statistically significant differences at ( $\alpha \leq 0.05$ ) between the mean scores of the experimental group (taught by brainstorming) and the control group (taught in the normal way) in the posttest of creative thinking.
- 3) There are statistically significant differences at ( $\alpha \leq 0.05$ ) between the mean scores of the experimental group (taught by brainstorming) and the control group (taught in the normal way) in each skill of creative thinking (fluency, flexibility, and originality) in the pretest of creative thinking.
- 4) There are statistically significant differences at ( $\alpha \leq 0.05$ ) between the mean scores of the experimental group (taught by brainstorming) and the control group (taught in the normal way) in each skill of creative thinking (fluency, flexibility, and originality) in the posttest of creative thinking.
- 5) There are statistically significant differences at ( $\alpha \leq 0.05$ ) between the mean scores of the experimental group (taught by brainstorming) and the control group (taught in the normal way) in achievement in English Language.

### 1.4 Significance of the Study

The importance of the study is as follows:

- This study may promote studies in the curriculum and teaching methods.
- Such a study may help other researchers to conduct similar research.
- This study may contribute to the development of new methods of teaching, such as brainstorming, to make the educational process more clear, receptive and stimulating for teachers and learners.
- This study may benefit those who enrich the teaching process such as mentors, educational supervisors and teachers in enriching the elements of the English language curriculum, so as to develop the skills of creative thinking of students and the application of creative education methods, so that students can face their problems in studying and in life and provide diverse and unusual solutions.

### 1.5 The limits of the Study

- Spatial Limit: This study was limited to a sample of 10<sup>th</sup> grade students at King Abdullah II School of Excellence in Amman.
- Time limit: This study was applied in the second semester of the academic year (2018 -2017).
- Objective Limit: This study was limited to three skills of creative thinking (Fluency, flexibility, originality), and levels of academic attainment, which are high, Medium and low) by applying the activities on which the brainstorming strategy is based in the English language curriculum for 10 grade.

### 1.6 Definition of Terms

#### 1.6.1 Brainstorming

Duwaidi (2004) defines it as “carefully planned, step-by-step learning situations to capture as many innovative ideas as possible in order to develop their mental abilities according to Bloom’s education levels.”

Agha (2009) also defines it as the generation and production of ideas and creative ideas from individuals and groups to solve a particular problem. These thoughts and ideas are new, that is, the mind is ready to think in all directions to generate as much thoughts as possible about the problem or topic, So that the individual has the freedom to allow the emergence of all opinions and ideas.

Procedural definition: the researcher defines it as “an educational method in which the learner sinks his ideas in group sessions to get the greatest number of ideas and encourage them to raise them and accept them without criticism to reach a solution to a particular problem.”

#### 1.6.2 Creative thinking

Al-Sumairi (2006) defines it as “a high-quality mental activity that appears in the behavior of its owner when confronted with ambiguous problems or seeking to meet needs characterized by flexibility, originality and fluency”.

Procedural definition: the researcher defines it as “The ability of the individual to produce distinctive ideas with fluency, flexibility and originality in educational situations and problems.”

### 1.6.3 Achievement

“The scores that the student’s get on the achievement test in the English language prepared by the researcher.”

## 2. Previous Studies

The researcher reviewed some studies of brainstorming, among these studies the following:

The study of Mohammed (2012) aimed to investigate the effect of the use of creative thinking on the achievement of students in the secondary stages in Pakistan. The sample consisted of (256) students randomly selected and divided into four groups, the study used a semi-experimental approach. The study concluded that there is a relationship between the use of creative thinking and the impact on their achievement.

The study of Salamat and Kharabshah (2010), the study aimed to know the effectiveness of the use of brainstorming on the achievement of seventh grade students in the geography and development of trends towards it. The researchers used the experimental approach, the sample consisted of (45) students from the seventh grade, which were distributed randomly into two groups, i.e. Experimental group and other control, and the tools used were an achievement test and a scale of the trends towards geography. Using statistical methods such as ANCOVA, the study found the following results: There were statistically significant differences in the level of ( $\alpha \leq 0.05$ ) between the arithmetic mean of the scores of the students of the experimental and control group on the achievement test, and the scale of trends towards geography is attributed to the teaching method, and in favor of to the students of the experimental group, which was taught using brainstorming strategy, the study recommended using brainstorming strategy in the teaching of social education courses and training teachers to use brainstorming method.

Mohsen (2010) also conducted a study aimed at investigating the effect of using fluency and originality skills in the achievement of the first secondary grade students in the field of earth sciences and the environment and their attitudes towards it in Jordan. The sample of the study consisted of (3) schools chosen by random method. The researcher used the semi-experimental method in his study and the researcher reached the following results: The existence of statistically significant differences in the achievement of students in the two groups, the group taught in the usual way and the group taught using the skills of creative thinking (originality and fluency). The differences were in favor of both originality and fluency. And the existence of statistically significant differences in the attitudes of students between teaching in the usual way and between each teaching using the method of fluency and originality and the differences were in favor of both originality and fluency.

Abu Sneh (2008) conducted a study aimed to uncover the effect of the use of brainstorming method in the development of achievement and critical thinking in the geography subject in the students of the Faculty of Educational Sciences (UNRWA). The study population consists of all students in the third year of the teacher’s specialization (131 students) divided into five divisions. Two of the five sections were randomly selected and one of them was assigned as experimental group, it has (25) students, they were taught in brainstorming method and the other is control group, its members’ number was (28) students who were taught in the traditional way. The achievement test was then used prepared by the researcher of the type of multiple choice, including forty paragraphs, the validity and stability and extraction of difficulties and discrimination have been verified. The California Test of Critical Thinking (2000) was used to verify its validity and consistency, including 34 paragraphs distributed among its five skills. The equivalence of groups was confirmed by the pre application of the achievement test and the California test of critical thinking.

The results of the post-test and the California test of the post-critical thinking and the overall test of the skill of analysis, induction and evaluation showed statistically significant differences at the level of significance ( $\alpha=0.05$ ) and in favor of the experimental group studied in brainstorming method. The results showed no statistically significant differences on the skills of inference and conclusion.

Samairi (2006) conducted a study aimed to identify the effect of using brainstorming method to teach creative expression in the development of creative thinking among the eighth grade students in Gaza compared to the traditional method.

The sample of the study consisted of two regular study sections at the Girls’ High School of Sheikh Ajlain, the sample of (70) students was divided into two equal groups: (35) experimental and (35) control. The experimental group studied the brainstorming method, the control group studied in the traditional way. To achieve the goal of the study, the researcher prepared a teacher’s guide and includes four topics of expression: science, unemployment, ethics, and the environment and explained how to teach it using the method of brainstorming and the guide

includes the following:

- 1) Setting goals
- 2) Organizing content to serve the objectives
- 3) Means of assessment

The researcher used the following research tools in his study:

- 1) The content analysis tool to detect the availability of creative thinking abilities (fluency, flexibility, originality) in the first ten lessons of the reading book and the texts scheduled for the eighth grade in the academic year 2004-2005, and the coefficient of reliability was (0.91).
- 2) Test of Creative Thinking (pre/post), an essay test consisting of six main questions and nine sub-questions. Through the use of the researcher the statistical package of social sciences known as (SPSS) and the (T) test, he reached several results, the most important of which:
  - There were statistically significant differences ( $\alpha=0.05$ ) among the average scores of the experimental group's students in the applications (pre/post) to test creative thinking in favor of the post-application.
  - There were statistically significant differences ( $\alpha=0.05$ ) between the average scores of the experimental group and the average score of the students in the control group in the total score in the post-creative thinking experiment in favor of the experimental group.
  - There were statistically significant differences ( $\alpha=0.05$ ) between the mean scores of the experimental group and the average scores of the female students in the control group in the dimension of (fluency, flexibility and originality) in the post-creative thinking experiment in favor of the experimental group.

In light of the results of the study, the study recommended the use of the method of brainstorming and modern teaching methods that develop thinking in general and creative thinking in particular.

Al-Otaibi (2002) conducted a study aimed to answer the following questions:

- 1) What is the effectiveness of brainstorming strategy in teaching the unit of change from God's creation in nature in developing the creative thinking abilities of the first grade students?
- 2) What is the effectiveness of brainstorming strategy in teaching the unit of change from the God's creation in nature in the development of academic achievement among the first grade students?

In this study, the semi-experimental design known as the pre/post measurement of the unequal control group was used. The sample consisted of (4) classes of first-grade students, in the third intermediate of the city of Riyadh, distributed randomly into two groups, where the two chapters represent (54) students in experimental group examined the unit of change of God's creation in nature using a strategy of brainstorming, and the others represent (50) students of the control group in which they studied the unit itself using the usual method of teaching, the Torrance test of creative thinking - shapes - Photo (b)-was used to measure the creative thinking abilities of female students, the test was used by the researcher to measure the academic achievement of the students, and both tests were applied both before and after.

Several results have been reached, the most important of which are:

- 1) There is a statistically significant difference at (0.01) between the modified averages of the experimental group's scores and the control group's scores in the test of the post-innovation thinking abilities with respect to fluency, for the benefit of the experimental group.
- 2) There was no statistically significant difference at the level of significance ( $\alpha=0.05$ ) between the modified averages of the experimental group's grades and the scores of the students in the control group in the test of the innovative thinking capacities in terms of detail capacity.

Alkiumi (2002) conducted a study aimed to identify the effect of brainstorming strategy on the development of creative thinking abilities (fluency, flexibility, originality, and total creative ability). The study was applied in Al Batinah region, southern Oman. It was limited to a sample of first secondary grade students (males) during the first semester of the academic year 2001/2002, who were (112) students, divided equally on the experimental and control groups. A module for the preparation of lessons for two units of the modern book (Modern European History) was prepared, the second unit (geographical discoveries and European expansion) and the third unit (political and intellectual developments in Europe and America in the eighteenth century). Two classes (experimental group) were taught with brainstorming while two classes (control group) were taught in the traditional way .

In the study, the Torrance test was used for innovative thinking using words (a) as a pre-test, and (b) as a post-test, after its validity and reliability were measured on a survey sample. The following variables (ability to think creatively, gender, nationality, school environment) were adjusted. The “T” test was used for two independent samples and the interrelated samples to examine the study questions. Correlation coefficients and internal consistency validation coefficients were used to measure the validity and reliability of the test data.

The following results have been achieved:

After applying the post-test, Torrance test image (B) the results were as follows:

The experimental group was taught using brainstorming strategy on the control group, which was taught in the traditional way of fluency, flexibility, originality and total innovation. The experimental group has also outperformed its pre performance in terms of fluency, flexibility, originality and innovation.

In a study conducted by Shatih (2002), it aimed to measure the extent of the use of creative thinking skills in teaching Arabic language for students in sixth grade in Nablus governorate and its impact on their achievement and their ability to solve linguistic problems, the sample consisted of (608) students from the sixth grade distributed in (16) schools; (8) experimental groups and (8) control groups. The researcher used the semi-experimental method. The researcher conducted (4) tests which included creative thinking skills (flexibility, fluency, Originality, expansion) a questionnaire consisting of (38) paragraphs. The results of the study as follows: There were statistically significant differences between the average achievement of the sixth grade pupils due to the method of teaching, gender, the academic rate, the bilateral interaction between the method and the rate.

The study examined the impact of the use of collaborative learning and brainstorming in the development of creative thinking and retention of its skills through teaching the curriculum of the prophetic biography of students of the basic stage in Jordan. The sample consisted of (130) students of Abdullah Siraj primary school for males, (3) random classes were selected, the first class studied using the cooperative learning strategy and its number (43) students, the second class studied using the strategy of brainstorming and its number (44) students, and the third class studied using education in the usual way and its number (43) students. The researcher used the semi-experimental method in his research. The results of the study were as follows: There were statistically significant differences between the arithmetic averages of the three study groups on the skills of flexibility, fluency and originality. There were statistically significant differences between the arithmetic averages of the three study groups (arithmetic, cooperative, and traditional) on the skills of fluency, originality, and flexibility in the test of creative thinking in its skills for the group of brainstorming and cooperative learning compared to the usual method.

### **3. Design and Methodology**

#### *3.1 Study Approach*

The researcher used the semi-experimental method, in which the variables affecting a phenomenon are controlled except for one variable that the researcher adapts, and to change it in order to determine and measure its impact on the phenomenon under study, where the researcher put the independent variable in this study, the “brainstorming strategy” under experiment to measure its impact on the dependent variable, the “creative thinking” and “achievement”, where the semi-experimental approach is the most suitable for the subject of this study, where the design of the two control and experimental groups was used, the experimental group was taught using the brainstorming strategy, and the control group was taught in the normal way.

#### *3.2 Population of the Study*

The study population is composed of all 10th grade students at King Abdullah II School of Excellence, their number reached (3820) in Amman for the academic year (2017/2018) according to the statistics of the Ministry of Education.

#### *3.3 Sample of the Study*

The sample of the study consisted of (168) students of the tenth grade at King Abdullah II School of Excellence in Amman. The researcher chose the school purposefully, so that this school was close to the researcher’s work place. The researcher then divided them into two groups: (84) students representing the experimental group and (84) students representing the control group.

#### *3.4 Study Tools*

In this study, the researcher used the following tools:

- 1) Achievement Test.

## 2) Creative thinking Test.

### 3.4.1 First: Achievement Test

#### 3.4.1.1 Test Validity

The arbitrator's validity: It means "the test measures what it has been set for", that is, the valid test is the test which measures what is set for its measurement, the researcher has verified the validity of the test by presenting it in its preliminary form on a group of specialized professors at Princess Alia University College, where they expressed their views and observations on the suitability of the test paragraphs, the extent to which the paragraphs belong to the test, as well as the clarity of its language formulation, in the light of those views, some paragraphs were excluded and others were amended, the final number of paragraphs is (30) paragraph.

#### 3.4.1.2 Reliability of the Test

Reliability of the test was assessed on a pilot study, using Split- half reliability; the scores of the pilot study were used to calculate the reliability of the test in the split- half method. The score of the individual paragraphs, as well as the degree of the relative vertebrates of the grades, were calculated by calculating the correlation coefficient between the two halves. The length was adjusted using the spearman Brown equation. The test is characterized by a high degree of reliability that the researcher is satisfied to apply to the study sample.

### 3.4.2 Second: Creative Thinking Test

The objective of this test is to measure the level of creativity in the English language of the 10th grade students, in the three basic creative capacities: fluency, flexibility and originality.

#### 3.4.2.1 Scale Validity

The validity of the scale was calculated in two ways:

##### 1) The apparent validity

This was done by presenting it to a group of arbitrators who agreed that the test paragraphs were formulated in a way that the students could understand. They also confirmed that the test is compatible with the Jordanian environment and its validity to apply to the study sample.

##### 2) Internal consistency validity

The researcher calculated the internal consistency between the degree of each dimension of the scale and the total score of the scale, as well as the correlation of the degree of each skill to the other skills' levels, all dimensions were related to the overall degree of the scale and the levels of the other dimensions statistically significant correlation at the level of significance (0.01). This indicates that the scale of creative thinking is internally consistent.

#### 3.4.2.2 Reliability of the Scale

##### 1) Split-half Reliability

The reliability coefficient was found using split-half reliability, where the students were divided into two halves, the respondents with the odd numbers and the even-numbered respondents, so that each half was independent. The correlation coefficient between the two pairs was calculated by Pearson equation, and the Spearman Brown equation was applied, where it was found that the reliability coefficient is (0.751)

##### 2) Alpha Cronbach Method

The Alpha-Cronbach equation was applied. The Alpha- Cronbach coefficient was (0.700), which is a good and satisfactory factor in such studies. It is clear from the above that the test of creative thinking has a high degree of reliability and is assured of the validity of the result obtained, and show the validity of the test and using it in the study.

## 4. Results of the Study

Results related to the first hypothesis test and its interpretation:

Where the first hypothesis is stated as: "There are statistically significant differences at ( $\alpha \leq 0.05$ ) between the mean scores of the experimental group (taught by brainstorming) and the control group (taught in the normal way) in the pretest of creative thinking."

To validate this hypothesis, the independent sample T test was used and Table 1 illustrates this.



Table 1. Mean and standard deviations and value of “T” and the level of significance to identify the differences between the averages of students in the control and experimental groups in pre application

Dimension	Group	N	Mean	ST	T value	Sig value	Level of Sig
Total score of creative thinking	Experimental/pretest	84	62.476	32.388	0.738	0.463	Not statistically significant
	Control/pretest	84	67.238	26.467			

\* The value of the tabulated “T” at the degree of freedom (82) and level of significance ( $\alpha \leq 0.05$ ) = 1.98.

\* The value of the tabulated “T” at the degree of freedom (82) and level of significance ( $\alpha \leq 0.01$ ) = 2.62.

Table 1 shows that the value of calculated (T) is less than the tabular value of (T) in all dimensions and the total score of the test. This indicates that there are no statistically significant differences between the experimental group and the control group, which indicates the equality of the two groups in the skills of creative thinking before applying the experiment.

Results related to the second hypothesis test and its interpretation:

Where the second hypothesis is stated as: “There are statistically significant differences at ( $\alpha \leq 0.05$ ) between the mean scores of the experimental group (taught by brainstorming) and the control group (taught in the normal way) in the posttest of creative thinking.”

To validate this hypothesis, the independent sample T test was used and Table 2 illustrates this.

Table 2. Mean and standard deviations and value of “T” and the level of significance to identify the differences between the averages of students in the control and experimental groups in pre application

Dimension	Group	N	Mean	ST	T value	Sig value	Level of Sig
Total score of creative thinking	Experimental/posttest	84	96.595	32.446	4.990	0.000	Statistical significant at 0.01
	Control/posttest	84	65.855	23.257			

Table 2 shows that the value of calculated “T” is greater than the value of tabulated “T” in all the dimensions and the overall score of the post-test is statistical at the level of significance ( $\alpha \leq 0.05$ ,  $\alpha \leq 0.01$ ). This indicates that there are statistically significant differences between the experimental group and the control group, and the differences were in favor of the experimental group, which means that the brainstorming strategy has an impact on the development of creative thinking.

It is clear from the results of the second hypothesis that there is an effect of teaching by the brainstorming on the development of creative thinking in the English language of the students of the experimental group.

Results related to the third hypothesis test and its interpretation:

Where the third hypothesis is stated as: There are statistically significant differences at ( $\alpha \leq 0.05$ ) between the mean scores of the experimental group (taught by brainstorming) and the control group (taught in the normal way) in each skill of creative thinking (fluency, flexibility, and originality) in the pretest of creative thinking.

To validate this hypothesis, the independent sample T test was used and Table 3 illustrates this.

Table 3. Mean and standard deviations and value of “T” and the level of significance to identify the differences between the averages of students in the control and experimental groups in pre application

Dimension	Group	N	Mean	ST	T value	Sig value	Level of Sig
Fluency	Experimental/posttest	84	38.523	20.628	0.678	0.498	Not statistically significant
	Control/posttest	84	41.356	17.500			
Flexibility	Experimental/posttest	84	21.332	10.946	1.266	0.208	Not statistically significant
	Control/posttest	84	24.142	9.316			
Authenticity	Experimental/posttest	84	2.618	3.176	1.520	0.131	Not statistically significant
	Control/posttest	84	1.737	2.001			

Table 3 shows that the calculated value of “T” is less than the tabular value of “T” in all dimensions and the overall score of the test. This indicates that there are no statistically significant differences between the experimental

group and the control group, namely, acceptance of zero hypothesis and rejection of alternative hypothesis, Which indicates the equality of the two groups in each skill of creative thinking (fluency, originality and flexibility) before applying the experiment.

Results related to the fourth hypothesis test and its interpretation:

Where the fourth hypothesis is stated as: There are statistically significant differences at ( $\alpha \leq 0.05$ ) between the mean scores of the experimental group (taught by brainstorming) and the control group (taught in the normal way) in each skill of creative thinking (fluency, flexibility, and originality) in the posttest of creative thinking.

To validate this hypothesis, the independent sample T test was used and Table 4 illustrates this.

Table 4. Mean and standard deviations and value of “T” and the level of significance to identify the differences between the averages of students in the control and experimental groups in post application

Dimension	Group	N	Mean	ST	T value	Sig value	Level of Sig
Fluency	Experimental/posttest	84	56.356	17.867	3.816	0.000	Statistical significant at 0.01
	Control/posttest	84	42.023	16.520			
Flexibility	Experimental/posttest	84	32.951	15.762	3.892	0.000	Statistical significant at 0.01
	Control/posttest	84	22.116	8.770			
Originality	Experimental/posttest	84	7.285	9.004	3.943	0.000	Statistical significant at 0.01
	Control/posttest	84	1.713	1.656			

\* The value of the tabulated “T” at the degree of freedom (82) and level of significance ( $\alpha \leq 0.05$ ) = 1.98.

\* The value of the tabulated “T” at the degree of freedom (82) and level of significance ( $\alpha \leq 0.01$ ) = 2.62.

Table 4 shows that the calculated value of “T” is greater than the tabular “T” value of all the dimensions, and the total score of the post-test is statistical at the level of significance ( $\alpha \leq 0.05$ ,  $\alpha \leq 0.01$ ), this indicates that there are statistically significant differences between the experimental group and the control group. The differences were in favor of the experimental group. This means that the brainstorming strategy has an effect on each skill of creative thinking (fluency, flexibility and originality).

Results related to the fifth hypothesis test and its interpretation:

Where the fifth hypothesis is stated as: There are statistically significant differences at ( $\alpha \leq 0.05$ ) between the mean scores of the experimental group (taught by brainstorming) and the control group (taught in the normal way) in the achievement test of English language.

To validate this hypothesis, the independent sample T test was used and Table 5 illustrates this.

Table 5. Mean and standard deviations and value of “T” and the level of significance to identify the differences between the averages of students in the control and experimental groups in post achievement test

Dimension	Group	N	Mean	ST	T value	Sig value	Level of Sig
Total score of achievement test	Experimental/posttest	84	25.213	4.861	6.541	0.000	Statistical significant at 0.01
	Control/posttest	84	17.642	5.711			

\* The value of the tabulated “T” at the degree of freedom (82) and level of significance ( $\alpha \leq 0.05$ ) = 1.98.

\* The value of the tabulated “T” at the degree of freedom (82) and level of significance ( $\alpha \leq 0.01$ ) = 2.62.

Table 5 shows that the value of the calculated “T” greater than the value of tabular “T” in the total score of the post-test statistical at the level of significance ( $\alpha \leq 0.05$ ,  $\alpha \leq 0.01$ ), this indicates statistically significant differences between the experimental group and the control group for the benefit of the experimental group, which means that brainstorming strategy has an impact on the achievement of students in English language.

## 5. Recommendations

In line with the findings of this study, the use of brainstorming strategy is clearly superior to the conventional way of developing the ability to think creatively and the achievement in the English language. In order to achieve what is called for by educational literature to use new methods and strategies in the teaching of English language to maximize the benefits of knowledge scientific study, and therefore the study recommends the following:

- 1) English teachers have to use brainstorming strategy in the teaching process.
- 2) English language textbooks in the educational stages must include some creative thinking skills such as fluency, flexibility and originality.
- 3) Teachers use modern methods and strategies in teaching English in different educational stages such as brainstorming.
- 4) The need to organize training courses and workshops for supervisors and teachers of English language urges the supervision of qualified trainers, and training them in the preparation and use of brainstorming.

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