THE EFFECT OF THE BRAINSTORMING STRATEGY ON DEVELOPING
THE PROBLEM-SOLVING METHOD OF AL-QUDS UNIVERSITY STUDENTS

Fadwa Halabiya
1Assistant Professor, Department of Psychology, Al-Quds University

ABSTRACT

The study aimed to identify the effect of the brainstorming strategy on the problem-solving method. Two groups of (15) male and female students were selected from the Department of Psychology, a first experimental group on which the brainstorming program was applied, and the second group (15) students And a student of a control group, and to achieve the objectives of the study, a brainstorming program was prepared, and the Sternberg and Wagner scale was used to measure the method of problem solving, which is statistically significant at the level (0.05), which indicates the impact of the program in increasing students’ awareness and that the differences between the experimental and control groups in the thinking styles on the Sternberg and Wagner scale are statistically significant, where the value of “P” reached (23.2), which is statistically significant at the level of (0.05), and that the average scores of the experimental group members were higher than the average scores of the control group members, which indicates the impact of the program in increasing students’ awareness of problem-solving methods among the experimental group members. With regard to the significance of the differences between males and females in the methods of solving problems on the Sternberg and Wagner scale, with regard to the interaction between the variable of sex and the group in the ways of thinking on the Sternberg and Wagner scale, it was statistically significant, with a value of "P" (4.915), which is a function at the level of significance (0.05), the average responses of females on the Sternberg and Wagner thinking scale were more than the males in the experimental group, and with regard to the significance of the differences between the respondents according to the age variable in solving problems on the Sternberg and Wagner scale, they were not statistically significant, and there was convergence in the average responses Students on the Sternberg and Wagner Scale of Thinking Styles of the respondents of different age groups, and the study recommended using the brainstorming program in teaching in universities to develop problem-solving skills to develop creative thinking and conducting studies concerned with knowing the differences between the sexes in solving problems and the effect of using brainstorming in developing problem-solving skills University The educational organization is constantly seeking to devise sound educational strategies to achieve creative outcomes in education and prevent the use of to traditional methods.

Keywords: Brainstorming, problem solving, Al-Quds University students.

I. INTRODUCTION

The brainstorming strategy or the so-called contemplation or “intellectual whirlwind” is one of the many methods of stimulating thinking and creativity that exceed more than thirty methods in America, and more than a hundred methods in Japan, including the American methods. The brainstorming strategy uses the mind in an active response to the problem, Where this strategy is based on freedom of thought to generate the largest number of ideas to address and solve problems through brainstorming sessions, which is a reaction to dissatisfaction with the traditional method.

And in the midst of the huge amount of problems, it begins to define itself as a result of the massive knowledge explosion in various economic, social and educational fields, as positive thinking and creativity are a necessity to be able to align reading and solve problems, and it has become one of the features of the third millennium. And many educators agreed that the main goal in learning is to work on developing the abilities of students who are distinguished by the ability to understand and solve problems for an effective image that embraces the spirit of the age (Benait, 2004).
Osborn is considered the godfather of the brainstorming method, as this method was considered a reaction to the dissatisfaction with the traditional method prevailing at the time, which is the “conference method” which is held by a number of experts so that each of them gives his opinion alternately or alternately, with the opportunity for discussion. This has been revealed The traditional approach is insufficient to solve a lot of difficult problem solving or brainstorming (Osborn, 1963).

(Balackova, 2000) defines it as a tactic introduced by (Osborne) from the thirties and uses this method with groups to support the creative solution to the problem, through the generation of new ideas that brainstorming is defined as “a method that depends on a kind of group thinking and discussion between small groups, with the aim of stimulating and diversifying ideas, and thus generating a list of ideas that can lead to a solution to the problem in question (Hussain and Fakhro, 2002: 78).

Moreover, the views of researchers are diverse regarding the brainstorming strategy as well as problem solving. Among the students of the College of Basic Education in a subject in the subject of geography, the research sample consisted of (79) male and female students who were divided into two groups into two groups: the first experimental group studied according to the brainstorming strategy, and the control group studied according to the usual (traditional) method, and the two groups were equalized with the variables (intelligence test). (Raven) and the tribal inferential thinking test). The behavioral objectives and plans which the two groups were taught were prepared and the inferential thinking test prepared by Al-Jubouri and Al-Hidd was adopted. Appropriate statistical methods were used for this research, and the results were the superiority of the experimental group in developing inferential thinking over the control group. Arar (2013) a study dealing with the title of the effect of brainstorming strategy on developing critical thinking in The social studies topic of the eighth grade students in Palestine, where the aim of this study is to know the effect of the brainstorming method on expressive performance and creative thinking At the literary fifth grade students. To achieve the goal of the research, the researchers chose a sample consisting of (74) female students divided into two groups, experimental and control, who were rewarded in terms of chronological age, academic achievement of parents, and grades of the previous year. After defining the scientific subject with five expressive topics, and adopting the developed Al-Quaisi criteria to measure expressive performance, the Torrance Scale of Creative Thinking was selected, and its validity, stability and objectivity were verified, and after teaching the two experimental groups according to brainstorming and conceptualization. The mean of the post-tests in expressive performance was found, and the Torrance test for creative thinking was applied, and the average scores of the students of the two groups were taken out after the application to know the significance of the statistical differences between the two groups. The result was reached that the students of the experimental group outperformed the students of the control group, which indicates the positive use of brainstorming when teaching expression among the literary fifth grade female students, as well as the superiority of the experimental group students over the control group students in terms of innovative and creative thinking. The researchers recommended a number of recommendations, the most important of which is the adoption of brainstorming when teaching the subject of expression, and Al-Agha (2009) approved a study that examined the effect of using the brainstorming strategy in developing some mathematical thinking skills on both sides of the brain among eleventh-grade students, and the study aimed to identify the effect of using the strategy Brainstorming in developing some mathematical thinking skills on both sides of the brain for eleventh graders of the scientific branch, and the researcher used the experimental method. To achieve the objectives of the study, the researcher used the following tools: • Brain control test. This is to classify students in terms of the dominant side of the brain. A test designed by the researcher related to some mathematical thinking skills, a test that contains (24) items distributed over six domains (induction, investigation, inference, relational curve, problem solving, symbolic expression). The test was presented to a group of specialists in curricula and teaching methods and a group of mathematics teachers for arbitration, and after judging the test and making amendments to it, it was applied to an exploratory sample of (30) students to calculate its validity and stability. The split-half method, where the correlation coefficient was (86.0) and the reliability coefficient (92.0), and the difficulty level and the coefficient of excellence were calculated for the test items.

The following statistical methods were used:

• Frequencies, arithmetic averages, and percentages.

• T-Test For two independent samples Mann-Whitney test for two independent samples (small samples and large samples) Kruskal-Willis test for three independent samples.
The study population consisted of all eleventh grade students of the scientific stream belonging to the public schools in Khan Yunis, where their number reached (1278) male and female students, and the study sample amounted to (60) students (30 of them as a control group and (30) as an experimental group, and the sample was chosen intentionally, and the researcher made sure that the two groups are equal in terms of The chronological age and previous achievement in mathematics, and the test was applied to the study sample in the second semester of the academic year 2008/2009 AD. The prepared unit was taught using the brainstorming strategy of the experimental group, and the control group was taught in the traditional way.

Based on the foregoing, it was found that brainstorming is a method that depends on a type of group thinking and discussion between small groups, with the aim of stimulating and diversifying ideas, and thus generating a list of ideas that can lead to a solution to the problem in question. Therefore, this study came in order to reveal the brainstorming strategy and its impact on developing the problem-solving method of Al-Quds University students.

Study Problem

Through the researcher’s work as a lecturer at the university, I felt that most university students do not have the ability to solve the problems they face, especially academic problems, and this negatively affects their academic performance, achievement and the way they present and solve their daily problems. Since there is an inability for students to solve problems, the researcher decided to find a method for acquiring students by developing problem-solving skills, so the researcher adopted this strategy. The study attempts to answer the following main question: Are there statistically significant differences at the significance level (α≤0.05) between the arithmetic averages of the students of the College of Educational Sciences / Al-Quds University on the Sternberg and Wagner Thinking Styles Scale due to the type of group (experimental and control)? The following hypotheses were formed:

**The first hypothesis:** There are no statistically significant differences at the significance level (α≤0.05) between the arithmetic averages of the students of the College of Educational Sciences / Al-Quds University on the Sternberg and Wagner Thinking Styles Scale due to the type of group (experimental and control), gender (male and female), and interaction between them.

**The second hypothesis:** There are no statistically significant differences at the significance level (α≤0.05) between the arithmetic averages of the students of the College of Educational Sciences / Al-Quds University on the Sternberg and Wagner Thinking Styles Scale due to the type of group (experimental and control), and age (21 and less, and 22 years and more), and the interaction between them.

Study Importance

The importance of the study is divided into two parts:

**theoretical significance:** The importance of the study lies in two areas: This study presents a proposed program for developing problem-solving skills in a brainstorming method to help the learner think well in solving his daily problems at the University of Quds.

2. It investigates a topic that Arab libraries lack, especially in Palestine, and contributes to providing governmental and non-governmental institutions with training programs that increase the efficiency of their employees with problem-solving skills by brainstorming, which increases the development of creative ideas and moves away from the traditional way of solving problems.

3. Attracting the attention of those interested and specialists in guiding universities and schools to teach the courses by using the brainstorming strategy.

**Practical importance**

1. Employing brainstorming programs in developing problem-solving skills for students by teachers in universities and schools.

2. Conducting studies to complete the results of this study in Palestinian educational organizations.

3. That the Ministry of Education adopt brainstorming programs in the curriculum, whether independently of the curriculum or the curriculum itself.

**Study Objectives**
This study aims to:

1. Identifying if there is an impact of the brainstorming strategy in developing the problem-solving method of Al-Quds University students.

2. Identifying if there are statistically significant differences between the arithmetic averages of the students of the College of Educational Sciences / Al-Quds University on the Sternberg and Wagner Thinking Styles Scale due to the type of group (experimental and control).

3. To identify if there are statistically significant differences at the significance level ($\alpha \leq 0.05$) between the arithmetic averages of the students of the College of Educational Sciences / Al-Quds University on the Sternberg and Wagner Thinking Styles Scale due to the type of group (experimental and control), gender (males and females), and the interaction between them.

4. To identify if there are statistically significant differences at the significance level ($\alpha \leq 0.05$) between the arithmetic averages of the students of the College of Educational Sciences / Al-Quds University on the Sternberg and Wagner Thinking Styles Scale due to the type of group (experimental and control), and age (21 and less, and 22 years old and more), and the interaction between them.

The limits of the study
The study was limited to the following limits:

Time limits: second semester 2020-2021

Spatial limits: Al-Quds University "Abu Dis"

Human limits: Students of the College of Education

Study Terminology
Idiomatically Brainstorming: Brainstorming is the seeding of ideas and their flow, and it is a type of thinking aimed at the multiplicity of ideas among students (Osborn, 2001:34). The researcher defines it procedurally: it is the program by which ideas will be generated from the minds of first-year students at Al-Quds University to obtain the largest number of them in order to arrive at appropriate innovative solutions to the problem. Unusual solutions

Technically speaking, problem solving: It is the activity and procedures that the learner undertakes when faced with a problematic situation, to overcome the difficulties that prevent him from reaching a solution. The student is unable to reach a goal and reach it, that is, it is confused and puts the student in a questioning position about the implementation of the decision or order, or doubts about an issue that he is ignorant of and requires an acceptable solution from him (Al-Shammari, 2003, p. Or by asking a question or presenting a situation that is addressed by the subject of the problem, to develop their inferential thinking through their search for possible solutions to get out of the state of doubt and hesitation, and then follow up the solution according to the steps of the problem-solving method of the brainstorming strategy.

Theoretical framework
The theoretical framework dealt with the independent and dependent variable and worked on explaining and detailing each of them separately. The presentation of the theoretical framework was as follows:

Brainstorming
The brainstorming strategy is based on four basic principles, which were mentioned by (Osborn, 1963), the first of which was the necessity of avoiding criticism and deferring evaluation of ideas to the end of the session: Since its appearance, it may be a sufficient factor not to issue other ideas. He bears the responsibility for this session activator, as members prevent each other until the end of the session, and secondly, the participant may criticize his idea and try to apologize for it. The third is the interest in generating the largest possible number of ideas, and the more ideas are, the more original ideas will be, and the ability to solve problems. Fourth, deepening and developing the ideas of others: It means to arouse the enthusiasm of the participants in the brainstorming sessions, whether students or others, because They add to the ideas of others, and provide what represents an improvement or development.
Brainstorming style features

The brainstorming method has several advantages, the most important of which is that it is an easy way to apply, because it restricts the production of the idea to criticism or stunting, and it trains students to solve the problem in a collective and interactive way, as well as helps spread imagination and flexibility in thinking, and it allows all individuals to participate in the discussion without An individual imposing his opinion or his idea or solving the problem, since from the above it can be said that brainstorming by doing the thinking process according to the rules mentioned by (Osborne) and the stages mentioned by (Rocha) has proven its success in many situations that need creative solutions because it is characterized by launching Individuals’ ideas without evaluation, because criticizing ideas or over-evaluating them, especially at the beginning of their appearance, may lead to a person’s fear or interest in quality more than quantity, slowing his thinking and reducing his percentage of creative ideas. This shows the importance of the thinking process in developing creative thinking and problem solving (Al Kubaisi, 2007).

The brainstorming strategy is to produce a list of ideas that constitute keys to the solution or lead to crystallizing the problem and deciding the final solution.

In a quick way, it can be applied individually or by the group, and therefore it contributes to the production of creative solutions to problems. The issue of problem solving has emerged since the beginning of the twentieth century through the world of Thumodike, Kohler and John Doe, where the problem-solving method requires different mental processes and the use of certain and different methods according to the situations and goals of the problem. (Kadhim, 2019).

Problem Solving

Jarwan (2002) defines problem solving as an effort to achieve a goal or solve a problem that does not have a ready solution, and he defines it (Sternberg, 2003) as a complex thinking process in which the individual experiences his experiences in order to carry out a task, solve a problem, or achieve a goal for which there is no ready solution and the problem is identified. Clarification and definition include a statement of the goal that he publishes in light of his definition according to what the problem is going through, and explained (Abu Riachi, 2005) problem-solving skills in employing previous experiences such as information closely related to the problem or previous solutions, requiring ideas useful in establishing hypotheses and issues related to the problem, and examining The hypotheses and solutions represented in succession, promising to formulate the problem if necessary, and evaluating solutions and making decisions based on evidence and including integrating the resulting solutions in the light of the current understanding and applying it in other stages of solving the problem (Abdulaziz, 2007).

Accordingly, it can be said that solving problems requires basic elements, including knowledge of data, identification of obstacles and overcoming them to reach the desired goals, which are clear and specific data and goals, and the expectation of a solution quickly, and the data are clear and the goals are not specified. It is expected that the solution will be possible, but with difficulty, and the data are not clear, and the goals are very specific and clear: the solution is expected to be possible, but with difficulty, the data and goals are not clear and undefined, and the solution is expected to be difficult, and the problems of insight: problems that have a solution, but the transition from the giver to the goals requires a degree A high level of thinking, contemplation, and realizing the relationship between data and means, so that the individual arrives at the solution in a surprising way (Al-Kisibi, 2017).

II. STUDY METHODOLOGY

The experimental method was used with a quasi-experimental design, which is a type of experimental method that aims mainly to study the causes of phenomena by treating the level of some independent variables and then measuring the result, to assess the relationships between cause and effect, but for the application of the experiment if all important factors are fully controlled. that may affect phenomena that are considered real experimental, but it is often not possible or practical to control all the main factors, so it becomes necessary to apply a quasi-experimental research design, a quasi-experimental approach is research that is similar to experimental research but is not real experimental research, although the independent variable is processed, the participants are not randomly assigned to particular conditions or orders. Quasi-experimental experiments are often conducted in field settings where random assignment is difficult or impossible. They are often performed to assess the effectiveness of treatment - perhaps some form of psychotherapy or an educational intervention. There are many different types of quasi-experiments, so the quasi-experimental method is considered to be somewhat
similar to the experimental method but lacks the key element - random assignment. They are often referred to as "misleading" experiments because they give researchers a sense of distress. In terms of internal health, they are often less than randomized trials. But there is something compelling about these designs; Taken as a group, they are more easily implemented than their random cousins.

Using the design of the experimental and control group; The program (brainstorming) was presented to the experimental group in the year 2018-2019, while the control group was not exposed to the program, and the Sternberg test was measured before and after to develop problem-solving skills for the two groups.

Study community
The study population consisted of 360 students in the Faculty of Educational Sciences in the first year in the second semester.

Study sample
A random selection was made of 15 first-year students from the Department of Psychology at Al-Quds University, Palestine, the experimental group (20) students on which the program was applied, and the control group (20) male and female students, which were not.

Study tool
The researcher reviewed the theoretical literature related to brainstorming, and previous studies on this subject, such as the Matalqa study (1998), the Demir study (2005), the Al-Ahmadi study (2006), the Al-Atari study (2006), the Brockling, 2006 study, and the Al-Atari study (2006). Bloomstrom (2008), then designing a program based on brainstorming according to the Sternberg Scale was also used.

Validity of the tool
To ensure the validity of the tool, the researcher presented the program in its initial form to (12) arbitrators from the training staff members of Al-Quds University, Birzeit University and An-Najah National University from the Department of Psychology, Measurement and Evaluation, and those with experience and competence in the field of study to determine the validity of the program, in order to ensure clarity The integrity of the wording of the paragraphs and their validity to measure what they were designed to measure, and after the arbitrators’ amendments, the program was prepared in its final form.

Reliability of the study tool
The reliability coefficient was calculated according to Cronbach's alpha equation, after applying the problem-solving scale to the students of the College of Education, where the value of the reliability coefficient was (0.88), and this value is educationally acceptable, suitable for the objectives of the study, and it can be relied upon.

Study implementation procedures
The researcher carried out the study procedures, according to the following steps:

1 - Choosing a brainstorming strategy to teach using

2 - The equivalence of the control and experimental groups was verified through their cumulative averages.

3 - An explanation of the lectures was prepared according to the brainstorming strategy over (15) lectures, and an educational guide was prepared according to the brainstorming strategy.

4 - Relying on the Sternberg Scale, and presenting it to a group of arbitrators for arbitration

5 - Applying the Sternberg test to students.

6 - Starting to teach the experimental group using the brainstorming strategy

7 - As for the control group, it was taught using the usual teaching strategy.

8 - Analyzing and discussing the results, and making recommendations.

Study Variables
Independent Variable: Brainstorming Program

Dependent Variables: Dee Sternberg’s Problem Solving Techniques

Intermediate variables: (gender, age)

study design

EG: O1 X O1

CG: O1__O1

CG: The Control Group

EG: The Experimental Group

O1: Sternberg test

X: Experimental processing (brainstorming teaching).

Ordinary, untreated

Statistical manipulations

Arithmetic means and standard deviations were extracted in order to know the results of the post-test, and the ANCOVA test was used to show the differences in favor of those in the experimental and control groups, and Cronbach's alpha test was used to calculate the stability of the test.

III. RESULTS

This study aimed to identify the impact of the brainstorming strategy in developing the problem-solving method of Al-Quds University students. One of them is a control one, which is studied using the usual method, and the other is an experimental one. According to the brainstorming strategy, the researcher relied on the Sternberg test scale, and applied it to both groups, and the validity, stability and validity of the scale were confirmed to achieve the objectives of the study. The groups were checked for equivalence and the following table shows this:

Table (1) Arithmetic averages and standard deviations of the scores of students of the College of Education for the two study groups in the pre-test

<table>
<thead>
<tr>
<th>group</th>
<th>Number</th>
<th>Creative Thinking Pretest (out of 38)</th>
<th>Attitudes Pretest (out of 38)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>standard deviation</td>
<td>arithmetic mean</td>
</tr>
<tr>
<td>control group</td>
<td>19</td>
<td>8.78</td>
<td>15.26</td>
</tr>
<tr>
<td>experimental group</td>
<td>19</td>
<td>4.28</td>
<td>17.47</td>
</tr>
</tbody>
</table>

It is evident from the previous table that there are small differences between the arithmetic averages of the experimental and control groups, and this confirms that there was parity between the two groups.

viewing results of the study according to its hypotheses:
**First Hypothesis:** There are no statistically significant differences at the significance level ($\alpha \leq 0.05$) between the arithmetic averages of the students of the College of Educational Sciences / Al-Quds University on the Sternberg and Wagner Thinking Styles Scale due to the type of group (experimental and control), gender (male and female), and the interaction between them.

To verify the validity of this hypothesis, the arithmetic averages and standard deviations of the scores of the sample members were calculated according to the variables of group and gender, on the Sternberg and Wagner Thinking Styles Scale in the pre and post measurement, and Table (1) shows these data.

Table (1): Arithmetic averages and standard deviations of the scores of the sample members according to the variables of group and gender, on the Sternberg and Wagner Thinking Styles Scale in the pre and post measurement

<table>
<thead>
<tr>
<th>Variable</th>
<th>Pre-Test</th>
<th>Post Test</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Standard Deviation</td>
<td>Arithmetic Mean</td>
</tr>
<tr>
<td>Control Group</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Experimental</td>
<td>270.93</td>
<td>46.95</td>
</tr>
<tr>
<td>Control Group</td>
<td>267.67</td>
<td>49.24</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>253.67</td>
<td>52.61</td>
</tr>
<tr>
<td>Female</td>
<td>279.72</td>
<td>41.69</td>
</tr>
</tbody>
</table>

In order to find out the significance of these differences between the mean scores of the two groups: experimental and control, and average scores of males and females, as well as knowing the effect of the interaction between the group and gender on the Sternberg and Wagner Thinking Styles scale with fixation of the effect of the pre-measurement, the accompanying analysis of variance was used, and the results became clear in Table (2)

Table (2): Analysis of the accompanying variance to show the significance of the differences between the averages on the Sternberg and Wagner Thinking Styles Scale according to the group, gender, and the interaction between them

<table>
<thead>
<tr>
<th>Source of Variation</th>
<th>Sum of Squares</th>
<th>Freedom Degree</th>
<th>Arithmetic Mean Squares</th>
<th>F Value</th>
<th>The Level of Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pretest</td>
<td>28089.81</td>
<td>1</td>
<td>28089.81</td>
<td>53.623</td>
<td>0</td>
</tr>
<tr>
<td>Gender</td>
<td>972.821</td>
<td>1</td>
<td>972.821</td>
<td>1.857</td>
<td>0.185</td>
</tr>
<tr>
<td>Group</td>
<td>12166.23</td>
<td>1</td>
<td>12166.23</td>
<td>23.225</td>
<td>0</td>
</tr>
<tr>
<td>Gender x Group</td>
<td>2574.393</td>
<td>1</td>
<td>2574.393</td>
<td>4.915</td>
<td>0.036</td>
</tr>
<tr>
<td>The Error</td>
<td>13095.89</td>
<td>25</td>
<td>523.835</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The Group</td>
<td>2762166</td>
<td>30</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table (2) shows that the differences between the experimental and control groups in thinking styles on the Sternberg and Wagner scale are statistically significant, with the value of “P” reaching (23.225), which is statistically significant at the level (0.05), and by referring to the table of averages (3) we note that The average scores of the experimental group members were higher than the average scores of the control group members, which indicates the impact of the program in increasing the students' awareness of the thinking styles of the experimental group members. With regard to the significance of the differences between males and females in the styles of thinking on the Sternberg and Wagner scale, it was not statistically significant. Where there was convergence in the average responses of the students on the Sternberg and Wagner scale to the thinking styles of the respondents and of their gender. With regard to the interaction between the gender and group variable in the thinking styles on the Sternberg and Wagner scale, it was statistically significant, with the value of “P” (4.915), a function at the level of significance (0.05), the average responses of females on the Sternberg and Wagner thinking scale were more of males in the experimental group.

Table (3): Arithmetic averages and standard error of the scores of the sample members according to the variables of group and gender, on the Sternberg and Wagner Thinking Styles Scale in the dimensional measurement

<table>
<thead>
<tr>
<th>Gender</th>
<th>Group</th>
<th>Arithmetic mean</th>
<th>Standard Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>Control Group</td>
<td>279.72</td>
<td>8.66</td>
</tr>
<tr>
<td></td>
<td>Experimental Group</td>
<td>302.13</td>
<td>10.65</td>
</tr>
<tr>
<td>Female</td>
<td>Control Group</td>
<td>272.61</td>
<td>8.12</td>
</tr>
<tr>
<td></td>
<td>Experimental Group</td>
<td>333.84</td>
<td>7.34</td>
</tr>
</tbody>
</table>

The second hypothesis: There are no statistically significant differences at the significance level (α≤0.05) between the arithmetic averages of the students of the College of Educational Sciences / Al-Quds University on the Sternberg and Wagner Thinking Styles Scale due to the type of group (experimental and control), and age (21 and less, and 22 years and more). and the interaction between them.

To verify the validity of this hypothesis, the arithmetic averages and standard deviations of the scores of the sample members were calculated according to the variables of the group and age, on the Sternberg and Wagner Thinking Styles Scale in the pre and post measurement, and table (4) shows these data.

Table (4): Arithmetic averages and standard deviations of the scores of the sample members according to the variables of group and age, on the Sternberg and Wagner Thinking Styles Scale in the pre and post measurement

<table>
<thead>
<tr>
<th>group</th>
<th>Pre-Test</th>
<th>post test</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>standard deviation</td>
<td>arithmetic mean</td>
</tr>
<tr>
<td>control group</td>
<td>46.95</td>
<td>270.93</td>
</tr>
<tr>
<td>experimental group</td>
<td>49.24</td>
<td>267.67</td>
</tr>
</tbody>
</table>
In order to find out the significance of these differences between the mean scores of the two groups: experimental and control and average scores of males and females, as well as knowing the effect of the interaction between the group and age on the Sternberg and Wagner Thinking Styles scale with fixation of the effect of the pre-measurement, the accompanying analysis of variance was used, and the results are clear in Table (5).

Table (5): Analysis of the variance accompanying to show the significance of the differences between the means on the Sternberg and Wagner Thinking Styles Scale according to the group, age, and the interaction between them

<table>
<thead>
<tr>
<th>Source of variation</th>
<th>sum of squares</th>
<th>FreedomDegree</th>
<th>arithmetic mean squares</th>
<th>F value</th>
<th>The level of significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-test</td>
<td>28634.6329</td>
<td>1</td>
<td>28634.63</td>
<td>43.83</td>
<td>0</td>
</tr>
<tr>
<td>Age</td>
<td>8.40928731</td>
<td>1</td>
<td>8.41</td>
<td>0.01</td>
<td>0.911</td>
</tr>
<tr>
<td>the group</td>
<td>16166.12</td>
<td>1</td>
<td>16166.12</td>
<td>24.746</td>
<td>0</td>
</tr>
<tr>
<td>age × group</td>
<td>5.608</td>
<td>1</td>
<td>5.608</td>
<td>0.009</td>
<td>0.927</td>
</tr>
<tr>
<td>The error</td>
<td>16331.978</td>
<td>25</td>
<td>653.279</td>
<td></td>
<td></td>
</tr>
<tr>
<td>the group</td>
<td>2762166</td>
<td>30</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table (5) shows that the differences between the experimental and control groups in the thinking styles on the Sternberg and Wagner scale are statistically significant, with the value of “P” (24.746), which is statistically significant at the level (0.05), and by referring to the table of averages (5), we note that The average scores of the experimental group members were higher than the average scores of the control group members, which indicates the impact of the program in increasing the students’ awareness of the thinking styles of the experimental group members. With regard to the significance of the differences between the respondents according to the age variable in thinking styles on the Sternberg and Wagner scale, they were not statistically significant. Where there was convergence in the average responses of the students on the Sternberg and Wagner scale to the thinking styles of the respondents and of their different age groups.

Table (6): Arithmetic averages and standard error of the scores of the sample members according to the variables of group and age, on the Sternberg and Wagner Thinking Styles Scale in the post-measurement

<table>
<thead>
<tr>
<th>Age</th>
<th>Group</th>
<th>Arithmetic Mean</th>
<th>standard error</th>
</tr>
</thead>
<tbody>
<tr>
<td>21 years and less</td>
<td>control group</td>
<td>274.54</td>
<td>10.48</td>
</tr>
<tr>
<td></td>
<td>experimental group</td>
<td>323.28</td>
<td>8.98</td>
</tr>
<tr>
<td>22 years and more</td>
<td>control group</td>
<td>276.66</td>
<td>8.53</td>
</tr>
<tr>
<td></td>
<td>experimental group</td>
<td>323.54</td>
<td>11.46</td>
</tr>
</tbody>
</table>
Recommendations:

Based on the results of the study, the researcher came up with a number of recommendations, which were as follows:

1. Using the brainstorming program in teaching college students in universities.
2. Faculty members in universities should pay attention to teaching students the problem-solving method.
3. The necessity of paying attention to educational strategies and applying them during the educational process in universities.
4. The Ministry of Higher Education should allow universities to take measures that help students acquire problem-solving methods.
5. Conducting similar studies that deal with other strategies and testing them in developing university problem-solving skills.

ARABIC REFERENCES

3. Zeitoun, Hassan (2003). Teaching skills: a vision in the implementation of teaching. Cairo, the world of books