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THE BRAINSTORMING STRATEGY AND ITS IMPACT ON THE DEVELOPMENT OF STUDENTS' HIGHER-ORDER THINKING SKILLS FROM THE TEACHERS' POINT OF VIEW

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ABSTRACT

This study aimed to identify the impact of the brainstorming strategy on developing higher-order thinking skills (analysis, synthesis, evaluation) in light of some demographic and functional variables for teachers, by following the descriptive and analytical approach, and distributing the questionnaire tool to a random sample of (106) individuals. The study reached a set of results, the most important of which are: the presence of statistically significant differences in estimating the effect of the brainstorming strategy in developing higher-order thinking skills (analysis, synthesis, evaluation) among students from the teachers' point of view due to the gender variable, as these differences were in favor of the analysis and synthesis skills. . There are statistically significant differences in estimating the effect of the brainstorming strategy in developing higher-order thinking skills (analysis, synthesis, evaluation) among students from the teachers' point of view, attributed to the scientific specialization variable (educational subject), in favor of the synthesis skill. There are statistically significant differences in estimating the effect of the brainstorming strategy in developing higher-order thinking skills (analysis, synthesis, evaluation) among students from the point of view of teachers, attributed to the educational stage variable in favor of the evaluation skill. The study also found that there were statistically significant differences in estimating the effect of the brainstorming strategy in developing higher-order thinking skills (analysis, synthesis, evaluation) among students from the teachers' point of view, attributed to the scientific specialization variable (educational subject), in favor of the evaluation skill. The study recommended the need to develop teaching programs aimed at developing higher-order thinking skills using other educational strategies and activities (classroom and non-classroom), and linking this in a practical way to homework and assignments.

KEYWORDS

The Brainstorming Strategy, Higher-order Thinking Skills, Analysis, Synthesis, Evaluation

Introduction

Despite the evolution of teaching methods and methods, traditional teaching methods based on indoctrination persist, especially as traditional methods have proved inappropriate, as they make pupils mainly dependent on hearing and preservation, do not help them develop their intellectual and intellectual abilities, and do not lead them to practice thought, research, survey, analysis, conclusion

and creativity. (Al-Khawalda, 2015), among modern teaching methods is the brainstorming strategy, which is also called (Brainstorming) (Thinking) and (Thinking). This strategy is one of the most important modern methods of teaching, allowing teachers to monitor and track ideas and their evolution in the minds of pupils. It also gives them a clear idea of pupils' attitudes in addressing problems and ways of thinking about disparate attitudes (Lutfah, 2019). Because thinking is the crown of mental abilities and practices, educational predecessors and theories tended to emphasize the need for the development of new teaching methods commensurate with knowledge requirements in the twenty-first century, as the fundamental basis for all mental and intellectual practices that enable learners to confront problems and devise solutions, treatments and optimal decision-making in various areas and aspects of life (Arar, 2021). Given this, the teaching of thinking has become a pivotal trend in contemporary pedagogical thinking, in that many studies have demonstrated that thinking enables the individual to adapt to persistent variables in life, and therefore the mission of educational institutions should be to directly develop and develop pupils' thinking skills as a basis for developing their cognitive and performance abilities. (Attiya, 2015, 48), and therefore, thinking skills were categorized into several levels, as led to the emergence of a concept (HOTs) (Hassan and Mohammed, 2020, 76), which refers to a range of higher mental thinking skills, which are concerned with how learning occurs, and the ability to bring about the needed change in pupils' experiences of acquiring interconnected knowledge, leveraging them to solve problems and devise new solutions and ideas to address them (Shafei, 2021, 37).

Search Problem:

With a growing interest in developing pupils' higher thinking skills at various levels and grades (Mahmoud, 2021), the results of many studies still indicate a poor level of performance of pupils related to these skills (Al-Gubawei, 2017), which is attributable to the dependence of most teachers on traditional teaching methods and methods (Al-Khawalda, 2015) (Arar, 2021), because the development of pupils' higher thinking skills essentially requires attention to teaching methods and methods used by teachers, in that their activities should be geared towards modern methods. (Hassan and Mohammed, 2020), foremost among which is the brainstorming strategy, which is one of the most common and used active education strategies, given its effectiveness in developing various thinking skills and raising the level of educational achievement of pupils (Al-Kasab, 2013) (Murad, 2016).

The problem with research is the need to recognize the impact of the brainstorming strategy on the development of students' higher thinking skills from the point of view of teachers, so that they can be formulated and expressed by the following question:

Are there differences in the assessment of the impact of the brainstorming strategy on the development of higher thinking skills (analysis, composition, evaluation) in students from the teacher's point of view attributable to variables (sex, scientific specialization (teaching subject), educational level, years of experience)?

Research Objectives:

The main objective of the research is to identify the impact of the brainstorming strategy on the development of higher thinking skills (analysis, composition, evaluation) in students by exploring the extent to which there are differences in the assessment of this impact among teachers due to a range of

variables, namely: (sex, scientific specialization (educational subject), educational level, and years of experience).

The importance of research:

The importance of this research in theory stems from the fact that it combines two variables that are crucial to contemporary educational thinking and modern educational processes (brainstorming strategy, higher thinking skills). The first represents modern teaching methods, while the second represents a pivotal trend in education, a trend (thinking education). In practice, research is important in that it seeks to uncover the nature of the relationship between the brainstorming strategy and the development of higher thinking skills from the teacher's point of view. The researcher had access to only one previous study that combined these two variables This research opens the way to contribute to the development of the educational process and its outputs in Iraq.

Research hypotheses:

1- There are statistically significant differences at the indicative level ($a \leq 0.05$) in the assessment of the impact of the brainstorming strategy on the development of higher thinking skills (analysis, composition, evaluation) in students from the teacher's point of view attributable to the gender variable.
2- There are statistically significant differences at the indicative level ($a \leq 0.05$) in the assessment of the impact of the brainstorming strategy on the development of higher thinking skills (analysis, composition, evaluation) in students from the teacher's point of view attributable to the variable scientific specialization (teaching material).
3- There are statistically significant differences at the indicative level ($a \leq 0.05$) in the assessment of the impact of the brainstorming strategy on the development of higher thinking skills (analysis, composition, evaluation) in students from the teacher's point of view attributable to the educational phase variable.
4- There are statistically significant differences at the indicative level ($a \leq 0.05$) in the assessment of the impact of the brainstorming strategy on the development of higher thinking skills (analysis, composition, evaluation) in students from the teacher's point of view due to the variable years of experience.

Search Limits:

Objective limits: Research was limited to the impact of the brainstorming strategy on developing students' higher thinking skills from the point of view of teachers.
Spatial boundaries: Research was conducted in Nineveh, Mosul governorate, Iraq.
Time limits: school year 2022-2033.

Second Research

Theoretical framework and previous studies

The theoretical relationship between research variables (brainstorming strategy, higher thinking skills) can be clarified by articulating their respective concepts, their importance in the educational process, and their respective teacher's role in two pillars, as follows:

First: Theoretical Framework:

First: Brainstorming Strategy:

The Brainstorming Strategy is one of the most important strategies within the philosophy and theory of active learning, which depends on allowing learners to participate actively in teaching activities within the classroom, by dividing them into small groups, enabling them to play different roles, work diverse projects, ask questions, all under the supervision of the teacher 347 2016).

Definition of brainstorming strategy:

brainstorming is defined as a method of collective thinking which aims to produce and generate diverse and diverse ideas, through the participation of all members of the group in thinking to solve a particular problem approach, especially when it is difficult to solve for everyone alone, and in another way it is used to stimulate the thinking of a group of pupils to solve a problem that leads to directed behaviour by identifying all ideas put forward and unfamiliar, which can be unified and sentenced (Bani Fawaz, 2019, 235). Brainstorming as an educational strategy is defined as a creative teaching method based on different thinking and mind abilities in order to produce and generate new ideas and opinions to solve and address a problem, in partnership with a limited group of individuals, and in an appropriate environment that helps to create and produce more ideas (Abu al-Rayat and Nazirin, 2020, 133). The brainstorming strategy is also defined as an educational position aimed at generating the largest number of ideas in students, to solve and address a particular problem within a specified period of time, by giving them a wide space to participate effectively and freely (Arar, 2021, 154).

In procedural terms, this study's brainstorming strategy can be defined as actions and teaching steps that depend on motivating learners to participate in the collective thinking of a problem, thereby contributing to the development of their higher thinking skills.

Objectives and importance of the brainstorming strategy:

The strategy of brainstorming essentially aims to transform the learner from a passive recipient to a positive participant and unlocking his potential by giving him freedom of thought and participation, Enabling it to generate appropriate ideas to address a problem in a short time by developing thinking skills and learner's self-reliance in learning, To come up with new ideas, and this strategy also contributes to entrenching the values of respect for opinion and other opinion, Promoting the values of exchange and leveraging the ideas of others, and stimulating the learner's motivation and motivation to produce creative ideas that represent solutions to specific problems (Altaf, 2019, 24) (Al-Mu 'atisma and Al Khaleda, 2020, 441).

Therefore, the importance of the brainstorming strategy is that it is an effective strategy in developing different thinking skills. raising their motivation and creative abilities, and enhancing their activity and effectiveness during the teaching process, As they can be creative in generating their ideas, sharing them with others freely and without fear of criticism and ridicule, It also contributes to the development of scientific thinking skills in problems and access to appropriate solutions to them and the production of new and unfamiliar ideas, where the learner becomes more persistent and determined to face difficulties and failures and double the effort to reach high value ideas (Arar, 2021, 153) (Oqal, 2021, 44). The importance of the brainstorming strategy is that it drives and motivates the learner to activate his or her higher mental abilities (analysis, composition, evaluation), thereby developing these abilities

and transforming them into high skills that he or she uses in various educational and life situations (Altaf, 2019, 23).

Principles for the Implementation of the Brainstorming Strategy:

The brainstorming strategy is based on a set of principles under which action should be taken in the implementation of this strategy, which can be summarized by three main principles as follows (Luttaf, 2019, 28-30) (Oqal, 2021, 37-38):

1- The principle of freedom of thought; This principle is based on the fact that strange errors may give rise to better ideas in others, by unleashing the freedom of thought of all learners, removing limitations on their freedom, and enabling them to reach a state of mental relaxation, which enables them to unleash their intellectual abilities, and prompting them to produce and generate ideas in an unimpressive atmosphere of criticism and evaluation.

2- The principle of building on others' ideas; By developing and emerging from others' ideas with new ideas, ideas are not exclusive to their owners, but can be initiated by any participant in generating other new ideas.

3- The principle of deferral of evaluation; By making the assessment at the last stage, because criticism or evaluation of any idea at the previous stages will lose the learner's ability to follow up and distract from trying to get a better idea, due to fear of criticism and a sense of tension.

Stages and steps of the brainstorming strategy:

The brainstorming strategy is implemented in several phases and steps, consisting of the following (Lutef, 2019, 33-38) (Oqal, 2021, 39-41):

1- Identifying and discussing the problem; It is based on prior planning of the problem. At this stage, the problem is carefully identified, analysed and disaggregated into its components and primary components, and thus presented to the learners and discussed with them in the light of the ideas put forward.

2- Reformulation of the problem; Through the rethinking and formulation of questions to generate new ideas and solutions, the atmosphere is also being created for brainstorming.

3- brainstorming; The solutions and ideas reached by learners during the brainstorming session are presented.

4- Selection and evaluation; At this stage, the best solutions and ideas presented are selected, evaluated and evaluated with a view to their development.

Second: Higher-Order Thinking Skills:

The term higher thinking skills is a modern terminology based primarily on researchers' classification of levels of thinking, patterns and fields, and the consequences of a pattern of such thinking at each level.

Definition of Higher Thinking Skills: The concept of higher thinking skills in some researchers refers to a set of skills that combine critical thinking skills with creative thinking skills. The commonalities between the two types are what are called higher thinking skills, which help the learner to manage his own thinking, and think logically and mentally about all things (Ottoman et al., 2015, 201). Others have defined it as a mental activity performed by an individual without being aware of all his actions and steps necessarily, but it requires high attention, and more thought and mental effort to find solutions

and remedies to the problems he faces (Al-Gubaiwi, 2017, 56). Others identified it as a set of mental processes that a learner uses when learning, namely data collection and analysis, problem solving and prediction (Hussein, 2019, 82). Higher thinking skills are also defined as a set of mental processes that rely on observation and research while confronting a problem, by describing and explaining the problem, providing explanations, conclusions, analysing it to its elements, and identifying strengths and weaknesses to reach proposed solutions (Shafei, 2021, 51).

In another definition, it is a set of abilities that emerge through asking questions, solving problems, decision-making and creative thinking, which include: mental and logical processes, reflection and deep thinking, and the calendar of serial thinking (Hussein, 2019, 82).

The higher thinking skills of this research can be defined in procedural terms as a set of skills that enable the learner to think logically about the confrontation of topics and problems, and access to new ideas and treatments, namely: analytical skill, installation skill, and calendar skill.

The importance of higher thinking skills:

the importance of higher thinking skills in the benefits they bring to the learner, is to enable him to exercise the act of thinking reasonably and rationally, to acquire critical and creative thinking skills, which enable him to understand the world around him, and to develop his cognitive and mental abilities (Al-Gubawei, 2017, 58).

Higher thinking skills also contribute to increasing the level of educational attainment by developing its capabilities for understanding, perception, analysis, interpretation and logical connectivity, and increasing its motivation to access new ideas and creative and innovative solutions (Shafei, 2021, 56).

Classification of higher thinking skills:

There is no specific and standardized classification of higher thinking skills. There are several classifications, the most famous of which are Bloom (Bloom, 1967) (Hussein, 2019, 91), which included three higher thinking skills, namely (Shuri, 2023, 93):

1- Analysis skill; It is the learner's ability to analyze problems and subjects into their main components so that he or she can understand them. This skill requires the dismantling and fragmentation of ideas and the analysis of relationships between parts and components, and the disclosure of the main principles governing their relationship.

2- Synthesis; It is one of the skills that focuses on creativity and innovation, as it is the learner's ability to rebuild and rebuild elements and partial components of the subject or problem in a new way, requiring participation, exchange of ideas, planning and implementation management of actions.

3- Evaluation; It is the learner's ability to make a judgement on the value of the subject, based on specific criteria, and the learner can participate in the conclusion of those criteria based on what previous skills require.

Second: Previous studies:

The study (Schori, 2023) aimed to recognize the impact of the use of brainstorming strategy in developing higher thinking skills (analysis-composition-assessment) and creative thinking (fluency-

flexibility-authenticity), and found the superiority of female pilot group students over female control group students in the post-post measurement of higher thinking skills (analysis-composition), with the exception of the experimental test (calendar). The study (Shafei, 2021) also aimed to verify the effectiveness of an enrichment programme in the light of problem-based learning to develop higher thinking skills and scientific awareness in science in middle school pupils. The results demonstrated that the enrichment programme prepared in the light of problem-based learning is effective and has a significant impact on the development of higher thinking skills and scientific awareness in middle school pupils. While the study (Arar, 2021) sought to reveal the impact of the brainstorming strategy on the development of critical thinking among female basic eighth graders in Palestine, the results of the study showed a difference between the two groups attributable to the strategy of brainstorming in the development of critical thinking, and for the benefit of the experimental group. The study (Mohammed, 2021) aimed to reveal the impact of using a proposed strategy based on brainstorming and problem-solving in the development of certain habits of mind, critical thinking skills in mathematics among fifth-grade primary students in Fayoum governorate, and found statistically significant differences in favour of the experimental group in the remote application of both tools, and a statistically significant correlation of the type (Strong expulsion) Among the habits of mind and critical thinking skills in mathematics in pupils sample research (experimental group). The study (Shaira, 2020) aimed to identify the effectiveness of the model of hands and minds in teaching science to develop the higher thinking skills of the first grade preparatory pupils, and found statistically significant differences between the average grades of the control and experimental pupils in the remote application of the higher thinking skills test for the students of the experimental group at the level of sub-skills, head and college degree of testing.

A study (Abu al-Rayat and Nadirin, 2020) found differences between the average grades of the pilot group students in tribal and postgraduate measurements to test the habits of the mind produced as a whole in favor of remote application, and to test the habits of the mind produced on each subtype in favor of remote application. The study (Al-Eismah and Al-Khaleda, 2020) showed that there are statistically significant differences in the test of creative thinking between experimental groups. A study (Murad, 2016) found statistically significant differences between the average grades of the pilot group students and the control group in remote application for the benefit of the experimental group, improved scientific thinking skills and increased attainment of the scientific concepts of the pilot group students compared to the control group students in tribal dimension application.

Comment on previous studies:

In the light of the previous presentation, only one study combined brainstorming strategy with higher thinking skills: (Schori, 2023), while other studies concerned one variable associated with other variables, current research thus contributes to filling a knowledge gap in studying the impact of the brainstorming strategy on the development of higher thinking skills, given the paucity of previous studies on the subject.

Third Research: Research methodology and procedures

Research curriculum:

To achieve the research objectives, the researcher followed the analytical descriptive approach to describe the phenomenon studied and analyze it in all its dimensions.

Society and Sample Research:

The research community includes all teachers at various educational levels in Nineveh, Mosul Governorate, Iraq. The sample was selected in a simple random manner, taking into account the conditions for its representation and expression of all characteristics and features of the indigenous community in all quantitative and qualitative respects, with 106 individual members.

Search Tool:

The researcher chose to use the identification as a tool for obtaining data from her primary sources. The researcher developed an identification model, consisting of two sections:

Section I: Personal data: (sex, scientific specialization (educational material), educational stage, years of experience).

Section II: Identification paragraphs: 24, divided into three themes: (analysis skill, installation skill, evaluation skill) and (8) paragraphs for each skill.

The paragraphs have been drafted using theoretical data, and the researcher has benefited from the tools used in some previous studies: (Woltup, 2019) (Oqal, 2021).

Sincerity and consistency of study tool:

To verify the truthfulness of the study tool, the researcher adopted the application of the ostensible honesty standard by presenting the identification to a group of arbitrators, to assess its suitability to recognize the impact of the brainstorming strategy in developing students' higher thinking skills from the point of view of teachers, and adjusting them to their observations until settling on their final version.

The researcher also applied the questionnaire to a survey sample to verify its suitability, using both the Pearson Correlation Coefficient to calculate internal consistency and constructive honesty, and the Cronbach's Alpha test to measure stability. The measurement results were as follows:

Table (1): Test honesty and resolution stability

Alpha Cronbach Coefficient	Pearson Binding Coefficient	Axis
0.905	0.593	**First Axis**
0.813	0.641	**Second Axis**
0.923	0.798	**Third Axis**

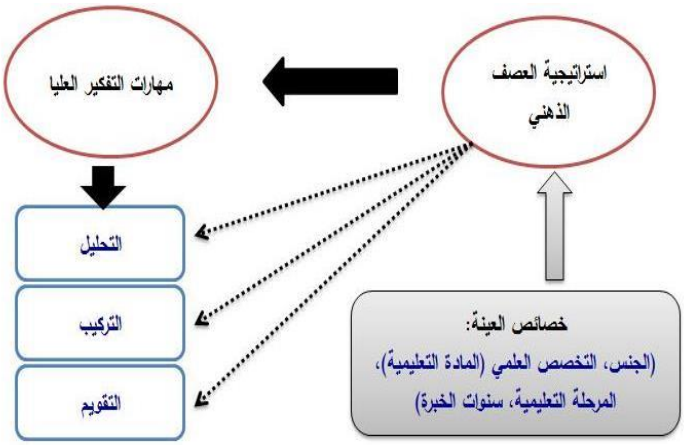
The values shown in the previous table indicate that the standards of honesty and consistency in identification have been achieved to a high degree, which means that they are perfectly valid to measure the relationship between study variables, and to achieve the goals for which they are designed.

Search model: The research model consists of two variables:

Independent Variable: Brainstorming Strategy

Subordinate variable: higher thinking skills (analysis, composition, calendar).

In addition to variables related to the characteristics of the sample, which include: (sex, scientific specialization (educational subject), educational stage, years of experience).



Form (1): Search Form
Source: Researcher's Design

Statistical processing methods:
In addition to calculating correlation transactions, for statistical data processing purposes using the SPSS programme, the researcher used a set of statistical methods:
1- Statistical descriptive methods: The values include arithmetic average and standard deviation, which reflect the grades and rank weights of each axis and paragraph of the axes and paragraphs of the resolution, according to the answers given by the members of the sample.
2- Test (T-Test) for monocultural sample, for impact test.
3- Multiple regression analysis, to test research hypotheses.

Fourth Research
Presentation and discussion of the study's findings
After the collection and unloading of the preliminary data obtained from the responses of the sample individuals to the questions and paragraphs of the questionnaire, all the responses of the sample members were subject to statistical analysis, in accordance with the specific statistical methods. Accordingly, this study was convened to present and discuss the results of the study, in three claims as follows:

First, the demographic and functional characteristics of the sample study:
This section consisted of four demographic and functional variables: (sex, scientific specialization (educational subject), educational level, and years of experience). The researcher adopted the calculation of percentages (differentials). Consequently, the results are as shown in the following table:

Table (2): Sample Properties

Ratio%	Number	Sub variable	Main variable
66.0	70	Female	Gender
34.0	36	Male	
5.7	6	Religious Sciences	**Educational specialization**
17.0	18	Arabic/Languages	
25.5	27	Science	

5.7	6	Social	**(educational material)**
14.2	15	Mathematics/Engineering	
32.1	34	Other	
5.7	6	Basic/Primary	**Level of schooling**
23.6	25	Numerical (medium)	
70.8	75	Secondary	
55.7	59	1. 5 years	**Years of experience**
9.4	10	6. 10 years	
12.3	13	11-15 years	
22.6	24	More than 15 years	

From the previous table, it appears that the sample study provided all the demographic and functional characteristics expressed in section I of the questionnaire. Although these characteristics are expressed in varying proportions the sample has all the characteristics that make it suitable to represent its chosen community of origin, Thus, in quantitative and qualitative terms, to achieve the study's objectives.

Second: Presentation and discussion of test results (T-Test):

The t test serves to arrive at many qualitative and descriptive quantitative results, which contribute to the determination of the hierarchical (weight) scores obtained by each of the horizontal resolution paragraphs, and the overall score obtained by each of their axis at the vertical level, where the averages of calculations reflect those scores (weights) according to the quinquennial Lectert scale.

This test also serves to explore the extent to which there is an impact relationship between the independent variable (brainstorming strategy) and the subordinate variable (higher thinking skills), regardless of the impact of demographic and functional variables related to the sample's characteristics.

The results of this test can be reviewed as follows:

Theme 1: The impact of the brainstorming strategy on the development of the analytical skill:

The following table shows the results of the T-Test test:

Table (3): Test results (T-Test) for first axis

Test value =0						Paragraph	M
Level of trust of difference 95%		Average	Moral Sig.	Free degree	T- value		
Min	Max						
4.18	3.92	4.047	0.00	105.0	61.143	Analysis of topics and problems to their parts	1
4.18	3.89	4.038	0.0	105.0	56.006	Ability to divide key ideas into sub-ideas	2
3.88	3.57	3.726	0.0	105.0	48.005	Analysis of relations between parts and components	3
3.87	3.56	3.717	0.0	105.0	47.034	Disclosure of the principles governing the relations between parts and components	4
3.71	3.35	3.528	0.0	105.0	39.146	Representative measurement of topics and ideas	5
3.82	3.52	3.67	0.0	105.0	47.143	Logical measurement and detection of missing introductions	6
3.82	3.52	3.67	0.0	105	49.392	Inductive and deductive reasoning skill	7
4.06	3.77	3.915	0.0	105	52.356	Analytical skill and overall reasoning	8
3.940	**3.638**	**3.789**	**0.000**	**105.000**	**50.028**	**General average**	

T-Test results on the impact of the brainstorming strategy on the development of the analytical skill between a ceiling of 4.47 at paragraph (1), which states that there is a high positive impact of the brainstorming strategy in developing the skill of analysing subjects and problems to its parts, While the minimum (3.53) was at paragraph (5), a value that indicates a moderate positive impact of the brainstorming strategy in developing the skill of representative measurement on subjects and ideas, Between these two boundaries came the averages values of the rest of the axis paragraphs, at the same time as all the values came (t) High and positive, as opposed to a moral value equal to zero, and below the level of indication ($a \leq 0.05$). At the vertical level, the overall average value of all the axis's paragraphs (3.79), indicating a positive impact of the brainstorming strategy on the development of analytical skills, was reached.

Theme 2: The impact of the brainstorming strategy on the development of the installation skill

Table (4): Test results (T-Test) for the second axis

Test value =0						Paragraph	M
Level of trust of difference 95%		Average	Moral Sig.	Free degree	T value		
Min	Max						
4.21	3.9	4.057	0.0	105.0	52.029	Ability to rebuild and install topics and ideas	1
4.35	4.07	4.208	0.0	105.0	58.572	Discussions with others and exchange of ideas	2
4.13	3.83	3.981	0.0	105.0	51.714	Planning and organization of procedures	3
4.27	3.96	4.113	0.0	105.0	52.376	Access to creative new and innovative solutions to problems	4
3.81	3.44	3.623	0.0	105.0	39.231	Abstract installation skill (abstract relationships)	5
3.8	3.51	3.651	0.0	105.0	49.69	Sequential Installation Skill	6
3.94	3.66	3.802	0.0	105	53.201	Analysis of characteristics and features	7
4.06	3.71	3.887	0.0	105	43.553	Reconstruction and total installation	8
4.071	**3.760**	**3.915**	**0.000**	**105.000**	**50.046**	**General average**	

The averages for the second axis paragraphs related to the impact of the brainstorming strategy on the development of the installation skill in paragraph (2), which means that there is a high and positive impact of the brainstorming strategy in developing the skill for discussions and exchange of ideas, as opposed to the minimum value (3.62) at paragraph (5) and, therefore, indicates the impact of the average brainstorming strategy on the development of the abstract installation skill (abstract relationships), with high and positive values of (t), and moral for below level ($a \leq 0.05$).

The overall average value of all axis paragraphs is also equal to (3.91), a high value that indicates a highly positive impact of the brainstorming strategy on the development of the installation skill.

Theme 3: The impact of the brainstorming strategy on the development of the calendar's skill:

The average arithmetic values of the third axis paragraphs on the impact of the brainstorming strategy on the development of the calendar skill ranged from 4.19 to 3.67 at both paragraph (4) and paragraph (3) respectively, respectively, while the overall average of all subparagraphs was 3.70, indicating an impact of the brainstorming strategy on the development of the calendar skill at an average level. In the three axes, descriptive quantitative and interpretative values decrease as they move downwards, with a discrepancy in the third axis, which means that the brainstorming strategy has a high impact on

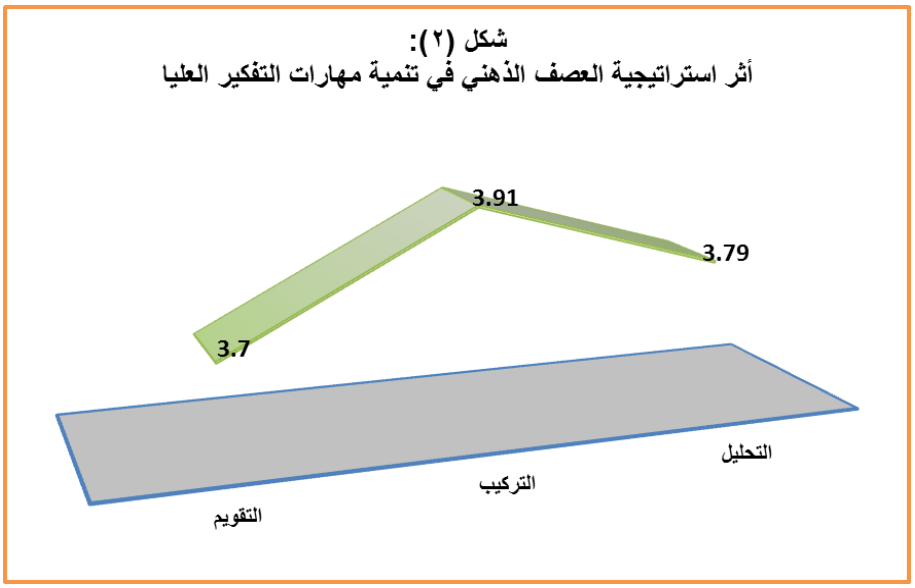
the development of basic higher thinking skills, especially the first three, and then begins to decrease as the following more complex skills are included.

The following table shows the results of the T-Test test and the impact of the brainstorming :strategy on the development of the calendar's skill

Table (5): Test results (T-Test) for the third axis

Test value =0						Paragraph	M
Level of trust of difference 95%		Average	Moral Sig.	Free degree	T value		
Min	Max						
4	3.68	3.84	0.0	105.0	48.321	Identification of calendar criteria and their application to problems and topics	1
3.67	3.37	3.519	0.0	105.0	47.743	Preliminary conclusion of calendar criteria	2
3.83	3.51	3.67	0.0	105.0	45.805	Disclosure of new criteria for judging the value of the subject	3
4.33	4.05	4.189	0.0	105.0	58.932	Raise and ask questions	4
4.15	3.81	3.981	0.0	105.0	45.837	Deductive reasoning skill	5
3.85	3.51	3.679	0.0	105.0	43.645	Assessment of partial ideas and their relationships	6
4.12	3.88	4	0.0	105	65.115	Overall Theme Calendar	7
4.15	3.83	3.991	0.0	105	48.616	Testing and evaluating new ideas	8
4.013	**3.705**	**3.859**	**0.000**	**105.000**	**50.502**	**General average**	

In any event, the above findings indicate in their overall outcome that there is an impact of the brainstorming strategy on the development of the three higher thinking skills (analysis, composition and evaluation), and that this impact is highly focused on installation skills and, to a moderate degree, on both analysis and evaluation skills, as illustrated in the following figure:



Source: Researcher's preparation

Third: Hypothesis test results:

To validate the study's hypotheses, the researcher performed a Multiple Linear Regression analysis, which is an advanced method that ensures accuracy in results and proximity to reality, and contributes

to improving research results by optimizing the use of data in determining causal relationships between variables.

First: First hypothesis test results:

The first hypothesis was that there were statistically significant differences at the indicative level ($a \leq 0.05$) in the assessment of the impact of the brainstorming strategy on the development of higher thinking skills (analysis, composition, evaluation) in students from the teacher's point of view attributable to the gender variable; The results of the first hypothesis test are as follows:

Table (6) Correlation factors between brainstorming strategy and higher thinking skills For Sex Variable

Miscalculation	Modified Determination Coefficient R2	Determination Coefficient)R^2(	Correlation Coefficien (R)	Variables	
				Dependent variable	Independent variable
0.466	0.0	0.069	0.263	Higher order thinking skills	Brainstorming Strategy

The correlation factor between brainstorming strategy and higher thinking skills for the sex variable (0.263), which is relatively low, is nevertheless indicative of the suitability of testing to validate the hypothesis using quantitative data on study variables. The connectedness of the coefficient can be ascertained by the results of the ANOVA test, namely by determining the calculated value (F) and its morale at the indicative level (0.05), where the result of the test is as shown in the following table:

Table (7) Variation test of relationship between brainstorming strategy and higher thinking skills for sex variable

Moral)Sig(..	Calculated F value	Average squares	Free degree	Sum of squares	Form
0.062	2.517	1	3	1.639	Linkage
		0.22	102	22.135	Remaining
			105	23.774	Total

The value (F) calculated for the relationship between brainstorming strategy and higher thinking skills for a gender variable is equal to (2.517) with a moral value of (0.62) which is greater than (0.05), which means that there is no statistically significant relationship at the indicative level ($0.05 \geq \alpha$) Between brainstorming strategy and higher thinking skills attributable to a gender variable, which is the most verifiable result by extracting value (T) and its morale, provided by the multiple regression analysis, as shown in the following table:

Table (8) Regression factors of the impact of the brainstorming strategy on the development of higher thinking skills for the sex variable

Moral)Sig.(	T value	Uni transactions	Non-standard transactions		Form
		Beta	Miscalculation	B value	
0.109	1.615		0.367	0.592	**Fixed**
0.066	1.857	0.27	0.128	0.237	**Analytical skill**
0.53	0.63	0.091	0.122	0.077	**Installation skill**
0.375	-892.-	-128.-	0.132	-117.-	**Evaluation skill**

In the previous table, it is noted that the morale values of the three higher thinking skills are all greater than the indicative level (0.05), that there is a negative value of the binding factor (B) at the calendar skill, while the T values are positive at the three skills. This indicates that there are statistically significant differences at the indicative level ($a \leq 0.05$) in the assessment of the impact of the brainstorming strategy on the development of higher thinking skills (analysis, composition, evaluation) in students from the teacher's point of view attributable to the gender variable, as these differences are in favour of analysis and installation skills. Which means that the first hypothesis is correct.

Second: Second hypothesis test results:

The second hypothesis states: There are statistically significant differences at the indicative level ($a \leq 0.05$) in the assessment of the impact of the brainstorming strategy on the development of higher thinking skills (analysis, composition, evaluation) in students from the teacher's point of view due to the variable scientific specialization (educational subject). The results of the test of this hypothesis are as follows:

Table (9) Correlation factors between brainstorming strategy and higher thinking skills for the scientific specialty variable

Miscalculation	Modified Determination Coefficient R2	Determination Coefficient)R^2(	Correlation Coefficient)R(	Variables	
				Dependent variable	Independent variable
1.637	0.1	0.101	0.318	**Higher order thinking skills**	**Brainstorming Strategy**

As the previous table shows, the coefficient of correlation between brainstorming strategy and higher thinking skills for the scientific specialization variable (educational subject) (0.318), although rather low, indicates the suitability of the test to validate the hypothesis, by calculating the F value calculated and its morale at the indicative level (0.05) of the ANOVA test. The test result is as shown in the following table:

Table (10) Variation test of relationship between brainstorming strategy and higher thinking skills for scientific specialty variable

Moral)Sig(..	Calculated F value	Average squares	Free degree	Total squares	Form
0.012	3.814	10	3	30.657	**Linkage**
		2.68	102	273.306	**Remaining**
			105	303.962	**Total**

The value (F) calculated for the relationship between brainstorming strategy and higher thinking skills for the scientific specialization variable (educational subject) (3.814) with a moral value of 0.012 (smaller than 0.05), a value that indicates a statistically significant relationship at the indicative level ($0.05 \geq \alpha$) between brainstorming strategy and higher thinking skills attributable to the scientific specialist (educational subject). The previous result can be verified by extracting T's value and morale through multiple regression analysis, as shown in the following table:

Table (11) Regression factors of the impact of the brainstorming strategy on the development of higher thinking skills for the scientific specialization variable

Moral)Sig.(	T value	Uni transactions	Non standard transactions		Form
		Beta	Miscalculation	B value	
0.612	0.509		1.288	0.656	**Fixed**
0.802	-252.-	-036.-	0.449	-113.-	**Analytical skill**
0.01	2.618	0.372	0.43	1.125	**Installation skill**
0.731	-345.-	-049.-	0.462	-160.-	**Evaluation skill**

Note in the previous table that the morale values of the three higher thinking skills are all greater than the level of indication (0.05) for the analysis and evaluation skills, while the level of indication is lower at the installation skill, with negative values of the binding factor (B) and the value (T) at the analysis and evaluation skills. These values indicate a wavelength between the brainstorming strategy and the skill of the installation, and a negatively thought-provoking relationship between the brainstorming strategy and the analytical and evaluation skills attributable to the scientific specialization variable (educational material). This also indicates that there are statistically significant differences at the indicative level ($a \leq 0.05$) in the assessment of the impact of the brainstorming strategy on the development of higher thinking skills (analysis, composition, evaluation) in students from the teacher's point of view attributable to the variable scientific specialization (teaching subject), in favour of the installation skill; Thus, the second hypothesis is also correct.

Third: Third hypothesis test results:

The third hypothesis states: "There are statistically significant differences at the indicative level ($a \leq 0.05$) in the assessment of the impact of the brainstorming strategy on the development of higher thinking skills (analysis, composition, evaluation) in students from the teacher's point of view attributable to the educational phase variable; The results of the third hypothesis test are as follows:

Table (12) Correlation factor between brainstorming strategy and higher thinking skills for educational phase variable

Miscalculation	Modified Determination Coefficient R2	Determination Coefficient)R^2(	Correlation Coefficient)R(	Variables	
				Dependent variable	Independent variable
0.59	-011.-	0.017	0.132	**Higher order thinking skills**	**Brainstorming Strategy**

The coefficient of association between the autonomous variable (brainstorming strategy) and the subordinate variable (higher thinking skills) for the educational phase variable (0.132), which is very

low, and by extracting the calculated value (F) and its morale at the indicative level (0.05) of the ANOVA test, can be quantified.

Table (13) Variation test of relationship between brainstorming strategy and higher thinking skill For Educational Phase Variable

Moral)Sig(..	Calculated F value	Average squares	Free degree	Total squares	Form
0.615	0.602	0.21	3	0.628	**Linkage**
		0.35	102	35.457	**Remaining**
			105	36.085	**Total**

The value (F) calculated for the relationship between brainstorming strategy and higher thinking skills for the educational phase variable (0.602) with greater moral value than (0.05), indicates that there is no statistically significant relationship at the indicative level ($0.05 \geq \alpha$) between brainstorming strategy and higher thinking skills attributable to the educational stage variable.

Table (14) Regression factors of the impact of the brainstorming strategy on the development of higher thinking skills for the educational phase variable

Moral)Sig.(	T value	Uni transactions	Non standard transactions		Form
		Beta	Miscalculation	B value	
0.00	6.307		0.464	2.927	**Fixed**
0.86	-177.-	-027.-	0.162	-029.-	**Analytical skill**
0.263	-1.125-	-167.-	0.155	-174.-	**Installation skill**
0.426	0.8	0.118	0.167	0.133	**Evaluation skill**

Note that the moral values of the three higher thinking skills (analysis, composition, and evaluation) are all greater than the level of indication (0.05), with negative values of the binding factor (B) and the value (T) at the analysis and installation skills.

This indicates that there are statistically significant differences at the indicative level ($a \leq 0.05$) in the assessment of the impact of the brainstorming strategy on the development of higher thinking skills (analysis, composition, evaluation) in students from the teachers' point of view attributable to the educational phase variable in favour of the appraisal skill. It also demonstrates the validity of the third hypothesis.

Fourth: Fourth hypothesis test results:

The fourth hypothesis states: There are statistically significant differences at the indicative level ($a \leq 0.05$) in the assessment of the impact of the brainstorming strategy on the development of higher thinking skills (analysis, composition, evaluation) in students from the teacher's point of view due to the variable years of experience. The results of the fourth hypothesis test are as follows:

Table (15) :Correlation coefficient between brainstorming strategy and higher thinking skills for the variable years of experience

Miscalculation	Modified Determination Coefficient R2	Determination Coefficient)R^2(	Correlation) Coefficient R(	Variables	
				Dependent variable	Independent variable
1.251	0.0	0.05	0.223	Higher order thinking skills	Brainstorming Strategy

The coefficient of correlation between brainstorming strategy and higher thinking skills for the variable years of experience (0.223), a relatively low value, can be determined by assigning the calculated value (F) and its morale at the indicative level (0.05), where the test result is as shown in the following table:

Table (16) Variation test of relationship between brainstorming strategy and higher thinking skills for the variable years of experience

Moral)Sig(..	Calculated F value	Average squares	Free degree	Total squares	Form
0.16	1.784	2.79	3	8.376	**Linkage**
		1.57	102	159.586	**Remaining**
			105	167.962	**Total**

The value (F) calculated for the relationship between brainstorming strategy and higher thinking skills for the experience years variable (1.784) with a moral value of (0.16) greater than (0.05), which means that there is no statistically significant relationship at the indicative level ($0.05 \geq \alpha$) between brainstorming strategy and higher thinking skills attributable to the experience years variable.

Table (17) Regression Factors of the Impact of Brainstorming Strategy on Developing Higher Thinking Skills for the Years of Experience Variable

Moral)Sig.(	T value	Uni transactions	Non standard transactions		Form
		Beta	Miscalculation	B value	
0.26	1.144		0.985	1.126	**Fixed**
0.627	-488.-	-072.-	0.343	-167.-	**Analytical skill**
0.229	-1.209-	-177.-	0.328	-397.-	**Installation skill**
0.026	2.26	0.329	0.353	0.799	**Evaluation skill**

Note in the previous table that the morale values of the three higher thinking skills were greater than the indicative level (0.05) for the analysis and installation skills, with negative values of the correlation factor (B) and their (T) value, while below the indicative level of evaluation skill, this indicates a waveform effect relationship between brainstorming strategy and evaluation skill, and a negatively thought-out effect relationship between brainstorming strategy and analysis and installation skills attributable to the variable years of experience. This also indicates that there are statistically significant differences at the indicative level ($a \leq 0.05$) in the assessment of the impact of the brainstorming strategy on the development of higher thinking skills (analysis, composition, evaluation) in students

from the teacher's point of view attributable to the variable scientific specialization (teaching subject), in favour of the appraisal skill; Which means that the fourth hypothesis is true is the other.

Conclusions:

The main findings of this study can be summarized as follows:

1- The brainstorming strategy has an impact on the development of the three higher thinking skills (analysis, composition, and evaluation) and is highly focused on installation skills and, to a moderate degree, on both analysis and evaluation skills.

2- There are statistically significant differences at the indicative level ($a \leq 0.05$) in the assessment of the impact of the brainstorming strategy on the development of higher thinking skills (analysis, composition, evaluation) in students from the teacher's point of view attributable to the gender variable, as these differences are in favour of analysis and installation skills.

3- There is a correlation of wavelength between brainstorming strategy and synthesis skill, and a relationship of thoughtless influence between brainstorming strategy and analytical and evaluation skills attributable to the variable of scientific specialization (educational material).

4- There are statistically significant differences at the indicative level ($a \leq 0.05$) in the assessment of the impact of the brainstorming strategy on the development of higher thinking skills (analysis, composition, evaluation) in students from the teacher's point of view attributable to the variable scientific specialization (teaching material), in favour of the installation skill.

5- There are statistically significant differences at the indicative level ($a \leq 0.05$) in the assessment of the impact of the brainstorming strategy on the development of higher thinking skills (analysis, composition, evaluation) in students from the teacher's point of view attributable to the educational phase variable in favour of the evaluation skill.

6- There is a wavelength between brainstorming strategy and calendar skill, and a mindful impact relationship between brainstorming strategy and analysis and composition skills attributed to the variable years of experience.

7- There are statistically significant differences at the indicative level ($a \leq 0.05$) in the assessment of the impact of the brainstorming strategy on the development of higher thinking skills (analysis, composition, evaluation) in students from the teacher's point of view attributable to the variable scientific specialization (teaching material), in favour of the appraisal skill.

Recommendations and proposals:

In light of this, the researcher recommends that:

1- Organizing training programmes and courses to develop teachers' skills in using a brainstorming strategy to develop students' higher thinking skills at all levels of education.

2- Developing teaching programmes aimed at developing higher thinking skills using other educational strategies and activities (classroom and non-classroom), and practically linking this to homework and homework.

3- Undertake more similar studies to identify factors affecting the effectiveness of the brainstorming strategy and other strategies in developing students' higher thinking skills at all levels of education.

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